SAUDI-AMERICAN BILATERAL RELATIONS: A CASE STUDY OF THE CONSEQUENCES OF INTERDEPENDENCE ON INTERNATIONAL RELATIONS

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This study examines the consequences of interdependence between Saudi Arabia and the United States from 1960 to 1978 as it relates to the concepts of cooperation and conflict. Research on interdependence focuses primarily on relations among Western countries and on whether interdependence is increasing or decreasing between them. It has rarely addressed relations between countries with different levels of economic development or the consequence of interdependence for international relations in terms of conflict and cooperation. Specifically, this study examines the following question: Does the level of interdependence between Saudi Arabia and the United States have any affect on the level of bilateral conflict and cooperation between the two countries? The hypotheses are tested using regression analysis. The primary conclusion is that increases in bilateral interdependence between Saudi Arabia and the United States from 1960 to 1978 produced increased cooperation as well as conflict.

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CHAPTER I

INTRODUCTION

Statement of the Problem

In this era, measuring the power of nations has become elusive. Stanley Hoffman (1975) states, "calculations of power are even more delicate and deceptive than in previous ages" (p. 184). Since the late 1940s, interdependence has grown because of exchanges in trade and technology. Such interdependence provides incentives for states to cooperate in order to further their beneficial relations and to limit their nonbeneficial relations.

States often encounter strong incentives for cooperation in order to solve global problems such as acid rain, nuclear waste, and nuclear proliferation. Rapid resource depletion within industrialized nations results in increased reliance on less-industrialized countries for raw materials. In turn, less-developed countries require technology and assistance from more-advanced countries in order to maintain and improve their lifestyles. Increased communication and transportation has increased the diffusion and convergence of ideas and values, and has encouraged the growth of interdependence.

For many scholars, the growth of international interdependence challenges the validity of the older "realist" model for the study of world politics. According to these scholars (e.g., Keohane and Nye, 1977), an important change in the very nature of the international political system has occurred during the past 35 years.

Scholars who follow the interdependence approach to world politics believe that increased interdependence has transformed the agenda of world politics, and that the former hierarchy of issues is no longer valid for the policymaker or the political analyst (Keohane and Nye, 1977; Holsti, 1978).

Closely related is the view that military force is no longer a decisive policy instrument in the interaction of international politics. As a result, it becomes difficult to determine a state's power on a particular issue because the overall balance of military power is an unreliable indicator of relative influence (Holsti, 1978).

The interdependence literature suggests that much of the contemporary reality of world politics calls for a radical change in traditional notions concerning the nature of international relations. However, relatively few studies have investigated increasing interdependence between nations and the possible consequences and implications of such increasing interdependence for international politics.

Furthermore, most studies of interdependence concern Western, industrialized countries. They tend to overlook the study of bilateral relations between advanced industrial countries and developing countries of the Third World.

Purpose of the Study

The purpose of this study is to determine if the interdependence approach can explain the consequences of increasing interdependence between Saudi Arabia and the United States from 1960 to 1978. The study thus examines how interdependence affects conflict and cooperation during this period. The present study builds on the most recent and important theoretical works on interdependence in an effort to contribute to the understanding of how this phenomenon affects the relations of an important non-industrial nation-state, Saudi Arabia, with an advanced industrial nation, the United States.

Among the relatively few studies on interdependence which provide a theoretical framework for the discussion of international relationships is one by Karl Deutsch and Alexander Eckstein (1961) which compared levels of industrialization and interdependence and found that the relationship was curvilinear. Interdependence, thus, first increased and then decreased as countries became industrialized. Keohane and Nye (1977), however, indicate that interdependence is generally increasing. Other studies

suggest that an increase in interdependence results in increased cooperation and reductions in conflict among nations. Studies which support this notion include: Angell, 1969; Gasiorowski and Polachek, 1982; Keohane and Nye, 1977, Rosecrance et al., 1977; Spiro, 1974; Young, 1969. Studies which refute this notion include: Bergsten, Keohane, and Nye, 1975; Gasiorowski, 1986; Keohane and Nye, 1973, 1975; Van Dyke, 1966; Waltz, 1970.

To achieve the purposes of this study, the following question is examined:

> Does the level of bilateral interdependence between Saudi Arabia and the United States have any affect on the level of bilateral conflict and cooperation between the two countries?

Hence, three hypotheses are tested:

H_{01}: Saudi Arabia's bilateral relations with the United States between 1960 and 1978 exhibit no increase in the level of interdependence.

H_{02}: If interdependence between Saudi Arabia and the United States increases, there will be no change in the level of conflict between the two countries.

H_{03}: If interdependence between Saudi Arabia and the United States increases, there will be no change in the level of cooperation between the two countries.

Research Approach

This study investigates Saudi-American interdependence and its consequences in terms of conflict and cooperation using simple and multiple regression analyses. By using regression analysis techniques, the impact and consequences of interdependence measures on conflict and cooperation can be ascertained as well as the amount of variation in the dependent variables which can be explained by the independent variables acting together.

Trade and financial data and estimates of gross national product (GNP) used in this study are derived, collected, and estimated from International Monetary Fund (IMF) tapes and Saudi Arabian Monetary Agency Annual Reports (SAMA) as well as from various other sources, such as yearbooks, annual reports, and information services. Multiple sources are used because no single source provides these data for the period examined by this study--1960 to 1978. The study is limited to this particular time period due to the limitation imposed by the data bank utilized. The Conflict and Peace Data Bank (COPDAB) project covers only the years from 1948 to 1978. As for the period before 1960, it was found that genuine activities pertaining to the bilateral relationship between Saudi Arabia and the U.S. were very limited. In addition, essential data needed for this study are not available for the period before 1960. Conflict measures are obtained from Edward Azar's Conflict

and Peace Data Bank (COPDAB, 1980). The sources used to collect the trade data are listed in Appendix A.

Significance of the Study

In order for the interdependence approach to offer a satisfactory explanation of changes in international relations and world politics, it must demonstrate whether it can explain and account for broad classes of relationships across levels of analysis and different units of analysis. One way to determine how broadly generalizations about the interdependence approach can be extended is to examine, for example, the effects of different levels of economic and political developments as well as examining with more precision other issues, relationships between countries, and propositions suggested by previous research.

Since most previous studies of interdependence have focused primarily upon relations among developed and industrialized nation states and very rarely on developing Third World countries, this study attempts to evaluate systematically and empirically the consequences, implications and impact of changing levels of interdependence on Saudi-American bilateral relations over time in terms of conflict and cooperation. In addition, studies focusing on bilateral relations between Saudi Arabia and the United States prior to this study have tended to be atheoretical,

and have evaluated these relations without the benefit of systematic testing.

This study represents an attempt to offer a rigorous approach to data analysis for studies dealing with interdependent bilateral relations in general, and Saudi studies in particular. More importantly, this research contributes to the study of one of the most important phenomena of the international system--interdependence--and its effects on, and relationship to, conflict and cooperation.

Organization of the Study

Chapter I contains a discussion of the research problem, the research hypotheses, and the purpose and significance of the study. Chapter II discusses the beginning and development of Saudi-American relations. Saudi-American oil and military relations are discussed in detail, and sources of conflict and strain in the relationship are identified. Chapter III discusses the development of the concepts of interdependence, conflict and cooperation, and their definitions in previous political research. Specific consequences of Saudi-American interdependence are also identified.

Chapter IV discusses indicators of interdependence and the measurement procedures adopted. It also describes the design of the study, the procedures for collecting data, and the statistical analyses used in the study. Chapter V

presents the analysis and findings of the research as well as an interpretation of the findings. Chapter VI presents a graphical display of the Saudi-U.S. bilateral interdependence and its consequences as well as the policy implications of the findings of this study on the basis of the models developed and the graphical presentation. Chapter VII presents the conclusions of the study. In addition, the limitations of the study are discussed, and recommendations for future research are presented.

CHAPTER II

SAUDI-AMERICAN RELATIONS

Introduction

Before World War I the U.S. displayed little interest in events in the Middle East. In 1931, the U.S. officially recognized Saudi Arabia as a state (Department of State Print, May 16, 1931, p. 395). In 1933, the Saudi grant of an exclusive concession to Standard Oil of California established the first economic ties with Saudi Arabia (Klebanoff, 1974, pp. 3-10).

Relations between Saudi Arabia and the U.S. are expressed by expanding contacts through private individuals and companies. Official contacts developed slowly. Private oil investments provided the starting point of contemporary Saudi-American relations. Commercial production of oil began in 1945, and by 1950 Saudi Arabia emerged as a major producer in the Middle East.

World War II changed the American view of the Middle East. What began as an interest in oil, supply routes, and air bases in the Middle East became an intense national concern. The presence of American troops in North Africa and the Arabian Gulf, together with the increasing flow of lend-lease supplies and need for oil, increased American

influence throughout the area (Long, 1985, pp. 14-16). Since World War II Saudi Arabia has maintained close ties with the U.S. and its oil has become increasingly important as American energy needs have outpaced domestic production.

The historical meeting that took place on the morning of February 14, 1945, on the American destroyer the U.S.S. Murphy between King Abdulaziz of Saudi Arabia and Franklin Delano Roosevelt, President of the United States, reflected the awareness of the United States of the importance of the Middle East, not only for the oil the region possessed but also for the political influence of its leaders (Miller, 1980, p. xi). This meeting marked the beginning of closer relations between the two nations. For the first time, an American warship had entered the Red Sea Port of Jidda. It also marked the first time that the King of Saudi Arabia had met an American president on Saudi soil. "Far more significant during these early years was the extent to which Saudi Arabian oil had come to shape American perceptions and policies toward the entire Middle East" (Miller, 1980, p. xii). In the late 1950s, Egypt drew closer to the USSR and other Socialist countries, and Moscow provided arms as a vehicle for acquiring influence in the Arab world. This prompted the U.S. to formulate the Eisenhower Doctrine, under which U.S. influence in the Middle East was to be promoted (U.S. House of Representatives Print, 1957). Saudi Arabia was to be the cornerstone of an effort to promote

this Doctrine, but Saudi Arabia was unable to obtain approval for the Doctrine from the other Arab countries because of Nasser's influence at that time (Cordesman, 1984, pp. 103-105).

In the late 1950s and early 1960s Egypt became a major source of strain in Saudi-U.S. relations. Following the renewal of the Dhahran Air Base Agreement in 1957, Saudi-U.S. relations were criticized by Egypt and other radical Arab states, making the agreement a liability to the Saudis. In 1962 Saudi Arabia cancelled the agreement (Long, 1985, pp. 39-40). The U.S. adopted a policy of "non-alignment" in the Arab conflict by trying to come to terms with Arab nationalism and improving relations with President Nasser of Egypt.

Such policy did not please Saudi Arabia. The U.S. recognition of the republican regime in Yemen and the failure of the U.S. to help Saudi Arabia assist Loyalist forces in Yemen antagonized Saudi Arabia and forced her to turn to other countries for arms after the U.S. refused to supply her with weapons (Washington Post, September 11, 1962). However, the close relations between the two countries were not completely impaired by these developments.

Shortly after King Faisal took charge of the government in 1962, he visited Washington and met with President Kennedy. The president explicitly declared U.S. support for

the integrity of Saudi Arabia. When the Egyptian forces bombed Najran, a Saudi town, in January 1963, the U.S. reaffirmed its support of the integrity of Saudi Arabia, and the Department of Defense renewed its training program of the Saudi armed forces.

In 1963 Saudi Arabia and the U.S. signed a contract for a national air defense system worth more than $300 million, and in 1965 alone agreements totaled $342 million (Nakhleh, 1975, pp. 53-55). The 1967 war marked a turning point in Saudi Arabia's position as well as in its relations with the United States. During the war Saudi Arabia joined the Arab effort to withhold oil from the U.S. (although it lifted the embargo soon after its imposition) and made an effort to diversify the resources of its defense requirements.

The emerging influence of Saudi Arabia has been most apparent in the change in its relationship with the United States. After the October 1973 war and oil embargo, American policy makers began to seriously consider Saudi Arabia's crucial role in the Middle East (Safran, 1985, pp. 167-179).

The formation, in 1974, of the Saudi-U.S. Economic Joint Commission (co-chaired by the United States Secretary of State and the Crown Prince of Saudi Arabia) is significant in itself. The term "joint" suggests cooperation between "equals" in seeking to achieve certain goals that are in the interest of both states rather than the more

typical agreement of earlier years when the U.S. had looked upon those who received its technology as clients.

The Joint Commission is only one part of a complex web of economic and security ties connecting the U.S. and Saudi Arabia. U.S. government agencies and private companies deeply involved in the operation of hospitals and the designing and building of roads are equipping and training the army, air force, and national guard. By 1978, the U.S. Army Corps of Engineers was managing about $9 billion worth of programs, and it was estimated that 32,000 Americans were living and working in Saudi Arabia (Los Angeles Times, February 7, 1978). The Saudi need for U.S. technological and military assistance is one side of the relationship between the two countries. The other and more basic side is oil.

The principal concerns of Saudi Arabia are: (1) to safeguard the territorial integrity of Saudi Arabia and the holy places of Islam, (2) to strongly support Islam, its traditions and teachings (religion plays an important part in the formulation of Saudi foreign policy), (3) Saudi Arabia counts on U.S. opposition to communism, and (4) Saudi Arabia aims to secure a comprehensive peace settlement of the Arab-Israeli problem (United States Senate Print, 1977, pp. 59-63). All of these goals are compatible with the policy objectives of the U.S., with the exception of the

Arab-Israeli conflict. It was that policy which was called into question by Saudi oil action in 1973.

In the period immediately following the 1973 crisis, linkage of the Arab-Israeli conflict and oil prices was avoided. Mindful of the need for U.S. protection, Saudi Arabia refrained from tying oil policy explicitly to the issue of peace in the region. Only subsequently did this issue surface. Saudi Arabia used its influence to moderate oil prices; in return the U.S. promoted an "acceptable" Middle East settlement and maintained regional stability (Economist, January 27, 1979, p. 14).

In 1976 Saudi Arabia overtook Canada and Venezuela as the largest supplier of oil to the United States. On a direct-sale basis, Saudi Arabia provided about 20% of all 1976 oil imports or about 8% of total U.S. consumption (Washington Post, December 12, 1976). By 1978 this had risen to 25%. See Table 1 for U.S. oil consumption supplied by imports from 1949 to 1980 and Table 2 for U.S. oil imports from Saudi Arabia and OPEC countries from 1960 to 1979.

Saudi-American Oil Relations

Access to oil is essential to developed countries and will continue to be so for as long as oil is the primary energy source for these countries. The geopolitical significance of oil lies in its vital necessity for

TABLE 1

SHARE OF UNITED STATES OIL CONSUMPTION
SUPPLIED BY IMPORTS 1949-1980
(MILLIONS OF BARRELS PER DAY)

Year	Total Consumption	Percent Provided by Imports	Total Imports
1949	5.76	11.3	0.65
1950	6.46	13.2	0.85
1951	7.02	12.0	0.84
1952	7.27	13.6	1.03
1953	7.60	13.6	1.03
1954	7.76	13.5	1.05
1955	8.46	14.8	1.25
1956	8.78	16.4	1.44
1957	8.81	17.8	1.57
1958	9.12	18.6	1.70
1959	9.53	18.7	1.78
1960	9.80	18.5	1.81
1961	9.98	19.2	1.92
1962	10.40	20.0	2.08
1963	10.74	19.7	2.12
1964	11.02	20.5	2.26
1965	11.51	21.4	2.47
1966	12.08	21.3	2.57
1967	12.56	20.5	2.26
1968	13.39	21.2	2.84
1969	14.14	22.4	2.47
1970	14.70	23.3	3.42
1971	15.21	25.8	3.93
1972	16.37	29.0	4.74
1973	17.31	26.2	6.26
1974	16.65	36.7	6.11
1975	16.32	37.1	6.60
1976	17.46	41.9	7.31
1977	18.43	47.8	8.81
1978	18.85	44.4	8.36
1979	18.50	43.4	8.46
1980	17.03	39.9	6.79

Source: Department of Energy/Energy Information Administration, Middle East, Persian Gulf, 1982, p. 96.

TABLE 2

U.S. PETROLEUM IMPORTS FROM OPEC NATIONS, 1960-1979
(THOUSANDS OF BARRELS PER DAY)

Year	Saudi Arabia	Total OPEC	Arab Members of OPEC**
1960	84	1,314	292
1961	73	1,286	284
1962	74	1,265	241
1963	108	1,283	258
1964	131	1,361	293
1965	158	1,476	324
1966	147	1,471	300
1967	92	1,259	177
1968	74	1,302	272
1969	65	1,336	276
1970	30	1,343	291
1971	128	1,673	327
1972	190	2,063	530
1973	486	2,993	915
1974	461	3,280	752
1975	715	3,601	1,383
1976	1,230	5,066	2,424
1977	1,380	6,193	3,185
1978	1,144	5,751	2,963
1979	1,356	5,637	3,056

*Source: U.S. Bureau of Mines and Federal Energy Administration; Petroleum Intelligence Weekly (Various issues), 1974-1981.

**Saudi Arabia, Iraq, Qatar, Libya, United Arab Emirates, Algeria, and Kuwait.

continued economic, political, and military well-being of industrialized countries and the fact that large oil reserves are located and controlled by a small group of developing countries whose interest may overlap those of developed countries but are not necessarily identical.

Access to oil includes adequacy and continuity of supply at reasonable prices not merely for the U.S. but also for countries whose futures will affect the U.S. Access includes a concern with the total supply of oil available for world trade and its allocation worldwide. For the U.S. to secure access to oil in the context of the 1970s' international relations, the U.S. responded by the institutionalization of "special relationships" with Saudi Arabia and Iran. These relationships were developing, at least since the late 1930s, for Saudi Arabia and were institutionalized in the 1974 Joint Commission.

Saudi Arabia emerged from 1967 to 1974 as a key supplier of oil to the U.S. and the West. As a result, it occupied a special position in American foreign policy--economically, politically, and strategically. Economically, Saudi Arabia was considered one of the world's largest oil producers and held over one-fourth of the world's proven oil reserve. It had a decisive voice in the movement and price structure of oil worldwide (United States Senate Print, 1977, pp. 7-10).

As Nakhleh (1975, pp. 9-22) explains, the commercial and military agreement that the United States signed with Saudi Arabia in June 1974 was a definite indication of the paramount economic position of Saudi Arabia in American long-range policy planning. Nakhleh points out that the U.S. is also interested in the unprecedented sums of

petrodollars amassed with Saudi Arabia; funds which could not be completely absorbed into the Saudi economy. Consequently, American policy makers have endeavored to lure some of these petrodollars back to the U.S. in the form of short-term investments, investments in U.S. government bonds, or as payments for U.S. services to the Saudi government. Particularly since 1974, according to Nakhleh (1975), Saudi Arabia has recognized the fact that in order to develop into a modern state in an era of complex relationships and a changing international environment, there must be a stable market for its oil at sufficiently high prices to guarantee adequate revenue to fuel its development, stable international trade, an atmosphere of cooperation between oil producers and oil consumers, and open access to American technology and expertise.

There is disagreement as to whether Saudi oil production policy is based on self-interest or genuine concern for promoting good relations with the United States and other industrialized nations (Quandt, 1982, pp. 1-3). One thing is clear--such policies do influence the economics of the industrialized West. If production is cut back, the price of oil may double, and development plans may be greatly affected. Saudi Arabia needs to generate oil revenues at a level compatible with the country's total economic development and international political and economic stability. An increase in OPEC prices immediately worsens the American

balance of payments, which devalues the dollar and, in turn, affects the value of Saudi holdings in the United States.

Oil pricing policies established by Saudi Arabia have made it difficult for the United States to be less dependent on Middle Eastern oil. Sheik Ahmed Zaki Yamani (former Saudi oil minister) stated at a special 1974 energy seminar in Washington, D.C., that Saudi policy planners recognize the need for international economic cooperation. He suggested that the U.S. and other industrial nations should: (1) adjust themselves "to the new economic reality that there is a transfer of wealth from the industrial world to a group of developing nations, the oil-producing nations"; (2) sit down with the newly wealthy group of states in order to "see how you can meet their requirements and how you can solve your problems"; and (3) establish a committee representing the oil producers, the industrial countries, and the developing countries to jointly discuss the world's energy needs in a spirit of cooperation (Dialogue on World Oil: Highlights of a Conference on World Oil Problems, 1974, p. 27).

Saudi-American Military Relations

U.S. economic and political relations with Saudi Arabia are an integral part of U.S. strategic posture in the region. The Saudi connection is an important ingredient in American policy planning for several areas and issues: the

Red Sea and the Suez Canal, the Arabian Gulf and the flow of oil, the Indian Ocean and Soviet naval strategy east of the Suez, the Arab-Israeli conflict and the alternatives of war and peace, and the actual U.S. military presence in the region. Due to its oil, wealth, size, geographic location, and newly-found economic power, Saudi Arabia is involved in these areas and issues of American foreign policy.

Any rational analysis of U.S. long-range policy goals and options toward the region would therefore necessarily take the Saudi presence into consideration. Thus, U.S. policy makers, in their planning of American long-range foreign policy toward Saudi Arabia, had to face two realities: Saudi Arabia's new financial position and its inability to absorb half of its oil revenues in its economy; and Saudi Arabia as a major importer of American arms, military equipment, and technology. On that basis, U.S. interests in Saudi Arabia and the Middle East centered (in the 1970s) around four points: (1) support of indigenous regional cooperative efforts and the collective security and orderly economic progress of the area; (2) encouragement of peaceful resolution of territorial and other disputes among states and widening channels of communication and consultation between them; (3) expanding U.S. diplomatic, cultural, technical, commercial, and financial presence and activities; and (4) maintaining access to the area's oil supplies

at reasonable prices (Department of State, Bureau of Public Affairs Print, 1974, p. 2).

In order to realize its long-range goals, the U.S. selected the following policies: (1) numerous bilateral agreements with Saudi Arabia in which the U.S. provided Saudi Arabia with services, technology, and equipment under the Saudi-U.S. Joint Commissions on Economic and Security Cooperation, and (2) becoming a major source of arms for Saudi Arabia and supporting the Saudi political ideology in the region (United States Senate Print, 1977, pp. 59-63).

In addition to mutually beneficial economic and political ties between Saudi Arabia and the United States, an integral part of their relationship is military supply and training. Since the 1940s, the United States has been a crucial external force in the effort to establish and maintain peace and security in the Middle East. The military relationship began shortly after World War II. For a chronology of U.S. military cooperation with Saudi Arabia, see Table 3. Military sales to Saudi Arabia from 1969 to 1980 amounted to over 30 billion dollars (see Table 4). For many years the United States' military supply and training programs in Saudi Arabia were at a relatively low level and concentrated on improving the effectiveness of the traditional small-scale Saudi military units. In the early 1960s, as a result of hostility between Saudi Arabia and Egypt over the civil war in Yemen, Saudi Arabia requested

modern air defense equipment from the United States, and since then the relationship has expanded.

The U.S. has been the major beneficiary of the modernization efforts of Saudi Arabia. This was evident from the major arms orders placed by Saudi Arabia between 1964 and 1968 (Department of Defense, 1973-1979). In testimony before the House Subcommittee on the Near East and South Asia in August 1974, Richard Violette, Director for Sales Negotiations at the Defense Security Assistance Agency, stated that American military programs in Saudi Arabia covered "a fairly broad range" (The Persian Gulf, 1974, p. 7).

The U.S. agreed to provide services for Saudi Arabia in the following areas: sale of F-15 fighter jets, build up of the navy, modernization of the national guard, construction of an air defense capability, and engineering and construction management services (U.S. Congress, 1974, pp. 7-9).

Development of Saudi military forces required U.S. equipment, advisors, and contractors. Saudi Arabia spent $19 billion on military goods and services from the U.S. between 1971 and 1978, and, in 1981, spent more than $1.5 billion (Quandt, 1981, p. 1). In addition to military weapons, the United States provided extensive military training for the Arabian Gulf countries. The United States government signed an agreement with the Saudi government on March 19, 1973, to equip and train the Saudi Arabian

TABLE 3

CHRONOLOGY OF SAUDI ARABIA-UNITED STATES MILITARY RELATIONS AND SAUDI ARABIA'S MAJOR ARMS PURCHASES, 1943-1976

Date	United States Military Cooperation with Saudi Arabia	Date	Major Arms Purchases
1943	United States mission arrives in July to determine Saudi requirements for military equipment and training		
1944	First United States military training mission arrives in April		
1946	Dhahran airfield completed		
1951	Dhahran Air Base Agreement and Mutual Defense Assistance Agreement signed June 18		
1953	Agreement to establish United States military mission signed June 27		
1955	Saudis purchase in August first United States tanks and subsequently reject Soviet arms offer		
1957	Dhahran Air Base Agreement renewed in February in exchange for continued military assistance; training starts for Royal Saudi Air Force, and first F-86 jets delivered	1956-58	55 M-47 Patton tanks (United States) 58 M-41 Walker Bulldog light tanks (United States) 12 F-86 Sabre aircraft (United States)

TABLE 3--Continued

Date	United States Military Cooperation with Saudi Arabia	Date	Major Arms Purchases
1963	United States Air Force interceptors temporarily stationed in Dhahran as deterrent after Egypt bombs three Saudi towns in January; Saudis initiate discussions for acquisition of modern air defense system		
1965	Agreement signed June 5 for United States Corps of Engineers to supervise construction of military facilities	1964	300 BAC Vigilant missiles (United Kingdom)
	Initial sales contract for C-130 aircraft signed in September	1965-67	6 Hawker Hunter FGA-9 aircraft (United Kingdom)
	Letter of intent signed with Raytheon in December for Hawk Air Defense System and British Lightnings		9 BAC Lightning F-52 and T-54 aircraft (United Kingdom)
1966	Saudi Arabian mobility program signed		37 BAC Thunderbird 1 (SAM) missiles (United Kingdom)
			150 Raytheon MIM-23A Hawk missles (United States)
1968	United States conducts initial survey of Saudi naval expansion requirements	1968-69	40 BAC Lightning F-23 and T55 aircraft (United Kingdom)
			25 BAC 167 Strikemaster aircraft (United Kingdom)
			220 Panhard AML-90 armored vehicles (France)
1971	Letters of offer for F-5 aircraft signed in July and September Royal Saudi National Guard modernization request received in September	1971	8 Hovercraft (United Kingdom)

TABLE 3--Continued

Date	United States Military Cooperation with Saudi Arabia	Date	Major Arms Purchases
1972	Agreement on naval modernization program signed in February		
1973	Agreement to arm and train National Guard units concluded in April	1973	20 Northrop F-5B aircraft (United States)
1974	Agreement to provide United States equipment and training for Royal Saudi Navy signed in April United States-Saudi Arabia Joint Commission of Security Cooperation established June 8	1974	38 Dassault Mirage III aircraft (France) 30 Northrop F-5E Tiger II aircraft (United States) 2000 AMX-30 tanks (France)
1975	Contract awarded in January to Vinnell Corporation to train four battalions of the National Guard		
1976	Contract awarded in March to Northrop Corporation to provide construction and training for Royal Saudi Air Force		

Source: New Perspectives on the Persian Gulf, 1973, p. 16.
Nyrop, Richard. 1977. Area Handbook for Saudi Arabia, 3rd ed. Washington: Foreign Area Studies, 335.

TABLE 4

U.S. MILITARY SALES TO SAUDI ARABIA,
1969-1980

Year	Amount
1969	$ 4,214,000
1970	80,910,000
1971	15,863,000
1972	371,004,000
1973	709,259,000
1974	2,031,250,000
1975	3,614,819,000
1976	5,791,678,000
1977	1,898,045,000
1978	4,135,567,000
1979	6,419,891,000
1980	5,200,000,000
Total	$30,273,500,000

Source: U.S. Department of Defense, Security Assistance Agency, Foreign Military Sales and Military Assistance Facts (DOD, December 1980) pp. 1-2, 5, 7-8, 27-28.

National Guard (SANG). Under the terms of the agreement the Saudis paid all costs of a modernization program which amounted to $335 million (U.S. Arms Sales, 1975, p. 17).

Sources of Conflict and Strain in Saudi-American Relations

Relations between Saudi Arabia and the U.S. have not been without strain. Oil prices, the Israeli and Palestinian issues, and the appropriate response to the Soviet challenge find the two countries frequently at odds. Motives are constantly being questioned on both sides (Quandt, 1981, p. 2). Some feel that little understanding of the realities of Saudi Arabia exists in Washington and the same is true of Saudi Arabia's understanding of the realities of Washington because each nation functions in a different geostrategic setting.

The issue which has affected the relationship between Saudi Arabia and the United States most is the Palestinian question and the existence of Israel. American administrations have not found a way to deal with the problems created by differing perceptions of Israel's role in the Middle East. The United States sees Israel as a barrier to further Russian aggression in the Middle East, while the Arab countries see the nation as a threat to their safety (United States Senate Print, 1977, pp. 59-61).

Prior to 1973, Saudi-U.S. relations were generally harmonious, the only strain being U.S. support of Israel, which eventually resulted in the Arab oil embargo against the U.S. during the 1973 war. The embargo did not end the pro-Western orientation of Saudi Arabia, but it did launch

Saudi Arabia on a course of foreign policy less closely tied to U.S. policy objectives (Safran, 1985). The Camp David process was then chosen by the United States as a path for resolving Egyptian and Israeli issues. The Camp David Accord was not supported by other Arab nations, primarily because it did not address the Palestinian issue. As a result of the agreement, Arab unity was broken and diplomatic ties were severed between Egypt and the other Arab nations. Egypt was suspended from the Arab League. The Saudis believe that the Camp David Accord failed to develop any comprehensive settlement because the problem of the Palestinian people was not solved. Successful resolution of the Palestinian issue would be reason for Saudi Arabia and other Gulf States to cooperate with the United States in its efforts to project its military presence in the Arabian Gulf area (Safran, 1985, pp. 256-264).

Oil policies of Saudi Arabia have also been a source of conflict. On October 17, 1973, Saudi Arabia joined 10 other Arab oil-producing nations in reducing oil production by 5% each month. On October 18, production was cut 10% to bring pressure on the United States, and on October 20, a total halt of oil exports was announced. The embargo was lifted after the United States acted as a mediator in bringing about troop disengagement accords between Egypt and Israel in 1974. The linking of oil and the politics of oil with the Arab-Israeli conflict raised considerable anxiety in

America and renewed concern about "Arab blackmail." In 1979 the Egyptian-Israeli treaty placed the Saudis in a difficult position. They denounced the treaty and supported political and economic sanctions against Egypt (Quandt, 1982, pp. 1-8). The relationship is sometimes strained by Saudi frustration over the periodic hesitation of the United States to supply Saudi Arabia with arms, making it necessary for the Saudis to turn to other arms suppliers.

For example, in 1977 and 1978 Saudi Arabia chose to make the issue of the sale of sixty F-15 aircraft a test of the special relationship between the two countries (Washington Post, May 2, 1978). As the debate raged between the White House and Congress, Saudi Arabia stressed the fact that it kept its part of the mutual bargain by restraining both OPEC prices and Arab political radicals at some risk to itself. It was now up to Washington to honor its promises in return. The threat of reduced levels of oil production was mentioned if the deal should fall through. Sheik Yamani said, "I am not ruling out any linkage" (Washington Post, May 2, 1978). A major factor voiced by congressional opponents to the sale of the F-15s to Saudi Arabia was the possibility that the planes might be used against Israel in the event of another war (Washington Post, March 29, 1978; New York Times, May 14, 1978). The sale was finally approved and it was seen as a reassurance that the U.S. regarded Saudi Arabia as a trusted, responsible partner.

The approval of the sale also demonstrated that the Israeli lobby could no longer exercise an absolute "veto" on U.S. arms sales to Arab states. It would be difficult for the U.S. to return to the one-sided pro-Israeli policy of the late 1960s and early 1970s. Strains in the relationship between Saudi Arabia and the United States also occurred when the United States failed to act during the fall of the Shah of Iran and during the Soviet invasion of Afghanistan. Some Saudis questioned the resolve of the United States to fulfill its portion of a special relationship with Saudi Arabia. Concerned over Soviet ambitions in the region and their own vulnerability, the Saudis emphasized the need for more timely and determined action by the United States (U.S. Relations, 1980, p. 103).

Relations between Saudi Arabia and the United States have additional limits. Saudi Arabia is reluctant to allow the United States to establish permanent military facilities on Saudi soil (Ali, 1976, p. 81). It is thought that the presence of American troops in the country would expose the Saudis to the charge of cooperating with the major ally of Israel and that would lead to suspicions that the purpose of the forces was to seize the oil fields, not to protect Saudi Arabia. Moreover, it might encourage other countries in the area to tighten their ties with the Kremlin. Part of the attitude of Saudi Arabia toward the military presence of the United States is also grounded in the suspicion that the

U.S. is not serious when it comes to translating armed strength into diplomatic leverage. Vietnam is a reminder that American power is limited. More recently, the unwillingness of the United States to challenge Soviet assertiveness in Afghanistan created an unfavorable impression of American determination. The withholding of arms and economic aid to Pakistan in 1978-1979, and Washington's inability to help the Shah of Iran, did not encourage the Saudis to seek United States patronage (Mideast Business Exchange, 1980, pp. 55-57).

To conclude, interdependence describes a web of transactions, flows, and interactions in the realms of trade, resources, investment, and money. Relationships between countries are becoming increasingly enmeshed and more visible, complicated, and problematic. Through choice, nations and groups interact in ways that set up mutual dependencies and constraints of varying types and intensity. Dependency likewise encompasses resources--manufacturing and trade, and the networks of money, people, and communications.

The discussion throughout this chapter has attempted to show that Saudi Arabia and the U.S. have several basic interests in common, and that they could develop a functional framework for the realization of these mutual interests. Policy makers in both countries need to realize that the mutual interest of the two countries can best be

served if clearly and openly defined. This is because American relations with Saudi Arabia, if based on farsightedness, courage, and thorough knowledge of the region and its problems, can contribute toward promoting these interests. "Realist" assumptions of world politics which have been the basis of American strategic planning for the last 25 years are no longer adequate to account for the new developments that occurred in the 1960s and 1970s.

For the growing web of agreements between the two countries to be controlled and implemented successfully, at least three prerequisites must be present: (1) an American understanding of Saudi society and sensitivity toward Saudi regional and Arab concerns, (2) regional peace and the free flow of international trade, and (3) open communication between the two countries on a regular basis regarding the changing elements of national interest as perceived by either state. Each country must remain aware of the actual process of decision making within the other society.

In the following chapter, the theoretical framework of the study is addressed.

CHAPTER III

THE THEORETICAL FRAMEWORK: INTERDEPENDENCE, CONFLICT AND COOPERATION IN INTERNATIONAL STUDIES

The Concept of Interdependence

Diversity of Definitions

The term interdependence has been defined in a variety of ways. In its most general sense, interdependence suggests a relationship of interests such that if one nation's position changes, other states will be affected by that change (Rosecrance and Stein, 1973). As Morse (1972, p. 59) states, interdependence is "a state of affairs where what one nation does impinges directly upon other nations." Further, Morse writes that, "interdependent behavior may be understood in terms of the outcome of specified actions taken by two or more parties (individuals, governments, corporations, etc.). When such actions are mutually contingent, these parties, then, are interdependent with respect to specific issue areas and not with respect to the whole spectrum of their activities" (Morse, 1972, p. 133). According to Oran Young (1969, p. 726), interdependence refers to "the extent to which events occurring in any given part or within any given component unit of a world system

affects (either physically or perceptually) events taking place in each of the other parts or component units of the system." Rosecrance et al. (1977, p. 427) define interdependence as "the direct and positive linkage of the interests of states such that when the position of one state changes, the position of others is affected, and in the same direction." They distinguish between two types of interdependence determined by different measurement techniques. When interdependence is measured by transactions (the flow of money, men, and goods), it is horizontal interdependence. Vertical interdependence is measured by the responses of "one economy to another in terms of changes in factor prices" (Rosecrance et al., 1977, p. 427).

Keohane and Nye (1976, p. 7) distinguish between societal interdependence and policy interdependence. Societal interdependence refers to "the extent to which events in one society (not necessarily controlled or monitored by governments) affect events in another." Policy interdependence refers to "the extent to which governments are affected by one another's policies so that they react to changes in policy by the other side" (Keohane and Nye, 1976, p. 7).

Two types of definitions can be distinguished in the literature. The first suggests that interdependence can be present when there is an increased national sensitivity to external economic developments. This sensitivity presumably

can either be perceived or unperceived (Rosecrance and Stein, 1973). To Cooper (1972, P. 159), interdependence refers to the "sensitivity of economic transactions between two or more nations to economic developments within those nations."

This implies that two countries with extensive mutual trade would experience a low degree of interdependence if the value of the trade was not sensitive to price and income developments in both countries. Therefore, two countries would be highly interdependent if their transactions were highly sensitive to economic developments, even if their mutual trade was initially at a low level. Interdependence implies two-way sensitivity. One-way sensitivity leads to a dependent economy (Cooper, 1972).

Tollison and Willett (1973) define interdependence as "the sensitivity of economic behavior in one country to developments in another, usually due to the sensitivity of economic transactions between or among nations to economic development with them" (p. 259).

The second suggests that "states are mutually dependent on one another for things valued by their populations. . . . Interdependence encompasses both conflictive and cooperative interactions among states" (Knorr, 1971, p. 168). Dependence implies potential vulnerability to foreign events that can jeopardize the receipt of values or worsen the terms on which their receipt is conditional. Interdependence, in

this context, means that "as one state A is dependent for valued things on another state(s), so that other state is also dependent for certain valued things on A" (Knorr, 1971, p. 168).

Interdependence, simply stated, is mutual dependence, which Keohane and Nye (1977) define as "a state of being determined or significantly affected by external forces" (p. 8). These authors argue that interdependence in world politics refers to "situations characterized by reciprocal effects among countries or among actors in different countries" (p. 9). To them, where there are "reciprocal (although not necessarily symmetrical) costly effects of transactions, there is interdependence. Where interactions do not have significantly costly effects, there is simply interconnectedness" (Keohane and Nye, 1977, p. 9).

The distinction between mutual dependence and interconnectedness involves two issues: sensitivity and vulnerability. "Sensitivity is an important concept not only because of its central role in many discussions of interdependence, but also because it is related to the considerations of the immediate economic and political significance of any pattern of economic interrelationship" (Keohane and Nye, 1977, p. 11).

Keohane and Nye (1977) define sensitivity as the "degree of responsiveness within a policy framework--how quickly do changes in one country bring costly changes in

another, and how great are the costly effects?" (p. 12). The vulnerability dimension of interdependence "rests on the relative availability and costliness of the alternatives that various actors face." Moreover, it is "an actor's liability to suffer costs imposed by external events even after policies have been altered" (p. 13). As such then, interdependence, with its sensitivity and vulnerability dimensions, can be social, political, economic, military, or ideological.

According to Jones and Willetts (1984), actual conditions of sensitivity are a function of "the immediacy of the effect of their pertinent external development upon the dependent actor; the salience of the issue to the affected actor; and the short-term adaptability of the actor in the face of the problems created by the given development." Each aspect of sensitivity "rests both upon objective features of the situation in which actors find themselves and upon their subjectively-based perceptions and policy orientations" (p. 6).

If mutual dependence is the concept to be adopted, then the question of symmetry or asymmetry, balance or imbalance, arises. Where asymmetry or imbalance prevails, the question may be how much is permissible in a relationship before it should properly be deemed one of dominance or one-way dependence, rather than interdependence.

According to Keohane and Nye (1977), interdependence is not limited to situations of mutual benefit. They conclude that interdependence always carries with it costs, because it restricts autonomy; "but it is impossible to specify a priori whether the benefits of a relationship will exceed the costs. This will depend on the values of the actors as well as on the nature of the relationship. Nothing guarantees that relationships that we designate as 'interdependent' will be characterized by mutual benefit" (p. 10).

Keohane and Nye (1977) caution against defining interdependence entirely in terms of situations of "evenly balanced mutual dependence." They assert that asymmetries in dependence often provide influence for those dealing with others. Those who are less dependent are often able to use the interdependent relationship to gain bargaining power and influence other issues. On the other end of the spectrum is total dependence. The majority of cases fall between the two extremes, and it is there that the primary political bargaining process lies (pp. 10-11).

To conclude, interdependence, as a concept, can be identified as "existing only where there is some measure of mutual dependence, with dependence signifying an actor's reliance upon some other(s) for support, or the satisfaction of a basic need. The disruption of, or adverse development within, such a relationship of dependence would be

intrinsically costly to the dependent actor" (Jones and Willetts, 1984, p. 21).

For the purpose of this study, several views of interdependence are examined, particularly those of Keohane and Nye (1977), which are supported by this study because they encompass three important concepts: mutuality, sensitivity, and vulnerability. Using this approach, it is possible to identify and differentiate clearly between interdependence and interconnectedness. The presence of cost in relationships between countries is also highlighted. Furthermore, Keohane and Nye's view incorporates Jones and Willetts' conceptualization.

This study focuses on this view of interdependence in terms of conflict and cooperation as possible consequences of interdependence. Therefore, these consequences are examined next.

Consequences of Interdependence

Interdependence has provided focal points for many writers in explaining system transformations. For instance, Morse (1976) refers to the effects of modernization as "the emergence of certain forms of interdependence among a large set of states and the transnational nature of the internal system" (p. 14). Morse sets forth a series of propositions about interdependence within the international system. For example, the greater the degree of interdependence, the

greater the likelihood of crisis. "Interdependence does not only breed crises and various forms of linkage, it also increases the potential for any single party to manipulate a crisis for its own domestic or foreign political ends" (p. 130).

Keohane and Nye (1977) see power as the "ability of an actor to get others to do something they otherwise would not do (and at an acceptable cost to the actor)." Power can also be construed as "control over outcomes" (p. 11). Keohane and Nye point out that asymmetrical interdependencies can be sources of power among actors, and that different types of interdependence lead to potential political influence under different constraints. Sensitivity interdependence can provide significant political influence only when the rules and norms in effect can be taken for granted, or when it would be costly for dissatisfied states to change policies quickly. Manipulation of interdependence can be used as an instrument of power. According to Knorr (1975), power, influence, and interdependence are inextricably related. Two states can be in conflict over some issues while cooperating on others. "When they cooperate they benefit from the creation of new values, material or nonmaterial. When they are in conflict, they are interdependent" (p. 3).

Interdependence indicates the ability of one state to influence another in some way. If interdependence is

mutual, damage could result from severing the relationship. Therefore, the costs and benefits of exercising power by each party in an interdependent relationship increase as the level of interdependence grows (Baldwin, 1979).

The Concepts of Conflict and Cooperation

Conflict has remained an important concept of philosophy and social science for more than a century (Gross, 1966, p. 337), and is possibly the key concept in international relations (Journal of Conflict Resolution, 1957, p. 2). Conflict resolution has become the focus of intense scholarly research in international relations during the past three decades. Since world powers that have historically set the competitive tone for international politics are not in constant conflict, the history of interstate relations shows the presence of both conflict and cooperation. The peace maintained among super powers may be tense and often precarious, but rivals usually experience periods of relative peace during which their tacit cooperation, although less visible, may be more significant than their public contentiousness.

For instance, regional integration theory highlights the need to understand organizational and functional cooperation among international entities which may possess goals that are both conflictual and cooperative. Negotiation and bargaining theories also incorporate

cooperative solutions to conflictual situations (Ward, 1982, p. 89).

The lack of cooperation studies compared to studies on conflict resulted from the belief that the level of conflict between two nations defines the cooperation that exists between them. Cooperation is viewed merely as the absence of high levels of conflict. "Yet, empirical studies of the statistical patterns of conflict and cooperation indicate the distinctness with which both conflict and cooperation may be observed . . . few . . . have sought to identify the explicit relationship which may exist between conflict and cooperation" (Ward, 1982, p. 91). The statistical relationship between conflict and cooperation found in the literature points out the fact that they are present simultaneously in the foreign-policy behaviors and are strongly related in a positive fashion. Such studies include East and Greg (1967), McClelland and Hoggard (1969), Park and Ward (1979) Robertson (1978), Russett (1967), Soroos (1977).

Alker and Bock (1972, p. 499) note that most "scholars would agree that cooperation and conflict are both present in the mixed-interest situations and payoffs of international relations." In studies of international relations, the relationship is considered indirect between conflict and cooperation. The two terms are believed to be related only to the extent that they are separately affected by other influences (East and Gregg, 1967; Park and Ward, 1979;

Rummel, 1972; Sigler, 1971). Other studies contend that conflict and cooperation are either at opposite ends of the same continuum or are orthogonal (Bobrow et al., 1973; Boulding, 1963; Kegley, 1973; and Rummel, 1971).

Kjell Goldmann (1972, 1973, 1974, 1977) developed theoretical and empirical techniques to track the level of East-West tension in the perception of European elites. The tension variable which serves as the focus of his work is composed of both conflictual and cooperative components (favorable and unfavorable conflict analytic units). Ward (1982) points out that Goldmann's discussion of tension "does not disaggregate these separate components, nor does it highlight the salience of each" (p. 91). However, studies utilizing Goldmann's data (Mahoney, 1977; Rattinger, 1975; and Ruloff, 1975) treat conflict and cooperation as reciprocal phenomena; knowledge of one would permit mathematical (and presumably theoretical) derivation of the other.

According to Ward (1982, p. 190), researchers who focus on conflict only in order to understand international relations are likely to obtain incorrect theoretical specifications, erroneous statistical inferences, inaccurate substantive conclusions, and inadequate policy recommendations.

For the purpose of this study, conflict is defined as "the aggregate level of hostility directed by one country toward another in all foreign policy issue areas. This term

does not refer only to actions involving military power . . . rather, actions such as diplomatic protests, hostile propaganda statements, and breaking of bilateral agreements can also embody conflict" (Gasiorowski, 1986, p. 25). Conflict is operationalized as any behavior or action falling in categories nine to fifteen in the inter-nation events scale identified by Azar and Sloan (1976, p. 9) (see Table 23, Appendix B).

Cooperation is defined as the aggregate level of friendly behavior and actions directed by one country toward another in all foreign policy issue areas. This term refers to actions identified by Azar and Sloan (1976, p. 9), such as establishing international or dyadic alliance, economic market, joint military maneuvers, extension of economic aid, industrial assistance, military and technical assistance, and the establishment of friendship, cultural and economic agreements, as well as policy support. Cooperation is operationalized as any behavior or action falling into categories one to seven in the inter-nation events scale identified by Azar and Sloan (1976, p. 9) (see Table 23, Appendix B).

The Relationship Between Interdependence, Conflict and Cooperation

Not all researchers agree on whether increased interdependence necessarily increases or reduces the likelihood of conflict. Kenneth Waltz (1970, p. 205) contends that the

closer contact associated with growing interdependence increases the chances for at least occasional conflict.

Van Dyke notes that interdependence in foreign trade relations sometimes creates a threat to domestic economics. Tariffs and quotas which are employed to protect domestic production of one country can result in reduced exports for another country and, consequently, affect employment and the ability to purchase other imports. Such problems have resulted in both conflict and cooperation (Van Dyke, 1966, p. 102).

Norman Angell suggested, as early as 1914, that an increase in interdependence, based on foreign trade, made war unlikely (Wiles, 1968, p. 529). Robert C. Angell (1969), investigating transnational participation between 1955 and 1964, used a wide variety of indicators. He too believed that increased interaction contributes to an increasingly peaceful international environment (pp. 26-186). Both studies suggest that interdependence is characterized by increased cooperation among nations, which should reduce the possibility of conflict.

Keohane and Nye (1977) comment that there are multiple interstate issues in today's complex environment which are not dominated by concern for military security. They also note the increase of cooperation between nations through multiple channels of communication. Transnational communications involve an increasing variety of

nongovernmental actors as well as the traditional state-to-state interaction.

This increase in the variety of persons involved in transnational communications is accompanied by an increase in the scope of subjects addressed. Thus, distinction between international and domestic issues being discussed is becoming less clear. Global problems concerning food, ecology, and energy needs require increased cooperation among nations. Because of the nature of these problems, according to Keohane and Nye, this increasingly interdependent world is characterized by greater cooperation and less conflict.

Oran Young (1969) suggests that decision-makers may be increasingly influenced by world public opinion (p. 735) which may have a moderating influence on the use of force in settling international problems.

Herbert Spiro points out the fact that a growing awareness of interdependence "may . . . have an inhibiting effect upon attempts to resolve by means of violence any particular set of conditions" (in Ionescu, 1974, p. 152). Increased consciousness of interdependence, according to Spiro, seems to have an inhibitive effect on grossly violent behavior (in Ionescu, 1974, p. 163).

Polachek (1978, 1980) presents statistical evidence that countries with high levels of trade have incentives to maintain good relations with their trade partners. Using

combined cross-national and time series data on trade and conflict among 30 countries for the years 1958 through 1967, he found an inverse relationship between trade and conflict (i.e., more trade is associated with less conflict).

In their examination of the relationship between conflict and interdependence, Gasiorowski and Polachek (1982) focus on the impact and implications of the growth of East-West trade for conflict reduction between the United States and the Warsaw Pact countries. They view trade as creating a degree of interdependence between the United States and the Warsaw Pact countries that provides incentives to reduce their hostilities. Asymmetrics in the benefits associated with trade are seen as leading to greater conflict reduction on the part of the participant that benefits most.

Gasiorowski and Polachek (1982) found a strong "inverse relationship between trade interdependence and international conflict" (p. 729). They found that an increase in U.S.-Warsaw Pact trade was related more to a decline in Warsaw Pact conflict than U.S. conflict, substantiating their argument that the party who benefits most has the greater incentive to reduce hostilities. These researchers believe that international hostilities can be reduced by involving hostile nations in interactions that benefit them (p. 729).

But Gasiorowski (1986) argues that "while it would be difficult to deny that trade helped improve East-West relations at this time, it is another matter to infer that this was caused by interdependence. U.S.-Warsaw Pact trade was fairly beneficial for both sides. . . . However, while East-West trade did increase markedly during this period, it may not have reached sufficient levels to impose real or potential costs on the participants" (p. 30). Gasiorowski (1986) examines the relationship between economic interdependence and international conflict by utilizing measures identified as embodying different kinds of interconnectedness (e.g., gross domestic product per capita, relative trade volume by gross domestic product, and long-term capital flow), and measures identified as embodying the costs associated with trade (e.g., import price elasticity of demand, import and export partner concentration indexes, export commodity concentration index, and short-term capital flow). His findings suggest that interdependence can have mixed consequences. Measures that embody the costly aspects of interdependence, mentioned above, are found to be positively associated with conflict, thus "implying that interdependence produces increased international conflict" (p. 23). Gasiorowski also notes that when these measures are controlled, the trade volume measure is found to be inversely related to conflict" (pp. 23, 36). He concludes by stating that "while the costly aspects of interdependence

seem to produce greater international conflict, its beneficial aspects appear to produce a decline in conflict" (pp. 23, 36).

To conclude, there appear to be two basic schools of thought with regard to the relationship between interdependence, conflict and cooperation. The first notes that interdependence contributes to greater cooperation and hence less conflict between countries involved. Scholars of this school include: Angell (1969), Gasiorowski and Polachek (1982), Haas and Schmitter (1966), Keohane and Nye (1977), Nye (1971), Polachek (1978, 1982), Rosecrance et al. (1977), Spiro (1974), Young (1969). Nye (1971) points out that a "functional web of interdependence" reduces international conflict by raising net costs, creating a sense of community, and producing value changes that promote "integrative solutions" to conflict (pp. 109-110).

Integration theorists, such as Haas and Schmitter (1966), believe that economic integration can "spill over" and lead to political integration. Polachek (1978, 1980) argues, similarly, that a desire to achieve the "gains from trade" creates incentives for trading countries to maintain cooperative relations. In his view, increased trade is associated in this way with declining conflict.

The second school of thought holds that interdependence can lead to greater conflict between countries. Scholars of this school include: Bergsten, Keohane, and Nye (1975),

Gasiorowski (1986), Hirschman (1945), Keohane (1975), Keohane and Nye (1973), Knorr (1977), Van Dyke (1966), and Waltz (1970). Keohane (1975) warns of a "crisis of interdependence" involving increased international tension because of the difficulties interdependence creates for policy making. In another study, Keohane and Nye (1973) argue that asymmetric economic interdependence provides a new form of power that can be used by less interdependent countries to gain concessions from others that are more interdependent.

Another view is that of Bergsten, Keohane, and Nye (1975), who argue that economic ties provide an opportunity to conduct "war by other means." Hirschman (1945) also examines the use of trade as an instrument of power by Nazi Germany.

For these writers, vulnerability can be used as an "economic weapon," enabling countries that lack substantial military power, or prefer not to use it, to coerce their interacting partners. By making it possible for countries to exert such coercion, vulnerability can be a source of increased international conflict. Knorr (1977) argues that vulnerability can lead to unanticipated crises which may threaten national security.

Gasiorowski (1986) notes that interdependence can have mixed consequences. While interdependence is expensive and can lead to increased conflict, it can also induce greater

international cooperation. Policies which reduce the cost of interdependence and preserve its benefits can not only promote the interests of individual countries but greater harmony and stability in the international system as well. Thus, although the costly aspects of interdependence seem to produce greater international conflict, the beneficial aspects appear to reduce conflict.

Conclusion

Based on the literature review, there appear to be two major concepts related to the consequences of interdependence that are particularly relevant to this study of bilateral relations between Saudi Arabia and the United States--conflict and cooperation.

In this chapter, the objective was to show postulated relationships between interdependence and both cooperation and conflict. The expected relationships were clarified by noting the important distinction between the concepts. Conflict and cooperation were also shown as not being mutually exclusive. That is, relations between nations can be characterized by both increased conflict and cooperation simultaneously. It is expected that both of these relationships associated with increased bilateral interdependence are to be found in the relationship between Saudi Arabia and the United States. Specifically, one would expect to find increased interdependence contributing to:

Increased cooperation. As Saudi Arabia and the U.S. participate more actively in trade relationships, better appreciation of mutual benefits should lead to increased cooperation.

Increased conflict. As Saudi Arabia and the United States become more involved in bilateral relations, the Arab-Israeli conflict, the Palestinian issue, the United States' support of Israel, and Saudi-U.S. arms trade may be sources of conflict.

Finally, although the literature suggests that cooperation and conflict are the more likely consequences of interdependence, this study does not imply that interdependence is the major causal factor of changes in cooperation and conflict. Therefore, the remainder of this study addresses these relationships in terms of association, not causality. The study investigates the relative strength of association and positive or negative covariance of the concepts.

CHAPTER IV

RESEARCH METHODOLOGY

This chapter addresses the research methodology of this study as well as the identification of independent and dependent variables and the process of developing the regression models.

Research Question and Hypotheses

The main question examined here is whether the increasing level of interdependence in the Saudi-American bilateral relationship has any affect on the level of bilateral conflict and cooperation between the two countries.

Based on the survey of literature, one might expect to find increased interdependence contributing to:

1. Increased cooperation. As Saudi Arabia and the United States participate more actively transactionally, better appreciation of mutual benefits should lead to increased cooperation.

2. Increased conflict. As Saudi Arabia and the United States become more involved in bilateral relations, the Arab-Israeli conflict, the Palestinian issue, the United States support of Israel, and Saudi-U.S. arms trade may become sources of conflict.

Thus, in this study, the following hypotheses are addressed:

H_{01}: Saudi Arabia's bilateral relations with the United States between 1960 and 1978 exhibit no increase in the level of interdependence.

H_{02}: If interdependence between Saudi Arabia and the United States increases, there will be no change in the level of conflict between the two countries.

H_{03}: If interdependence between Saudi Arabia and the United States increases, there will be no change in the level of cooperation between the two countries.

A discussion of the variables identified in the literature and used in this study follows.

Dependent and Independent Variables Identified in the Literature and Used in the Study

Most studies that examine and attempt to measure increasing or decreasing levels of interdependence and the effect of increasing interdependence on conflict and cooperation utilize a limited number of variables and do not consider the majority of variables identified in the interdependence literature (e.g., Gasiorowski and Polachek, 1982; and Katzenstein, 1975).

The following is a discussion of the dependent and independent variables. (Table 5 lists measures of interdependence and their sources, and Table 6 lists the dependent and independent variables used in the study).

TABLE 5

MEASURES OF INTERDEPENDENCE IDENTIFIED IN THE LITERATURE

Variables	Studies
Trade partner concentration index; export-partner concentration index; import-partner concentration index; commodity concentration and index	Hirschman, 1945 Gasiorowski, 1985, 1986 Rosecrance and Stein, 1973
Import price elasticity of demand	Tollison and Willett, 1973 Salant, 1977 Gasiorowski, 1986
Financial capital flows short-term; and long-term	Gasiorowski, 1986 Whitman, 1969
The GNP models	Hughes, 1972 Russett, 1984
The GDP models	Gasiorowski, 1985 Katzenstein, 1975
The percentage models	Gasiorowski and Polachek, 1982 Russett, 1984 Hughes, 1972
The dollar value of trade	Gasiorowski and Polachek, 1982
Index of money supply	Tetrault, 1980
The consumer price index	Rosecrance et al., 1977

TABLE 6

DEPENDENT AND INDEPENDENT VARIABLES IDENTIFIED
IN THE LITERATURE AND USED IN THE STUDY

The Dependent Variables	Saudi Arabia (S.A.)	The United States (U.S.)
The net weighted conflict measure	S.A. actor/U.S. target	U.S. actor/S.A. target
The weighted cooperation measure	S.A. actor/U.S. target	U.S. actor/S.A. target
The weighted conflict measure	S.A. actor/U.S. target	U.S. actor/S.A. target
The Independent Variables	**S.A.**	**U.S.**
Trade partner concentration index	Not applicable Not a bilateral measure	Not applicable Not a bilateral measure
Financial capital flows	Data is not available	Data is not available
Import price elasticity of demand	Not applicable Not a bilateral measure	Not applicable Not a bilateral measure
The GNP model	Used	Used
The export percentage model	Used	Used

TABLE 6--Continued

The Independent Variables	S.A.	U.S.
Imports as percentage of GNP	Used	Used
The percentage of a country's total trade with a given partner	Used	Used
Ratio of total foreign trade to GDP	Used	Used
The dollar value of trade	Used	Used
Index of money supply	Used	Used
The consumer price index	Used	Used

Source: See Tables 25 and 26, Appendix B, for variables sources and Table 24 for units used for each variable.

Dependent Variables Used in the Study

Conflict and cooperation make up the dependent variables. Both Polachek (1980) and Gasiorowski and Polachek (1986) investigated the idea that conflict affects trade levels rather than trade levels affecting conflict. Both studies resulted in the rejection of the notion, thus indicating that conflict is appropriately identified as a dependent variable.

The dependent variables measure the conflict and cooperation between Saudi Arabia and the United States during the period from 1960 to 1978. These measures are obtained by utilizing the (1) conflict intensity weights (net weighted conflict), (2) weighted cooperation scores, and (3) weighted conflict scores found in the Conflict and Peace Data Bank (COPDAB). COPDAB is a comprehensive survey of international events, each of which is scaled to indicate the degree of hostility or cooperation reflected. The events were collected from more than 70 reputable sources in the United States and from around the world. COPDAB is an extensive longitudinal collection of daily inter-national and intra-national events from 1948 through 1978 and includes more than 500,000 events for 135 countries (Azar, 1980). The dependent variables are operationalized using the following indicators:

1. The net weighted conflict measure. This is divided into two measures; in one case, Saudi Arabia is the

initiating actor and the U.S. is the target. In the other, the United States is the initiating actor and Saudi Arabia is the target. The net weighted conflict measure for each country is obtained by using Azar's COPDAB data bank and the Azar-Sloan scale for inter-nation events (see Tables 23 and 24, Appendix B). In the COPDAB coding scheme, a scale is used to measure interaction between nations. The range of this scale is 1 to 15, with 1 representing maximum cooperation and 15 representing maximum conflict. Eight is considered neutral. Each scale value was assigned weights as an indication of the intensity in relation to this neutral point, which was assigned a value of 1 (Azar and Sloan, 1976, p. 9). For the COPDAB coding scheme, see Table 23, Appendix B.

These intensity weights reflect the degree of hostility or friendliness embodied in each event. The net weighted conflict measure from one country toward another is obtained by summing the intensity weights producing a specific net plus or minus score. "These weights were experimentally validated using surveys of international relations scholars and practitioners. . . . This weighting scheme is the key advantage enjoyed by COPDAB over other events data collections. It enables the user to combine into a single measure hostile and cooperative events, as well as events in different issue areas. COPDAB also has a residual category with an intensity weight of 0 for events with an ambiguous

or neutral meaning. Aggregating events into a single measure of conflict can be problematic in events data sets that do not have these features" (Gasiorowski, 1986, p. 28).

2. The weighted cooperation measure. This measure includes two kinds of cases; one with Saudi Arabia as the initiating actor and the United States as the target, and the other with the U.S. as the actor and Saudi Arabia as the target (see Table 24, Appendix B). The total measure is obtained by using Azar's COPDAB and the Azar-Sloan scale for inter-nation events, and instead of combining hostile and cooperative events in a single measure, the weighted values of cooperative events are scaled, aggregated, and summed for each year, producing a total weighted score for cooperation.

3. The weighted conflict measure. This measure includes two kinds of cases; one with Saudi Arabia as the initiating actor and the United States as the target, and the other with the U.S. as the actor and Saudi Arabia as the target (see Table 24, Appendix B). The total measure is obtained by using Azar's COPDAB and the Azar-Sloan scale for inter-nation events, and instead of combining hostile and cooperative events in a single measure, the weighted values of conflictive events are scaled, aggregated, and summed for each year, producing a total weighted score for conflict.

The Independent Variables Identified in the Literature

1. The Trade Partner Concentration Index (Gasiorowski, 1985, 1986; Hirschman, 1945). The Trade Partner Concentration Index can be applied either to imports or exports. Gasiorowski (1986, p. 33) notes that countries with limited trade partners have greater difficulty adjusting to interruptions in trade. Such countries are more susceptible to boycotts and embargoes and may be coerced by their limited trade partners to make concessions in their decision-making processes. When a country imports goods from a relatively small number of countries, it has a high import-partner concentration. When a country exports goods to a relatively small number of countries, it has a high export-partner concentration.

2. Import price elasticity of demand (Gasiorowski, 1986; Salant, 1977; Tollison and Willett, 1973). Gasiorowski defines it as: "the absolute value of the percentage change in import volume associated with a percentage change in import prices. Countries with higher elasticities are likely to experience more severe transmission of inflation overall, and import price elasticities can be used to measure this effect" (1986, p. 33).

3. Financial capital flows (Gasiorowski, 1986; Whitman, 1969) include long-term and short-term capital flows. These variables are calculated by dividing total

long-term and short-term capital flows into and out of a given country in a period by the country's average GNP for this period. Gasiorowski argues that, like trade flows, capital flows can create sensitivities. Capital flows can, at sufficient levels, cause foreign exchange management to be difficult and can impede domestic monetary policy. The sovereignty of a host country can be threatened by direct foreign investment. Additionally, he argues that while long-term capital flows act as an interconnectedness measure, short-term capital is highly fungible and serves as a substitute for the sensitivity of short-term capital and can be used as a measure of interdependence (p. 34).

4. The GNP ratio. The ratio of total foreign trade to GNP requires the computation of the ratio of trade to the gross national product of the acting nation. GNP is used to control for size. This ratio is variable-sum, and allows increases among nations when total trade grows as a percentage of GNP (Hughes, 1972, p. 661). The GNP model, with its implications, can be a useful measure of change over time within a dyad.

5. The export-percentage variable. The calculations for this variable involve the ratio of exports from nation A to nation B with the total exports of nation A. It uses total exports as a control for size. This model is "a constant-sum model." If nation A's exports to nation B rise from 15% to 35% of nation A's total exports, nation A's

exports to one or more other countries must then decline proportionally. "The concept being measured by transaction data thus is a fixed sum for each nation" (Hughes, 1972, p. 661).

6. Imports as percentage of GNP (Russett, 1984). This variable measures the value of imports as a percentage of a country's gross national product.

7. The percentage of a country's total trade with a given partner (Gasiorowski and Polachek, 1982). This is the ratio of total trade (exports and imports) between country A and B to the total foreign trade of country A.

8. Ratio of total foreign trade to Gross Domestic Product (GDP) (Gasiorowski, 1985). This variable represents a country's average propensity to trade. Countries with an inclination for trade experience a higher volume for their domestic size and are, therefore, more prone to dependence on trade (Gasiorowski, 1985, p. 332). A country's propensity to trade serves as an indicator of its link to the world economy (Gasiorowski, 1985, p. 333).

9. The dollar value of trade (Gasiorowski and Polachek, 1982). This variable is the sum value of total foreign trade (exports and imports) of a given country.

10. Index of Money Supply (IMS) (Tetreault, 1980). IMS is an indicator of factor movement. The value of a country's money supply at any time is more likely linked to the total economic transactions of private and public

entities than to foreign exchange rates or to nominal interest rates. Some economists consider monetary "channels" to be transmission paths for inflation (pp. 433-434).

11. The Consumer Price Index (CPI) (Rosecrance et al., 1977). CPI is made up of the weighted average of prices of 296 commodities which are commonly purchased by consumers, and is used specifically to adjust wages in order to compensate for changes in the purchasing power of money (Nemmers, 1979, p. 114).

Independent Variables Used in the Study

The study utilizes the variables identified in the literature which are most appropriate for the context and the level of analysis of this study--bilateral interdependence. The independent variables are divided into two groups (see Table 24, Appendix B for further details):

1. National characteristics variables: These variables are population, gross national product, gross domestic product, total value of foreign trade (exports plus imports), consumer price index, money supply, ratio of total foreign trade by GNP (exports and/or imports/GNP), and ratio of total foreign trade/GDP (exports and/or imports/GDP).

2. Dyadic characteristics variables:

These include all the variables describing the relationship between the two countries which are as follows: (a) total exports and imports between the two countries (total trade),

(b) total arms exports and imports between the two countries and between them and the rest of the world, (c) total oil exports and imports between the two countries, (d) total oil export and import prices between the two countries, (e) total exports and/or imports/GNP of each country, (f) total exports and/or imports/GDP of each country, (g) ratio of U.S. arms exports to Saudi Arabia/U.S. total arms exports to the world, (h) ratio of U.S. oil imports from Saudi Arabia/U.S. total oil imports from the world, (i) ratio of U.S. oil import prices from Saudi Arabia/U.S. oil import prices from the world, (j) ratio of each country's total exports to the other by its total exports to the world, and (k) ratio of each country's total imports from the other by its total imports to the world (see Table 24, Appendix B).

The variables, trade concentration index, import price elasticity of demand, and financial capital flows, are not used. The trade concentration variable and import price elasticity are not included because these two variables "can be calculated for a country's relations with all other countries but not for bilateral relationships" (Gasiorowski, 1986, p. 35). They are considered measures of systemic rather than bilateral interdependence. The attempt to adopt Gasiorowski's formula to calculate the trade partner concentration index between Saudi Arabia and the United States was not successful because it could not be mathematically reduced to be clearly used for bilateral

relationships. The financial capital flows variables are not included due to the lack of data. Various agencies in Saudi Arabia and the United States, from the Saudi monetary agency to the U.S. Department of Commerce, were contacted but the information was not obtained, either because it was not available or because it was classified. For detailed information concerning the dependent and independent variables, see Tables 24 through 28, Appendix B. Table 24 provides detailed information about the dependent and independent variables used in the study. Table 25 lists all Saudi data sources used. Table 26 lists all U.S. data sources used. Table 27 includes the Saudi Data Set identifying all variables and their values. Table 28 includes the United States Data Set identifying all variables and their values.

Model Development

In order to test the stated hypotheses, regression models were developed. The approach generally follows Gasiorowski's (1986) approach which regresses the measure of conflict on several variables measuring interdependence. However, the models developed in this study to determine the impact of interdependence on conflict and cooperation differ from those developed by Gasiorowski (1986). The models developed for this study describe the level of interdependence between Saudi Arabia and the United States (bilateral

interdependence) rather than the level of interdependence of Saudi Arabia or the United States with the rest of the world (systemic interdependence).

All models deemed to be useful in understanding the relationships involved are examined and a set of models is specified for each country. For Saudi Arabia, there are three basic models: one for the net weighted conflict measure, the second for the weighted cooperation measure and the third for the weighted conflict measure. The same models are developed for the United States.

Research Technique: Regression Analysis

The research technique utilized in this study is regression. Regression analysis is a statistical technique used to analyze the relationship between a single dependent variable and an independent variable or several independent variables. The objective of multiple regression analysis is to use several independent variables whose values are hypothesized to predict the dependent variable.

The models proposed in this study to relate the dependent variables (conflict and cooperation) to the independent variables (measures of interdependence) are identified as follows:

The simple form of the model is

$$Y = \beta_0 + \beta_1 X_1 + \epsilon$$

and the multiple form of the model is

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 +, \ldots, + \beta_K X_K + \epsilon$$

where Y is the dependent variable to be predicted: β_0 is a constant term (intercept) and β_1, β_2, ... β_K are slope coefficient(s) of the associated independent variables. These represent the amount of increase or decrease in Y for each unit change in X. And X_1, X_2, ... X_K are the independent variable(s) listed in Tables 24, 27, and 28, Appendix B; ϵ is a random error component. Thus, the estimated model is determined by Y using both the simple and multiple least squares methods to minimize the sum of the squared errors (SSE) $\Sigma (Y - Y)^2$.

The predicted forms of the simple and the multiple models are shown below:

The predicted simple regression model is:

$$Y = \beta_0 + \beta_1 X_1$$

The predicted multiple regression model is:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 +, \ldots, + \beta_K X_K$$

In both models, the relationship between the Y and X variables is assumed to be linear. The regression line or "least squares" line is the "best" line to predict values of Y because its estimates are, in the aggregate, closer to the true value of Y than the estimates of any other straight line. Its predictions yield the smallest variance for the error terms since "the sum of the squared deviations of the observed data points (Y_i) form the least squares line which

is smaller than the sum of the squared deviations of the data points from any other line that can be drawn through the data points" (Daniel, 1978, p. 244). Regression analysis not only shows the relationship between a dependent variable and an independent variable but also estimates the strength of the relationship.

The Process of Model Development

To identify the appropriate models for both Saudi Arabia and the United States that explain and predict the dependent variables, the following procedures were followed:

Step 1. Identifying the set of variables or variable that best explains each dependent variable by: (a) analyzing the correlation among all variables in order to determine the existence of multicollinearity, and (b) selection of the set of independent variables that are statistically significant and exhibit no multicollinearity. The variables were judgmentally selected based on their importance as determined by the literature findings. The decision also involved evaluation of initial model results and the correlation matrices. Subsequently, stepwise regression was chosen among several possible techniques. The reason for this is that it checks and rechecks for the most significant variables. Stepwise regression also helps to deal with the problem of multicollinearity. (The multicollinearity issue

is discussed further in the section "Treatment of Multicollinearity" in Chapter V.)

Step 2. Testing the selected models: this involves testing the models' reliability and the significance of the parameters. Each model is checked by using the analysis of variance F test and the multiple coefficient of determination R^2. The F test for testing the total overall reliability of the model and a partial set of β parameters and t tests on individual β parameters aid in deciding the final form of the model. First the F test is conducted, H_0: $\beta_1 = \beta_2 = \ldots \beta_K = 0$. If the model is deemed adequate (i.e., if H_0 is rejected), then t tests are conducted on those individual β parameters of particular interest. This step also includes checking for multicollinearity. Further analysis is also applied to test the assumptions of the model. These assumptions are as follows:

1. The mean of the probability distribution of ϵ is 0; that is, the average of the errors over an infinitely long series of experiments is 0 for each setting of the independent variables.

2. The variance of the probability distribution of ϵ is constant for all settings of the independent variables.

3. The probability distribution of ϵ is normal.

4. The errors associated with any two different observations are independent; that is, the error associated

with one value of Y has no effect on the errors associated with other Y values (Mendenhall and Sincich, 1986, p. 81).

The reliability to be placed on inferences depends upon satisfaction of the above assumptions. Because it is never known for certain that the random errors satisfy these assumptions, however, the residuals (the deviations between the observed and the corresponding predicted values of Y) are examined to see if patterns can be discovered that suggest autocorrelations, heteroscedasticity, non-normality, or improper choice for the independent variables in the model. The magnitudes of the residuals also give an idea of how well the model is predicting. In reference to the presence of autocorrelation, it is clear that using times series data poses a problem related to satisfying the independence assumption of the error term because correlated residuals are quite common when the response is a time series variable. Autocorrelation is defined as "the correlation between time series residuals at different points in time" (Mendenhall and Sincich, 1986, p. 499). The effect of autocorrelation on the linear model depends on the pattern of autocorrelation. Positive autocorrelation exists when positive error terms tend to be followed over time by positive error terms, and when negative error terms tend to be followed over time by negative error terms (Mendenhall and Sincich, 1986, p. 283).

Possible existence of autocorrelations in the models developed is detected by plot of residuals against time. When the residual plot suggests that the error term may be autocorrelated, the Durbin-Watson test is utilized. The null hypothesis tested is:

H_0: The error term is not correlated.

The alternative hypothesis is:

H_A: The error term is positively or negatively correlated.

The Interactive Statistical Program (ISP) (Makridakis and Winkler, 1985) is utilized to calculate the upper and lower limits of the d statistic ($\alpha = 0.05$). Assessing the violations of the models assumptions is addressed in Chapter V, in the section "Other Forms of Regression Models (Non-linear)."

The Process of Checking the Reliability and Utility of the Models in the Study

The process of checking the reliability and utility of the models in this study includes examining the following statistics: The coefficient of determination for R^2 and the adjusted R^2, F-value, t-value, P-value of t, P-value of F, and the beta coefficients.

1. The coefficient of determination for R^2 is used to explain how well the regression line fits the observed data. It indicates the amount of variation in the dependent variable(s) explained or accounted for by the dependent

variables in the regression equation (Kvanli et al., 1986, p. 517). Since R^2 increases when new variables are added, the value of adjusted R^2 is included to show whether there is a significant increase or not.

2. The statistical significance of the F-value is used as a criterion to evaluate the overall usefulness of the regression model. When all other assumptions of regression analysis are met, a statistically significant F-value implies that the overall regression model is the useful one (P-value of $F < 0.05$).

In applying the F-test, the null hypothesis used is that there is no linear relationship between the dependent variable and the set of independent variables in the population.

$$H_0: \quad \beta_1 = \beta_2 = \ldots = \beta_K = 0$$

the alternative hypothesis is that at least one of the parameters differs from zero.

$$H_A: \quad \beta_1 \neq \beta_2 \neq \ldots \beta_K \neq 0$$

The level of significance is 0.05.

3. The statistical significance of the t-value is used to test the significance of the regression coefficients (βs) and the intercept. If the calculated t-value is greater than the critical t-value, the β value is significant. The significance level used is 0.05.

4. Detection of residual autocorrelation: the Durbin-Watson test. When using the least squares equation, it may

pose a problem of residual correlation and this violates one of the assumptions basic to the least squares inferential procedure. As a result, one cannot apply the least squares method to estimate and predict with confidence in its validity. Therefore, the Durbin-Watson test is used to test for the presence of residual autocorrelation (Mendenhall and Sincich, 1986, p. 290).

If the value of Durbin-Watson is near zero, it indicates a strong positive autocorrelation, while a value close to four means that there is a significant negative autocorrelation. A value near two indicates that there is no autocorrelation. If so, the use of the regression model on the time series data is valid (Mendenhall and Sincich, 1986, p. 285). To determine the upper and lower limit of the Durbin and Watson value, the Interactive Statistical Program (ISP) (Makridakis et al., 1985) as well as SAS are used. The upper and lower limit values calculated for Durbin and Watson tests are reported with each model used in the study.

5. To test the significance of each independent variable, students' t distribution is used. Thus, the probability value (P-value) of t demonstrates the statistical significance. If the P-value of an independent variable is less than 0.05, it implies that the independent variable has a statistically significant relationship with a given dependent variable, while all other independent variables

included in the model are held constant (Bohrnstedt and Knoke, 1982, p. 189).

The size of each beta coefficient is also important in regression analysis because it provides a useful interpretation of the relationship between a specific independent variable and the dependent variable in a given regression equation. The value of the beta coefficient, which can be either positive or negative, indicates the relative ability to explain the contribution of each independent variable to change in the dependent variable (Bohrnstedt and Knoke, 1982, pp. 366-368).

Graphical display of regression residuals obtained from fitting the first-order model should show any potential problems, inadequacy in the model, or any departure from the usual assumptions made about the error term ϵ. Second- or higher-order models are developed and judgments are made as to whether these models lead to improvements and additional information for the prediction of the dependent variables on the basis of the appropriate test statistics (e.g., test of the null hypothesis).

Graphical Analysis

In addition to the development of the regression models, a graphical presentation of the most significant dependent and independent variables is presented in Chapter VI. The graphical presentation provides another way of

examining the behavior of the two countries and of showing the increasing levels of interdependence and their impact on conflict and cooperation between the two countries from 1960 to 1978.

The following chapters report the application of the methodology and the analysis of the results, conclusions, and suggestions for future directions in research.

CHAPTER V

ASSESSING THE IMPACT OF INTERDEPENDENCE ON CONFLICT AND COOPERATION

This chapter presents a detailed report of the methodology followed to assess the impact of interdependence on conflict and cooperation. The process of model specification is addressed as well as the findings of the models specified.

The Process of Model Specification

The process of model specification constituted the following:

I. Identification and Selection of Variables

Identification of the dependent variables and the selection of the independent variables involved the identification of two sets of dependent variables corresponding to the two data sets--the Saudi and United States data sets (Tables 27 and 28, Appendix B). The first set includes the following Saudi dependent variables:

1. Net weighted conflict measure--Saudi Arabia actor/United States target (SANWC),
2. Weighted cooperation measure--Saudi Arabia actor/United States target (SAWCO),

3. Weighted conflict measure--Saudi Arabia actor/United States target (SAWCN), and

4. Net weighted conflict measure--United States actor/Saudi Arabia target (USNWC).

The second set includes the following United States dependent variables:

1. Net weighted conflict measure--United States actor/Saudi Arabia target (USNWC),

2. Weighted cooperation measure--United States actor/Saudi Arabia target (USWCO),

3. Weighted conflict measure--United States actor/Saudi Arabia target (USWCN), and

4. Net weighted conflict measure--Saudi Arabia actor/United States target (SANWC).

The fourth dependent variable in each data set is included to test the behavior of the interdependence measures for each country with the dependent variable net weighted conflict once when Saudi Arabia is the actor and the United States is the target, and another when the United States is the actor and Saudi Arabia is the target.

The process of selecting the most appropriate model for each dependent variable involved the selection of only those variables deemed to offer the most significant information and can best explain the variations in the dependent variables involved. Therefore, to select and screen the independent variables in the United States and Saudi data

sets (Tables 27 and 28, Appendix B), as well as to ensure that no irrelevant independent variable(s) has been included and no relevant independent variable(s) has been excluded, the following procedures are followed:

Organization of the independent variables

In each data set, the independent variables are grouped as follows: (A) GNP variables, (B) GDP variables, (C) percentage variables and those embodying the dollar value of trade, and (D) those variables not included in the above groups.

In the United States data set, Group A variables are:

U.S. total trade/GNP (USTGP)
U.S. total exports/GNP (USEGP)
U.S. total imports/GNP (USIGP)
U.S. total trade with S.A/GNP (USTSP)
U.S. total exports to S.A./GNP (USESP)
U.S. total imports from S.A./GNP (USISP)

Group B variables are:

U.S. total trade/GDP (USTGD)
U.S. total exports/GDP (USEGD)
U.S. total imports/GDP (USIGD)
U.S. total trade with S.A./GDP (USTSD)
U.S. total exports to S.A./GDP (USESD)
U.S. total imports from S.A./GDP (USISD)

Group C variables are:

U.S. total trade (USFTR)
U.S. total exports (USEXP)
U.S. total imports (USIMP)
U.S. total trade with S.A. (USTSA)
U.S. total exports to S.A. (USESA)
U.S. total imports from S.A. (USISA)
U.S. total exports to S.A./U.S. total exports (USESW)
U.S. total imports from S.A./U.S. total imports (USISW)

Group D variables include:

U.S. total money supply (USTMS)
U.S. total oil imports from S.A./U.S. total oil imports (USOSW)
U.S. oil imports prices from S.A./U.S. oil import prices (USOPW)
U.S. total arms exports to S.A./U.S. total arms exports (USASW)

In the Saudi data set, Group A variables are:

S.A. total trade/GNP (SATGP)
S.A. total exports/GNP (SAEGP)
S.A. total imports/GNP (SAIGP)
S.A. total trade with U.S./GNP (SATUP)
S.A. total exports to U.S./GNP (SAEUP)
S.A. total imports from U.S./GNP (SAIUP)

Group B variables are:

S.A. total trade/GDP (SATGD)
S.A. total exports/GDP (SAEGD)
S.A. total imports/GDP (SAIGD)
S.A. total trade with U.S./GDP (SATUD)
S.A. total exports to U.S./GDP (SAEUD)
S.A. total imports from U.S./GDP (SAIUD)

Group C variables are:

S.A. total trade (SAFTR)
S.A. total exports (SAEXP)
S.A. total imports (SAIMP)
S.A. total trade with U.S. (SATUS)
S.A. total exports to U.S. (SAEUS)
S.A. total imports from U.S. (SAIUS)
S.A. total exports to U.S./S.A. total exports (SAEUW)
S.A. total imports from U.S./S.A. total imports (SAIUW)

Group D variables include:

S.A. total money supply (SATMS)
S.A. total arms imports from U.S./S.A. total arms imports (SAAUW)

Screening of the independent variables

In each group of each data set, the independent variables are screened to identify the most important and significant variables and to assess the conceptual relationships between the independent variables. This involved conducting a correlation analysis. The theoretical importance of each independent variable and its contribution to the explanation of each dependent variable was also examined.

II. Check for multicollinearity

A basic assumption of regression is the absence of perfect multicollinearity. This means that none of the independent variables are perfectly correlated with another independent variable or linear combination of other independent variables (Lewis-Beck, 1980, p. 58). Since social science data often consist of independent variables that are intercorrelated, multicollinearity is often a problem.

To treat the problem of multicollinearity, various options were considered (Lewis-Beck, 1980, pp. 58-62):

1. The first option is to enlarge the sample size. The assumption is that the bigger the sample size, the greater the chances of finding the statistical significance of each variable. It was impossible to act on this option because of the limitations imposed by the availability of data from the Conflict and Peace Data Bank which is only available to 1978.

2. The second option is to include the most highly correlated independent variable(s) with the dependent variable. This involves discarding the offending variable(s). However, Mendenhall and Sincich (1986, p. 227) and Lewis-Beck (1980, p. 59) suggest that dropping any of the variables may not be necessary and that all of the independent variables can be kept in the case of each model as long as inferences about Y and the future Y-values of the independent variable are restricted within the experimental region.

3. The third option involves identifying those independent variables that are highly interrelated and can be added together in a single indicator provided that it is conceptually appropriate to do so. The process of implementing this option to treat the problem of multicollinearity is summarized in four steps below:

A. Examining the original correlation matrix in each data set to identify those independent variables that exhibit high correlation among themselves.

In the United States data set, examination of the correlation matrix showed that the variables (in Group A) USTGP, USTSP, USEGP, USIGP, USESP, and USISP are identical to the variables (in Group B) USTGD, USTSD, USEGD, USIGD, USESD, and USISD, respectively as shown below in Table 7. Therefore, in response to the problem of multicollinearity, the variables (in Group B) USTGD, USTSD, USEGD, USIGD,

TABLE 7

CORRELATION OF THE GNP AND GDP VARIABLES

Independent Variables	Dependent Variables USNWC	SANWC	USWCO	USWCN
USTGP	-0.48	-0.47	0.49	0.27
USTGD	-0.48	-0.47	0.49	0.27
USTSP	-0.31	-0.35	0.34	0.35
USTSD	-0.31	-0.35	0.34	0.35
USEGP	-0.51	-0.46	0.52	0.24
USEGD	-0.51	-0.46	0.52	0.24
USIGP	-0.45	-0.47	0.46	0.28
USIGD	-0.45	-0.47	0.46	0.28
USESP	-0.26	-0.33	0.30	0.38
USESD	-0.26	-0.33	0.30	0.38
USISP	-0.33	-0.36	0.36	0.32
USISD	-0.33	-0.36	0.36	0.32

USESD, and USISD are dropped and the GNP variables (in Group A) are kept for they are widely used in the literature.

In the Saudi data set, examination of the variables (in Group A) SATGP, SATUP, SAEGP, SAIGP, SAEUP, AND SAIUP shows that they are identical to the variables (in Group B) SATGD, SATUD, SAEGD, SAIGD, SAEUD, and SAIUD, respectively. Therefore, in response to the problem of multicollinearity, the GDP variables (in Group B) are dropped and the GNP variables (in Group A) are kept.

B. Compiling a list of the independent variables that can be added in pairs on the basis of clarity and conceptual appropriateness.

C. Determining the method of adding those independent variables in pairs on the basis of mathematical and conceptual appropriateness. This method includes: (1) adding two variables together, (2) subtracting one variable from the other, (3) dividing one variable by another and (4) multiplying one variable by another.

In the United States data set, examination of the variables USTGP, USTSP, USEGP, USIGP, USESP, and USISP shows, conceptually, that some of the variables can be added together in a way to reduce the problem of multicollinearity. For instance, the variables, United States total exports/GNP (USEGP) and United States total imports/GNP (USIGP) constitute United States total trade/GNP (USTGP). The variables United States total exports to Saudi Arabia/GNP (USESP) and United States total imports from Saudi Arabia/GNP (USISP) constitue United States total trade with Saudi Arabia/GNP (USTSP). Additionally, examination of their individual contribution to the explanation of the dependent variables shows, overall, similarity. Therefore, the variables USEGP, USISP, USESP, and USISP are dropped and the variables USTGP and USTSP are kept.

Examination of the variables (in Group C) USEXP, USIMP, USESA, USISA, USFTR, USTSA, USESW, and USISW reveals that

some of the variables can be constructed in a way to reduce the problem of multicollinearity. For instance, the variables United States total exports (USEXP) and United States total imports (USIMP) constitute United States total trade (USFTR). The variables United States total exports to Saudi Arabia (USESA) and United States total imports from Saudi Arabia (USISA) constitute the United States total trade with Saudi Arabia (USTSA). The United States total exports to Saudi Arabia/United States total exports constitute the share of Saudi Arabia in the United States total exports (USESW). And the United States total imports from Saudi Arabia/United States total imports constitute the share of Saudi products in the United States total imports (USISW).

In the Saudi data set, further examination of the variables (in Group A) SATGP, SATUP, SAEGP, SAIGP, SAEUP, and SAIUP suggests that some variables can be added together in a way to reduce the problem of multicollinearity. For instance, the variables Saudi total exports/GNP (SAEGP) and Saudi total imports/GNP (SAIGP) constitute Saudi total trade/GNP (SATGP). The variables Saudi total exports to United States/GNP (SAEUP), and Saudi total imports from United States/GNP (SAIUP) constitute Saudi total trade with United States/GNP (SATUP). Therefore, the variables SAEGP, SAIGP, SAEUP, and SAIUP are dropped and the variables SATGP

and SATUP are kept for their contribution to the explanation of the dependent variables and theoretical importance.

Examination of the variables (in Group C) SAEXP, SAIMP, SAEUS, SAIUS, SAFTR, SATUS, SAEUW, AND SAIUW suggests that some variables can be constructed in a way to reduce the problem of multicollinearity. For instance, the variables Saudi total exports (SAEXP) and Saudi total imports (SAIMP) constitute Saudi total trade (SAFTR). The variables Saudi total exports to United States (SAEUS) and Saudi total imports from United States (SAIUS) constitute Saudi total trade with United States (SATUS). The variables Saudi total exports to United States/Saudi total exports constitute the share of the United States in the Saudi total exports (SAEUW). And the variables Saudi total imports from United States/Saudi total imports constitute the share of United States products in the Saudi total imports (SAIUW). Additionally, examination of the individual contribution of each variable suggests keeping the variables SAFTR, SATUS, SAEUW, SAIUW, and SAIUS. Therefore, the variables SAEXP, SAIMP, and SAEUS are dropped.

In the United States data set, examination of the correlation between the dependent variables and each of the independent variables in Group C (Table 8) suggests the selection of the following independent variables with the dependent variable USNWC: USEXP shows the highest correlation of -0.41, USFTR shows a correlation of -0.39, USIMP

TABLE 8

CORRELATION OF UNITED STATES VARIABLES IN GROUP C

Independent Variables	Dependent Variables			
	USNWC	SANWC	USWCO	USWCN
USESA	-0.22	-0.32	0.27	0.43
USEXP	-0.41	-0.41	0.42	0.30
USESW	-0.25	-0.32	0.29	0.38
USISA	-0.29	-0.34	0.32	0.37
USIMP	-0.38	-0.42	0.40	0.35
USISW	-0.35	-0.34	0.37	0.30
USFTR	-0.39	-0.42	0.41	0.33
USTSA	-0.27	-0.34	0.30	0.39

shows a correlation of -0.38, and USISW shows a correlation of -0.35. With the dependent variable SANWC, the following independent variables are selected: USIMP and USFTR show the highest correlation of -0.42, USEXP shows a correlation of -0.41, and USTSA, USISW, and USISA show a correlation of -0.34. With the dependent variable USWCO, the following independent variables are selected: USEXP shows the highest correlation of 0.42, USFTR shows a correlation of 0.41, USIMP shows a correlation of 0.40, and USISW shows a correlation of 0.37. With the dependent variable USWCN, the following independent variables are selected: USESA shows

the highest correlation of 0.43, USTSA shows a correlation of 0.39, USESW shows a correlation of 0.38, and USISA shows a correlation of 0.37.

Further examination of the independent variables USEXP, USIMP, USESA, USISA, USFTR, USTSA, USESW, and USISW (Table 9) suggests keeping the variables USFTR, USTSA, USESW, and USISW. Table 9 shows: the independent variable USEXP exhibits high correlation with the independent variables USFTR, USESW, and USESA and is conceptually part of the independent varables USFTR and USESW; the independent variable USIMP exhibits high correlation with the independent variables USISA, USFTR, and USISA and is conceptually part of the independent variables USFTR and USISW; the independent variable USESA exhibits high correlation with the independent variables USEXP, USTSA, and USESW and is conceptually part of the variables USTSA and USESW; and the independent variables USISA exhibits high correlation with the independent variables USIMP, USTSA, and USISW and is conceptually part of the independent variables USTSA and USISW.

Therefore, the independent variables USEXP, USIMP, USESA and USISA are dropped, and the variables USFTR, USTSA, USESW and USISW are kept because their selection eliminates greatly the problem of multicollinearity. In addition, they show, individually, significant correlation with each of the

TABLE 9

UNITED STATES GROUP C VARIABLES:
CORRELATED WITH EACH OTHER

Independent Variables	R
USEXP USESA	0.91
USIMP USISA	0.93
USEXP USFTR	0.99
USIMP USFTR	0.99
USESA USTSA	0.99
USISA USTSA	0.99
USESA USESW	0.99
USEXP USESW	0.91
USISA USISW	0.98
USIMP USISW	0.89

dependent variables as well as being conceptually and theoretically important.

Examination of the correlation between the dependent variables and each of the independent variables (Table 10) selected from Groups A and C (USTGP, USFTR, USTSP, and

TABLE 10

CORRELATION OF UNITED STATES VARIABLES SELECTED FROM GROUPS A AND C

Independent Variables	Dependent Variables USNWC	SANWC	USWCO	USWCN
USTGP	-0.48	-0.47	0.49	0.27
USFTR	-0.39	-0.42	0.41	0.33
USTSP	-0.31	-0.35	0.34	0.35
USTSA	-0.27	-0.34	0.30	0.39

USTSA) suggests the selection, with the dependent variable USNWC, the independent variables USTGP and USTSP; with the dependent variable SANWC, the variables USTGP and USTSP are selected; with the dependent variable USWCO, the variables USTGP and USTSP are selected; and with the dependent variable USWCN, the variables USFTR and USTSA are selected.

Therefore, the variables USTGP and USTSP are included because of their contribution to the explanation of the dependent variables USNWC, SANWC and USWCO. And the variables USFTR and USTSA are included because of their contribution to the explanation of the dependent variable USWCN.

In the Saudi data set, examination of the variables (selected from Groups A and C) SATGP, SAFTR, SATUP, and SATUS suggests the theoretical importance and relative contribution of the GNP models. Therefore, the variables

SATGP and SATUP are kept and the variables SAFTR and SATUS are dropped.

Finally, the remaining variables in both the United States and Saudi data sets are United States total trade/GNP (USTGP), United States total money supply (USTMS), United States total oil imports from Saudi Arabia/United States oil imports (USOSW), United States oil import prices from Saudi Arabia/United States oil import prices (USOPW), United States total imports from Saudi Arabia/United States total foreign imports (USISW), United States total trade with Saudi Arabia/GNP (USTSP), United States total exports to Saudi Arabia/United States total exports (USESW), United States total arms exports to Saudi Arabia/United States total arms exports (USASW), United States total trade (USFTR), United States total trade with Saudi Arabia (USTSA), Saudi Arabia total imports from United States (SAIUS), Saudi Arabia total money supply (SATMS), and Saudi Arabia total exports to United States/Saudi Arabia total exports (SAEUW), Saudi Arabia total arms imports from United States/Saudi Arabia total arms imports (SAAUW), Saudi Arabia total foreign trade/GNP (SATGP), Saudi Arabia total trade with United States/GNP (SATUP), and Saudi Arabia total imports from United States/ Saudi Arabia total foreign imports (SAIUW).

Examination of the remaining variables in both data sets suggests dropping the variables USTSP, SATGP, SATUP,

SAIUW and SAAUW for their redundant contribution to the explanation of the dependent variables. Therefore, on the basis of their statistical significance and marked contribution to the explanation of the dependent variables, the following United States and Saudi variables are kept: USTGP, USTMS, USOSW, USOPW, USESW, USISW, USASW, USFTR, USTSA, SAIUS, SATMS, and SAEUW.

With the selected independent variables identified for each data set, a regression analysis was performed for each dependent variable with the selected independent variables in each data set. At each step of the process, partial F-values were examined. Furthermore, the Durbin-Watson statistic was utilized to account for autocorrelation. As a result, two dependent variables were excluded for the lack of fit of the models and statistically insignificant results. The first dependent variable excluded is weighted conflict measure, Saudi Arabia actor/United States target (SAWCN) in the Saudi data set and the second is net weighted conflict measure, Saudi Arabia actor/United States target (SANWC) in the United States data set. The final analysis of all the models showed the usefulness of six models associated with the following dependent variables: in the Saudi data set, net weighted conflict measure, Saudi Arabia actor/United States target (SANWC), weighted cooperation measure, Saudi Arabia actor/United States target (SAWCO), and net weighted conflict measure, United States actor/Saudi

Arabia target (USNWC); in the United States data set, net weighted conflict measure, United States actor/Saudi Arabia target (USNWC), weighted coopration measure, United States actor/Saudi Arabia target (USWCO), and weighted conflict measure, United States actor/Saudi Arabia target (USWCN).

Although these models are discussed later in this chapter, below is an illustration of the specification process used to finalize the models in each data set by selecting one model as an example: United States model I, net weighted conflict measure--United States actor/Saudi Arabia target (USNWC).

The hypothesized model to assess the impact of interdependence on conflict when the United States is the actor and Saudi Arabia is the target is as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + , \ldots, + \beta_5 X_5 + \epsilon$$

where Y is the net weighted conflict measure, United States actor/Saudi Arabia target (USNWC), β_0 is the intercept, β_1 to β_5 are parameters of X_1 to X_5 and ϵ is an error term. The variables X_1 and X_5 represent the variables the ratio of United States total foreign trade/GNP (USTGP), the ratio of United States total oil imports from Saudi Arabia/United States total foreign oil imports (USOSW), the United States total money supply (USTMS), the ratio of United States oil import prices from Saudi Arabia/United States oil import prices (USOPW), and the ratio of United States total imports

from Saudi Arabia/United States total imports (USISW). Therefore, the model can be estimated by

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + , \ldots, \beta_5 X_5$$

The results are summarized below. The standard error of estimate and the P-value of t are given in parentheses.

```
USNWC =  246.4558  -  7.19367 USTGP  -  0.839607 USOSW
        (115.0619)   (2.61147)        (19.06155)
          (0.0517)   (0.0164)**         (0.9655)

+  1.37324 USTMS  -  22.54329 USOPW  + 110.77160 USISW
  (0.681108)        (18.747307)        (43.885138)
  (0.0649)           (0.2506)           (0.0254)**        (1)
```

where $R^2 = 0.5817$, adjusted $R^2 = 0.4208$, F-test = 3.616, Prob. > F = 0.0286, and Root MSE = 78.9105.

An examination of T-values and P-values of T and stepwise regression suggests dropping the variable USOSW. Therefore, the number of independent variables in the model is reduced to those variables in equation (2), and they are USTMS, USTGP, USISW, and USOPW.

```
USNWC  =  245.7378  + 1.3874 USTMS  - 7.24027 USTGP
         (109.7661)  (0.57825)        (2.3009)
           (0.0419)  (0.0309)**       (0.0071)**

+  110.1923 USISW  -  23.2465 USOPW
   (40.3484)         (9.4688)
    (0.0162)**       (0.0278)**                        (2)
```

where $R^2 = 0.581$, adjusted $R^2 = 0.462$, F-test = 4.866, Prob. > F = 0.0114, and Root MSE = 76.0457.

The model shows that the variables United States total money supply (USTMS) the ratio of United States total trade/GNP (USTGP), the ratio of United States total imports from Saudi Arabia/United States total imports (USISW) and

the ratio of United States oil import prices from Saudi Arabia/United States oil import prices (USOPW) account for 58% of the variance in the dependent variable (USNWC). The critical value of F (3.11) and the P-value (F) of 0.0114 indicate the usefulness of the model. The P-values for all independent variables show that the independent variables have statistically significant relationships with the dependent variable USNWC. The value of the Durbin-Watson statistic of 2.01 indicates the absence of autocorrelation. The model shows that for each unit increase in the independent variable (USTMS), keeping the other three variables constant, the dependent variable (USNWC) will increase by 1.3874. This positive relation between United States money supply and conflict is expected since "monetary channels are regarded by some economists as paths of transmission of inflation" (Tetreault, 1980, p. 434). In the United States, with developed banking facitlities, money supply is an indicator of factor movements, because its value at any time is more likely to be directly linked to the outcome of the sum of public and private economic transactions (Tetreault, 1980, pp. 433-434).

For each unit increase in the independent variable (USTGP), keeping the other three independent variables constant, the dependent variable (USNWC) will decrease by 7.24027. This is expected and is consistent with the findings of the first school of thought related to the

inverse relationship between conflict and interdependence (Gasiorowski and Polachek, 1982; Keohane and Nye, 1977; Nye, 1971; Polachek, 1978, 1980; Young, 1969).

For each unit increase in the independent variable (USISW), keeping the other three independent variables constant, the dependent variable (USNWC) will increase by 110.1923. This is expected and is consistent with the findings of the second school of thought related to the positive relationship between conflict and interdependence particularly since the majority of United States total imports from Saudi Arabia consists of oil, a commodity that became in short supply and more sensitivity since 1973 and ended as a source of tension in the relationship between the two countries (Bergsten, Keohane, and Nye, 1975; Hirschman, 1945; Keohane, 1975; Keohane and Nye, 1975; Knorr, 1977; Van Dyke, 1966; Waltz, 1970).

For each unit increase in the independent variable (USOPW), keeping the other three independent variables constant, the dependent variable (USNWC) will decrease by 23.2465. This is consistent with the findings of the first school of thought related to the inverse relationship between conflict and interdependence.

Therefore, the model shows an inverse relationship between the measure of conflict (USNWC) and the measures of interdependence USTGP and USOPW and a positive relationship between the measure of conflict (USNWC) and the measures of

interdependence USTMS and USISW. These findings are consistent with Gasiorowski's (1986) findings that interdependence can have mixed consequences. That is, "while interdependence is costly and may . . . lead to increased conflict, it may have beneficial aspects that induce greater international cooperation" (p. 37).

The following section addresses the development of a scale to interpret the predicted values in the models developed.

Interpretation of the Predicted Value of the Models Developed

To interpret the predicted values of the dependent variables, (i.e., showing the range, magnitude and intensity of the conflictive and/or cooperative behavior directed toward, and received by, each country) obtained by using the models developed in this study, it was essential to devise a scale of magnitude and intensity. The extensive review of literature on interdependence and its consequences did not reveal the existence of such a scale.

Because the dependent variables of this study were obtained from the Conflict and Peace Data Bank, and were weighted according to the intensity weights of the Azar and Sloan Scale for Inter-Nation Events (1976) (see Table 23, Appendix B), the scale developed for this study incorporates Azar and Sloan's concept of a single scale for conflictive and cooperative events. In addition, this scale can also be

used for weighted cooperation and weighted conflict separately (see Tables 29 through 31, Appendix B).

The following is a description of the three scales: The first scale, the net weighted conflict scale, interprets the predicted value(s) of the dependent variable: net weighted conflict measures (SANWC and USNWC). This scale combines cooperative and conflictive events between dyads. The upper and lower limits of the scale represent the highest predicted values (488.8531) and lowest predicted values (-0.47829) in the dependent variables. The scale magnitude ranges from zero to more or less 450 with zero representing the neutral point and $\pm$450 representing the degree of the event (-450 and less, most cooperative, and +450 and more, most conflictive). The scale is divided into two sub-scales (cooperation and conflict) and each sub-scale is divided into three areas, high, medium, and low, to illustrate the magnitude of the predicted value of Y (see Tables 29-31, Appendix B). To illustrate the intensity of the predicted value within those three areas, each sub-scale is divided into nine regions ranging from 1 to 9. For example, a predicted value of Y may fall within any one of the three areas (high, medium, and low) and within that area it (Y) may fall within any one of the three regions in that particular area.

The second and third scales are variations of the first scale. Instead of combining conflict and cooperation in one

scale, each is used separately (see Tables 29-31, Appendix B). The second scale is the weighted cooperation scale and corresponds to the dependent variables weighted cooperation measures (SAWCO and USWCO). The third scale is the weighted conflict scale and corresponds to the dependent variables weighted conflict measures (SAWCN and USWCN).

To illustrate how the scales can be used to interpret the predicted values of the dependent variables in the six developed models, the models are divided into three groups based on the scale to be used to interpret them.

The first group includes Saudi Arabia models I and III and United States model I. The scale used to interpret them is the net weighted conflict scale (Table 29, Appendix B). The second group includes Saudi Arabia model II and United States model II. The scale used to interpret them is the weighted cooperation scale (Table 30, Appendix B). The third group includes United States model III. The scale used to interpret it is the weighted conflict scale (Table 31, Appendix B).

For the models in the first group (Tables 11 and 12), the predicted values of the dependent variables (SANWC and USNWC) indicate for the Saudi-United States relationship a low to medium level of cooperation from 1960 to 1978. The relationship exhibits the highest level of cooperation in 1974 (Table 29, Appendix B).

The intensity of the cooperative behavior falls in Regions 1 to 5, and for 1974, it falls in Region 8 (Table 29, Appendix B). Comparison of the actual with the predicted values of the dependent variables shows the same pattern in the levels of cooperation. The intensity level of the actual values fall in Regions 1 to 3 with few years falling in Region 4. The actual values for 1974 show the same intensity level as the predicted values in that they both fall in Region 8.

The models in the second group (Tables 11 and 12) show the predicted values of the dependent variables (SAWCO and USWCO) also indicating that the Saudi-United States relationship exhibits a low to medium level of cooperation from 1960 to 1978, except for 1974. The intensity of the cooperative behavior falls in Regions 1 to 4, and for 1974 it falls in Regions 8 and 9 (Table 30, Appendix B).

Comparison of the actual with the predicted values of the dependent variables shows the same pattern of low to medium levels of cooperation except for 1974. Again the intensity level of the actual values falls in Regions 1 to 3 with few years falling in Region 4. The actual values for 1974 show an intensity level falling in Regions 7 to 8.

United States model III in the third group (Table 12) shows the predicted values of the dependent variable (USWCN) indicating that the Saudi-United States relationship exhibits a low level of conflict with an intensity level

concentrated in Region 1 (Table 31, Appendix B). Comparison of the actual with the predicted values of the dependent variable USWCN shows the same pattern of low level of conflict with an intensity level lower than the predicted values falling in Region 1, except for 1963 showing the intensity level falling in Region 2. As to the ability of the models to predict, they show generally limited ability to predict, which is expected due to the limited number of observations available for analysis.

The policy implications of the findings are addressed in Chapter VI.

Description of the Specified Models

This section addresses the description of models specified for both countries. First, the Saudi models are presented followed by the United States models.

Saudi Arabia--Model I (SANWC)

Saudi Arabia model I shows the impact of the independent variable, the ratio of Saudi total exports to the United States/Saudi total foreign exports (SAEUW) on the dependent variable, net weighted conflict measure, Saudi Arabia actor/United States target (SANWC). The results of this analysis are summarized in Table 13. The model shows an inverse relationship between the measure of conflict (SANWC) and the measure of interdependence (SAEUW).

TABLE 11

ACTUAL AND PREDICTED VALUES OF THE SAUDI MODELS

Year	Model I				Model II				Model III			
	Actual	Predicted	Residuals	% Error	Actual	Predicted	Residuals	% Error	Actual	Predicted	Residuals	% Error
1960	60	-12.18	72.18	120.30	0	65.24	-65.24	----	16	-97.81	113.81	711.31
1961	86	-15.77	101.77	118.34	0	66.96	-66.96	----	-32	-100.70	68.70	-214.70
1962	45	-20.74	65.74	146.09	34	69.62	-35.62	-104.76	-92	-104.71	12.71	-13.81
1963	-123	-25.87	-97.13	78.97	145	84.68	60.32	41.60	-215	-108.84	-106.16	49.38
1964	-26	-28.66	2.66	-10.2	26	82.83	-56.83	-218.5	-54	-111.10	57.09	-105.72
1965	-143	-30.65	-112.35	78.57	143	77.65	65.35	45.70	-178	-112.69	-65.31	36.69
1966	-57	-14.62	-42.38	74.34	64	58.80	5.02	7.85	-164	-99.78	-64.22	39.16
1967	76	8.39	67.61	88.96	45	31.57	13.43	29.85	-139	-81.23	-57.77	41.56
1968	-76	11.81	-87.81	115.54	82	29.30	52.70	64.27	-108	-78.48	-29.52	27.34
1969	0	20.30	-20.30	----	0	30.44	-30.44	----	-6	-71.63	65.63	-1093.91
1970	-6	30.03	-36.03	600.48	6	23.45	-17.45	-290.86	-6	-63.80	57.79	-963.20
1971	29	14.61	14.39	49.63	0	36.22	-36.22	----	-32	-76.22	44.22	-138.19
1972	-42	6.07	-48.07	114.31	74	38.85	35.15	47.50	-44	-83.10	39.10	-88.87
1973	136	-22.18	158.18	116.31	170	83.97	86.03	50.60	-269	-105.87	-163.13	60.64
1974	-403	-403.76	0.76	-0.19	485	488.85	-3.85	-0.79	-395	-413.39	18.39	-4.65
1975	-67	-49.57	-17.42	26.01	89	77.32	11.68	13.13	-144	-127.95	-16.05	11.15
1976	22	-90.05	112.05	509.33	22	46.03	-24.03	-109.23	-136	-160.57	24.57	-18.06
1977	-188	-98.46	-89.54	47.63	210	178.90	31.10	14.81	-215	-167.34	-47.66	22.17
1978	-126	-81.67	-44.33	35.18	222	246.12	-24.12	-10.87	-106	-153.81	47.81	-45.10

TABLE 12

ACTUAL AND PREDICTED VALUES OF THE UNITED STATES MODELS

Year	Model I				Model II				Model III			
	Actual	Predicted	Residuals	% Error	Actual	Predicted	Residuals	% Error	Actual	Predicted	Residuals	% Error
1960	16	-76.45	92.45	577.80	6	84.02	-78.02	-1300.31	22	12.43	9.57	43.49
1961	-32	-61.43	29.43	-91.98	32	69.38	-37.37	-116.79	0	8.61	-8.61	----
1962	-92	-156.30	64.30	-69.90	99	166.86	-67.86	-68.55	7	4.90	2.10	30.06
1963	-215	-78.70	-136.30	63.40	267	88.53	178.47	66.84	52	13.67	38.32	73.70
1964	-54	-96.41	42.41	-78.53	54	106.72	-52.72	-97.63	0	15.23	-15.23	----
1965	-178	-116.06	-61.94	34.80	184	128.18	55.8	30.34	6	15.93	-9.92	-165.45
1966	-164	-116.24	-47.7	29.12	176	127.02	48.98	27.83	12	11.47	0.53	4.46
1967	-139	-120.09	-18.91	13.61	145	131.31	13.69	9.44	6	5.23	0.77	12.81
1968	-108	-18.57	-89.4	82.81	108	22.67	85.33	79.01	0	-0.48	0.48	----
1969	-6	-31.74	25.75	-429.11	6	36.63	-30.63	-510.54	0	0.89	-0.89	----
1970	-6	2.71	-8.71	145.21	6	-1.33	7.33	122.25	0	3.97	-3.97	----
1971	-32	-121.34	89.34	-279.19	32	130.98	-98.98	-309.33	0	8.02	-8.02	----
1972	-44	-103.12	59.12	-134.36	45	112.52	-67.52	-150.04	1	2.71	-1.71	-171.11
1973	-269	-236.62	-32.38	12.04	287	251.64	35.36	12.32	18	11.60	6.41	35.59
1974	-395	-307.29	-87.71	22.21	411	321.33	89.67	21.82	16	25.70	-9.70	-60.65
1975	-144	-184.14	40.14	27.88	144	200.29	-56.29	-39.09	0	5.81	-5.81	----
1976	-136	-173.14	37.14	-27.31	142	195.57	-53.57	-37.73	6	2.89	3.11	51.79
1977	-215	-124.53	-90.47	42.08	244	144.53	99.47	40.77	29	33.13	-4.13	-14.26
1978	-106	-199.54	93.54	-88.24	146	217.17	-71.16	-48.75	40	33.30	6.17	16.77

TABLE 13

SAUDI ARABIA--MODEL I (SANWC)

Independent Variable	Parameter Estimate	Standard Error of Estimate	t-Test	P-Value of t-test	F-Test	Prob. of F
Intercept	37.2244	24.1490	1.541	0.1416	--	--
SAEUW: SA total exports to US/SA total foreign exports	-8.3058	1.6469	-5.043	0.0001	25.433	0.0001

R^2 = 0.5994 Adj. R^2 = 0.5758
Root Mean Square Error = 79.7504 Observations = 19
Degrees of Freedom for numerator = 1, for denominator = 17
F value from table (alpha = 0.05) = 4.45/F calculated = 25.433/Prob. > F = 0.0001
The critical t-value from table (alpha = 0.05) = 2.110
Durbin-Watson test = 2.14

Saudi Arabia--Model II (SAWCO)

Model II shows the impact of the independent variables, Saudi total imports from the United States (SAIUS), Saudi total money supply (SATMS), and the ratio of Saudi total exports to United States/Saudi Arabia total exports (SAEUW) on the dependent variable, weighted cooperation measure, Saudi Arabia actor/United States target (SAWCO). The results of this model are summarized in Table 14.

The model shows the dependent variable, weighted cooperation measure, Saudi Arabia actor/United States target (SAWCO), is positively related to the independent variables SAEUW and SATMS and inversely related to the independent variable SAIUS. The inverse relationship between (SAIUS) and (SAWCO) is consistent with the theoretical expectations of this study, since arms constitutes a large of part of total Saudi imports from the United States. As Saudi Arabia and the United States become more involved, issues such as arms transfers will become a source of conflict because of their political sensitivity, especially regarding the Arab-Israeli conflict and the United States relations with Israel. The positive relationship between the interdependence measures (SATMS, SAEUW) and the dependent variable (SAWCO) is also expected and is consistent with the findings of the first school of thought related to the positive relationship between interdependence and cooperation (e.g., Gasiorowski and Polachek, 1982; Polachek, 1978, 1980).

TABLE 14

SAUDI ARABIA--MODEL II (SAWCO)

Independent Variables	Parameter Estimates	Standard Error of Estimate	t-Test	P-Value	F-Test	Prob. > F
Intercept	-2.41255	15.95160	-0.151	0.8818	---	---
SAIUS: Saudi total imports from U.S.	-0.25230	0.089137	-2.831	0.0127	8.01	0.0127
SAIMS: S.A. total money supply	0.05621	0.019119	2.940	0.0101	8.64	0.0101
SAEUW: S.A. total exports to U.S./S.A. total exports	10.00419	1.174347	8.519	0.0001	72.57	0.0001

R^2 = 0.8519 Adj. R^2 = 0.8223
Root mean square error = 50.05918 Observations = 19
Degrees of freedom for numerator = 3, for denominator = 15
F value from table (alpha = 0.05) = 3.29,
F-calculated = 28.762, Prob. > F = 0.0001
The critical t-value from table (alpha = 0.05) = 2.131
Durbin-Watson test = 1.99

Saudi Arabia--Model III (USNWC)

Model III shows the impact of the independent variable: the ratio of Saudi total exports to U.S/Saudi total foreign exports (SAEUW) on the dependent variable, net weighted conflict measure when the United States is the actor and Saudi Arabia is the target (USNWC). This permits observation of the behavior of Saudi independent variables with the United States dependent variable (USNWC). The results of this analysis are summarized in Table 15.

The model shows an inverse relationship between the measure of conflict (USNWC) and the measure of interdependence (SAEUW). This is consistent with the theoretical expectations of this study.

In the following section, the United States models are addressed.

United States--Model I (USNWC)

This model is already presented and discussed in detail in this chapter under "The Process of Model Specification."

United States--Model II (USWCO)

This model shows the impact of the following independent variables: United States total money supply (USTMS), the ratio of United States total trade/GNP (USTGP), the ratio of United States total imports from Saudi Arabia/United States total imports (USISW) and the ratio of United States oil import prices from Saudi Arabia/United States oil

TABLE 15

SAUDI ARABIA—MODEL III (USNWC)

Independent Variables	Parameter Estimate	Standard Error of Estimate	t-Test	P-Value	F-Test	Prob. > F
Intercept	-57.9930	21.8435	-2.655	0.0167	—	—
SAEUW: SA total exports to US/SA total foreign exports	-6.6937	1.4897	-4.493	0.0003	20.19	0.0003

R^2 = 0.5429 Adj. R^2 = 0.5160
Root Mean Square Error = 72.13685 Observations = 19
Degrees of freedom for numerator = 1, for denominator = 17
F value from table (alpha = 0.05) = 4.45 F-calculated = 20.19/Prob. > F = 0.0003
The critical t-value from table (alpha = 0.05) = 2.110
Durbin-Watson test = 1.83

import prices (USOPW) on the dependent variable, weighted cooperation measure, United States actor/Saudi Arabia target (USWCO). The results of this analysis are summarized in Table 16.

The model shows the dependent variable (USWCO) is positively related to the interdependence measures USTGP and USOPW. This is consistent with the theoretical expectations of this study and with the findings of the first school of thought related to the positive relationship between interdependence and cooperation (Gasiorowski and Polachek, 1982; Polachek, 1978, 1980).

The model also shows the dependent variable (USWCO) is inversely related to the interdependence measures USTMS and USISW. This is also consistent with the theoretical expectations of this study and with the findings of the second school of thought related to the inverse relationship between interdependence and cooperation (Bergsten, Keohane and Nye, 1975; Hirschman, 1945; Keohane, 1975; Knorr, 1977; Vandyke, 1966).

The inverse relationship between the United States money supply and cooperation is expected since "monetary channels are regarded by some economists as paths of transmission of inflation" (Tetreault, 1980, p. 434). The inverse relationship between the interdependence meausure (USISW) and the dependent variable (USWCO) is also expected. Finally, since oil constitutes the bulk of the United States

TABLE 16

UNITED STATES--MODEL II (USWCO)

Independent Variables	Parameter Estimates	Standard Error of Estimate	t-Test	P-Value	F-Test	Prob.> F
Intercept	-245.78686	119.55365	-2.056	0.0589	---	---
USTMS: U.S. total money supply	-1.4293169	0.6298144	-2.269	0.0396	5.15	0.0396
USTGP: U.S. total trade/GNP	7.37220	2.506096	2.942	0.0107	8.65	0.0107
USISW: U.S. total imports from S.A./ U.S. total imports	-111.75993	43.946236	-2.543	0.0234	6.47	0.0234
USOPW: U.S. oil import prices from S.A./U.S. oil import prices	24.658637	10.313136	2.391	0.0314	5.72	0.0314

R^2 = 0.5650 Adj. R^2 = 0.4407
Root mean square error = 82.82648, observations = 19
Degrees of freedom for numerator = 4, for denominator = 14
F-value from table (alpha = 0.05) = 3.11 F calculated = 4.546, Prob. > F = 0.0146
The critical t-value from table (alpha = 0.05) = 2.145
Durbin-Watson test = 2.16

imports from Saudi Arabia, and because its sensitivity, particularly since the oil embargo period of 1973, oil has become a source of tension in the relationship between the two countries. The positive relationship between the interdependence measure (USOPW) and the dependent variable (USWCO) support this expectation. For the Saudi role within OPEC to moderate oil prices proved to be a source of tension reduction between the two countries in relation to a very sensitive issue area--oil pricing. These findings are consistent with the study by Gasiorowski (1986) showing the mixed consequences of interdependence.

United States--Model III (USWCN)

The results of the stepwise regression procedure indicate the model found in Table 17 best describes the relationship between the weighted conflict measure and the independent variables.

The model shows the interdependence measure, the ratio of United States total exports to Saudi Arabia/United States total arms exports (USASW), is positively related to conflict. This finding is consistent with the theoretical expectations of this study. That is, as Saudi Arabia and the United States become more involved in bilateral relations, issues such as arms transfers will become a source of conflict despite the fact that arms transfers from the point of view of purely commercial transactions may have a

TABLE 17

UNITED STATES--MODEL III (USWCN)

Independent Variables	Parameter Estimates	Standard Error of Estimate	t-Test	P-Value	F-Test	Prob.> F
Intercept	7.2872864	6.9542195	1.048	0.3113	---	---
USASW: U.S. total arms exports to S.A./U.S. total arms exports	6.7804345	2.500457	2.712	0.0161	7.35	0.0161
USOSW: U.S. total oil imports from S.A./U.S. total oil imports	1.9432769	1.16913007	1.662	0.1172	2.76	0.1172
USESW: U.S. total export to S.A./U.S. total exports	-41.117095	17.571596	-2.340	0.0335	5.48	0.0335

R^2 = 0.4372 Adj. R^2 = 0.3247
Root mean square error = 12.36937, observations = 19
Degrees of freedom for numerator = 3, for denominator = 15
F-value from table (alpha = 0.05) = 3.29, F calculated = 3.885,
Prob. > F = 0.0308 The critical t-value from table (alpha = 0.05) = 2.131
Durbin Watson test = 2.36

cooperative impact on the bilateral relations, but because of its sensitivity as it relates to the Arab-Israeli conflict and the United States relations with Israel, arms transfer became a source of conflict in the relationship.

The model shows the variable, the ratio of United States total oil imports from Saudi Arabia/United States total oil imports (USOSW), is also positively related to conflict. This is also consistent with the theoretical expectation of this study. Even though USOSW shows statistical insignificance in this model, it remains a theoretically important variable and its impact shows consistency with the impact of the variable USISW in both United States models I and II.

The model also shows the variable, the ratio of United States total exports to Saudi Arabia/United States total exports (USESW), is inversely related to conflict. This is also consistent with the theoretical expectations of this study and the findings of the studies showing the inverse relationship between interdependence and conflict (Gasiorowski and Polachek, 1982; Polachek, 1978, 1980).

The positive relationship between the measure of conflict (USWCN) and the measures of interdependence USASW and USOSW and the inverse relationship between USWCN and USESW are consistent with the findings of Gasiorowski's (1986) study showing the mixed consequences of interdependence.

The following section addresses the issue of determining how well the models developed describe the true relationship between the dependent and independent variables and the consideration of other forms of regression models.

Other Forms of Regression Models (Nonlinear)

Determining how well the models describe the true relationship between the dependent variable and the independent variable(s) depends on the form of the probability distribution of the random error ϵ which is assumed to be normally distributed with mean equal to 0. Variance among the errors should also be constant, and the errors associated with any two different observations should be independent.

The validity of many of the inferences associated with regression analysis depends on the error term ϵ satisfying these assumptions. When applying a regression analysis to a set of data, however, one may not know for certain that these assumptions are satisfied, especially in many practical situations (Mendenhall and Sincich, 1986). One way to check if the random errors satisfy these assumptions is to examine the residuals.

Determining whether the data violate the normality assumption involves examining the frequency distribution of the residuals as well as checking the normal probability plot. Plots of the residuals against the independent

variables can suggest modifications that will improve the model. These include the addition of quadratic terms to allow for curvature in the response surface. If the rate of curvature of the response curve is very small over the range of a particular independent variable, the straight line might provide a better fit to the response data and function as a useful prediction equation, but if the curvature is not (or may not be) slight, then a second-order model is considered. Third or higher-order models are used only if more than one reversal in the direction of the curve is expected (Mendenhall and Sincich, 1986, p. 307).

Examination of the residual plots of the models developed to check for the violations of the normality assumption hints at a mild pattern of curvilinearity in the United States models I and II. This mild appearance in the trend of the residuals suggests that a second-order term may further improve the models. Therefore, a quadratic term was added to the equations of the United States models I and II. The comparative analysis performed on the quadratic models with the original first-order models showed the absence of any improvements in the models. No additional information has been contributed for the prediction of the dependent variables, thus indicating that the linear line first-order model provides a better fit to the response data.

Comparative Presentation of Regression Results

In this section, a comparative presentation of the regression results between the two countries is presented to identify similarities, differences, and the relative usefulness of each one as it relates to the other. The models are divided into three sets, on the basis of the dependent variables. The first set of models includes the net weighted conflict measures of the two countries (Saudi Arabia model I and United States model I). The second set of models includes the weighted cooperation measures of the two countries (Saudi Arabia model II and United States model II), and the third set of models includes Saudi Arabia model III, net weighted conflict measure, United States actor/ Saudi Arabia target (USNWC), and third United States model III, weighted conflict measure United States actor/Saudi Arabia target (USWCN).

The first set of models assesses the association between the independent variables SAEUW, USTGP, USTMS, USISW, and USOPW with the dependent variable net weighted conflict measure once when Saudi Arabia is the actor and the United States is the target and again when the United States is the actor and Saudi Arabia is the target (see Table 18).

The first set of models shows, in Saudi Arabia model I, the independent variable Saudi total exports to the United States/Saudi total exports (SAEUW), accounts for 60% of the

TABLE 18

COMPARATIVE REGRESSION RESULTS
(SANWC) (USNWC)

Saudi Arabia--Model I SA actor/US target				United States--Model I US actor/SA target			
Independent Variables	Parameter Estimate	Standard Error	P-Value P < .05	Independent Variables	Parameter Estimate	Standard Error	P-Value P < .05
Intercept	37.2244	24.1490	0.1416	Intercept	245.73783	109.76616	0.0419
SAEUW: SA total exports to US/SA total exports	-8.3058	1.6469	0.0001	USIMS: US total money supply	1.387442	0.578253	0.0309
				USTGP: US total trade/GNP	-7.240274	2.300930	0.0071
				USISW: US total imports from SA/US total imports	110.19236	40.34839	0.0162
				USOPW: US oil import prices from SA/US oil import prices	-23.246560	9.468832	0.0278
R^2 = 0.5994				R^2 = 0.5816			
Adj. R^2 = 0.5758				Adj. R^2 = 0.4621			
F-value = 25.43				F-value = 4.866			
Prob. > F = 0.0001				Prob. > F = 0.0114			
Durbin-Watson = 2.14				Durbin-Watson = 2.019			
RMSE = 79.75041				RMSE= 76.0457			
Observations = 19				Observations = 19			

variance in the dependent variable, net weighted conflict measure, Saudi Arabia actor/United States target (SANWC), using the simple linear regression equation. However, the independent variables in United States model I (USTMS, USTGP, USISW, and USOPW), account for 58% of the variance in the dependent variable, net weighted conflict measure, United States actor/Saudi Arabia target (USNWC), using the multiple linear regression equation. Saudi model I also shows an adjusted R^2 of 0.58, whereas United States model I shows an adjusted R^2 of 0.46.

The second set of models assesses the association of the independent variables SAEUW, SATMS, SAIUS, USTGP, USTMS, USISW, and USOPW with the dependent variable weighted cooperation measure once when Saudi Arabia is the actor and the United States is the target and again when the United States is the actor and Saudi Arabia is the target (see Table 19).

The second set of models shows different results between the two countries. In Saudi Arabia model II, the independent variables (SAEUM, SATMS, and SAIUS) account for 85% of the variance in the dependent variable (SAWCO) using the multiple linear regression equation, while the independent variables in United States model II (USTMS, USTGP, USISW, and USOPW), account for 56% of the variance in the dependent variable (USWCO) using the multiple linear regression equation. Saudi model II also shows and adjusted R^2 of

TABLE 19

COMPARATIVE REGRESSION RESULTS
(SAWCO) (USWCO)

Saudi Arabia--Model II				United States--Model II			
Independent Variables	Parameter Estimate	Standard Error	P-Value P < .05	Independent Variables	Parameter Estimate	Standard Error	P-Value P < .05
Intercept	-2.41255	15.95160	0.8818	Intercept	-245.78686	119.55365	0.0589
SAIUS: Saudi total imports from US	-0.25230	0.089137	0.0127	USIMS: US total money supply	-1.4293169	0.6198144	0.0396
SATMS: SA total money supply	0.05621	0.019119	0.0101	USTGP: US total trade/GNP	7.37220	2.506096	0.0107
SAEUW: SA total exports to SA/US total exports	10.00419	1.174347	0.0001	USISW: US total import from SA/US total imports	-111.75993	43.946236	0.0234
				USOPW: US oil import prices from SA/US oil import prices	24.658637	10.313136	0.0314

R^2 = 0.8519
Adj. R^2 = 0.8223
F-value = 28.762
Prob. > F = 0.0001
Durbin-Watson = 1.99
RMSE = 50.05918
Observations = 19

R^2 = 0.5650
Adj. R^2 = 0.4407
F-value - 4.546
Prob. > F = 0.0146
Durbin-Watson = 2.16
RMSE = 82.82648
Observations = 19

0.82, whereas United States model II shows an adjusted R^2 of 0.44.

Both models in the second set show money supply to be statistically significant. But the United States model shows money supply to be inversely related to cooperation, and the Saudi model shows money supply to be positively related to cooperation. The positive relationship between money supply and cooperation in the Saudi model may be attributed to the lack of fully developed banking facilities similar to those available in the United States that could act as indicators of factor movements and could be considered as paths of transmission of inflation. The models also show a high degree of correlation between the independent variables and the dependent variable, but the correlation between the variables in the Saudi model is higher than that in the United States model. This higher correlation between the variables in the Saudi Arabia model makes it more useful for analysis and prediction than the United States model.

The third set of models assesses the association of the independent variables SAEUW, USASW, USESW, and USOSW with two dependent variables, the United States net weighted conflict measure (USNWC) and the United States weighted conflict meausre (USWCN). The third set of models shows different results between the two countries.

Table 20 provides a summary of the results for both models. In the Saudi Arabia model III, the independent variable SAEUW accounts for 54% of the variance in the dependent variable (USNWC) using the simple regression equation. While the independent variables in the United States model III account for 44% of the variance in the dependent variable (USWCN), using the multiple linear regression equation. Saudi model III also shows an adjusted R^2 of 0.52 whereas the United States model III shows an adjusted R^2 of 0.32.

Overall assessment of the three sets of models indicates the relative usefulness of the three Saudi models as indicated by the high values of R^2 compared with the relatively lower R^2 for the United States models. The Saudi models show the possibility of having one explanatory variable (SAEUW) which has significant relationships with both conflict and cooperation whereas the United States model I and II show the variables USTMS, USTGP, USISW, and USOPW to have a significant relationship with both conflict and cooperation. The analysis of the models shows that in bilateral interdependence, one model may not be appropriate to account for variations in the behavior of the two countries. Rather each has to have at least one model to explain its behavior.

The significant independent variables that seem to offer the best explanation, compared with the others in this

TABLE 20

COMPARATIVE REGRESSION RESULTS
(USNWC) (USWCN)

Saudi Arabia--Model III				United States--Model III			
Independent Variables	Parameter Estimate	Standard Error	P-Value P < .05	Independent Variables	Parameter Estimate	Standard Error	P-Value P < .05
Intercept	-57.9930	21.8435	0.8818	Intercept	7.2872864	6.9542195	0.3113
SAEUW: SA total exports to US/SA total exports	-6.6937	1.4897	0.0003	USASW: US total arms exports to SA/US total arms exports	6.7804345	2.500457	0.0161
				USOSW: US total oil imports from SA/US total oil imports	1.9432769	1.16913007	0.1172
				USESW: US total export to SA/US total exports	-41.117095	17.571596	0.0335

R^2 = 0.5429
Adj. R^2 = 0.5160
F-value = 20.19
Prob. > F = 0.0003
Durbin-Watson = 1.83
RMSE = 72.13685
Observations = 19

R^2 = 0.4372
Adj. R^2 = 0.3247
F-value = 3.885
Prob. > F = 0.0308
Durbin-Watson = 2.36
RMSE = 12.36937
Observations = 19

study are the ratio of Saudi Arabia total exports to United States/Saudi Arabia total foreign exports (SAEUW), the ratio of United States total foreign trade/GNP (USTGP), the ratio of United States total imports from Saudi Arabia/ United States total imports (USISW), the ratio of United States oil import prices from Saudi Arabia/United States oil import prices (USOPW), the ratio of United States total arms exports to Saudi Arabia/United States total foreign arms exports (USASW), the ratio of United States total exports to Saudi Arabia/United States total exports (USESW), United States total money supply (USTMS), Saudi Arabia total imports from United States (SAIUS) and Saudi Arabia total money supply (SATMS).

Using the Developed Models for Prediction

Two issues are discussed in this section. The first is how to use the model(s) developed in this study to predict some value(s) of Y to be observed in the future. Second is how to interpret the predicted values obtained after utilizing the model(s) to predict.

Using the models for prediction. By utilizing the interactive statistical program (ISP), (Makridakis et al., 1985), the values of the last two observations (1977 and 1978) of the independent variables in each Saudi Arabia and United States models were deleted. The regression models were fitted using the first 17 observations. Then the

models were used to predict the last two observations. This was performed by substituting the last two actual values for 1977 and 1978 of the independent variables in each of the Saudi Arabia and United States models to generate the predicted values for the years 1977 and 1978. The predicted values were then compared with the actual values for 1977 and 1978 in each dependent variable. The results of this predictive test of the models are presented in Table 21.

TABLE 21

COMPARISON OF ACTUAL AND PREDICTED VALUES OF THE SPECIFIED MODELS

Models	Years	Actual Value of Y	Predicted Values
SA I	1977	-188	-87.60
	1978	-126	-71.62
SA II	1977	210	374.24
	1978	222	603.57
SA III	1977	-215	-167.03
	1978	-106	-153.59
US I	1977	-215	-90.26
	1978	-106	-202.07
US II	1977	244	91.30
	1978	146	204.06
US III	1977	29	-4.29
	1978	40	-12.31

Saudi model III is selected to report on the fitted model. The results of the regression analysis are summarized below. Standard error of estimate and P-value of t are given beneath in parentheses, and the model is determined by:

$$\begin{array}{rl} \text{USNWC} = & -58.3765 - 6.6516\ \text{SAEUW} \\ & (22.8914)\ \ (1.5702) \\ & (0.022)\ \ \ (0.001) \end{array}$$

Where $R^2 = 0.545$, adjusted $R^2 = 0.514$, F-test = 17.94, Prob. > F = 0.001, and Durbin and Watson test = 1.75. Interpreting the predicted values obtained from using this model requires the utilization of the scale developed for this study, net weighted conflict scale (Table 29, Appendix B). As expected, the models predictive powers are limited as a result of the few observations available. An increase in the number of observations should improve their ability to predict.

Interpreting the predicted values. To interpret the predicted values obtained from the models, Saudi Arabia model III is chosen to illustrate this procedure. The dependent variable is the net weighted conflict measure, United States actor/Saudi Arabia target (USNWC), and the independent variable is the ratio of Saudi exports to United States/Saudi Arabia foreign exports (SAEUW).

Table 20 shows the predicted values (Saudi Arabia model III) equals -167.03 for 1977 and -153.59 for 1978. The scale, net weighted conflict (Table 29, Appendix B) indicates that both values fall in the medium cooperation area,

Region 4. It indicates that medium level cooperation characterizes the bilateral relations between the two countries in the years 1977 and 1978.

Measuring the Accuracy of the Developed Model(s)

In order to judge the ability of the developed model to predict the future, it is important to determine its accuracy. Accuracy plays an important role in selecting and testing a particular model (Mahmoud, 1984, p. 140). There are many different accuracy measures that range from mean error to R^2 and Theil's U-statistic (Mahmoud, 1987, p. 505). Accuracy can refer to "the goodness of fit" which in turn measures how well the forecasting model is able to produce the data that were used to develop the model. Most important, however, it should refer to the future (post-sample). Forecasting accuracy is difficult to evaluate because of the wide range of accuracy measures available. Each has advantages and disadvantages. It should be noted that there is no single universally-accepted measure of accuracy (Gardner, 1980; Mahmoud, 1984, p. 141).

In testing the specified models, the following accuracy measures are determined, based on their widespread use: mean percentage error (MPE), mean absolute percentage error (MAPE), mean square error (MSE), root mean square error (RMSE), and mean error (ME). Table 22 shows the calculated accuracy measures for the United States and Saudi models.

TABLE 22

ACCURACY MEASURES FOR THE UNITED STATES AND SAUDI MODELS

Models	ME	MSE	RMSE	MPE	MAPE
US I	-14.33	12394.75	111.33	-16.3	74.3
US II	47.31	13345.28	115.52	11.39	51.18
US III	26.2	688.65	26.24	77.21	77.21
SA I	-77.39	6518.67	80.73	48.25	48.25
SA II	-272.90	86285.215	293.74	-125.03	125.03
SA III	-0.19	2282.96	47.78	-11.29	33.60

The mean error (ME) measure shown in Table 22 shows that the models are not appropriate due to the lower value of ME, except for Saudi model III. However, one of the disadvantages of this is that negative values offset positive values and the measure does not assign an equal weight to the error. Thus, the MAPE would be better in judging the ability of the models to predict the future. It is clear that all other accuracy measures reveal that the ability of the models to forecast is weak. This is because of the problem of limited data points. Thus, it is important that policy makers test the models before using them. Also, it is important to test the models' accuracy over time to make sure that the models are appropriate ones.

Discussion and Findings

The Impact of Saudi Trade with the United States

The results of the analysis displayed by the three Saudi models generally support the theoretical expectations of this study and are consistent with Gasiorowski's (1986) finding of the mixed consequences of interdependence. That is, "while interdependence is costly and may . . . lead to increased conflict, it may have beneficial aspects that induce greater international cooperation" (p. 37). The three models clearly show the cooperative impact of Saudi exports to the United States (as indicated by the interdependence measure SAEUW) on Saudi bilateral relations with the United States from 1960 to 1978. The independent variable, the ratio of Saudi total exports to United States/Saudi Arabia total foreign exports (SAEUW), is present in all Saudi models and shows a statistically significant impact on the dependent variables--conflict and cooperation. The three models show that as Saudi Arabia engages in bilateral trade with the United States (particularly more Saudi exports to the United States), the more positive an impact this will have on the level of their bilateral cooperation and more negative an impact on the level of their bilateral conflict. This finding has important implications for Saudi and United States policy makers in their quest to make the relationship mutually

beneficial (the policy implications of findings are addressed later in Chapter VI).

Saudi Arabia is a single-commodity economy dominated by oil, and oil accounts for a large portion of its exports to the world in general and to the United States in particular. Oil provides to Saudi Arabia needed foreign exchange earnings and government revenues, and is the source of growth of its national income.

The United States maintained a 3% to 4% share of the Saudi export market until 1975 when it dramatically increased its market share (as indicated by the Saudi interdependence measures in Table 27, Appendix B) to almost 10% in 1977 and 15% in 1978 (Saudi Arabian Monetary Agency (SAMA), 1970-1980). The primary reason for this increase was that the Saudi price level competed with oil-export cutbacks from Iran. While the United States ranked as only the tenth largest importer of Saudi petroleum in 1976 (SAMA, 1977-1980), having purchased less than 5% of the total export value in that year, the loss of Iranian oil supplies and output cutbacks by several OPEC countries (as a move to shore-up prices and for conservation purposes) caused a dramatic change. Saudi Arabia became the foremost exporter of petroleum to the United States. Some 16% of the total United States petroleum requirements were received from Saudi Arabia in 1976 and more than 18% in 1977 (SAMA, 1977-1980). Examination of Saudi oil exports to the United

States and their impact and ramification shows that they have enabled Saudi Arabia to receive in exchange the needed goods and services as well as essential technologies to fuel Saudi development plans. This is indicated by the interdependence measures in the Saudi data set (Table 27, Appendix B). Data analysis also shows that Saudi trade with the United States grew from $2.6 billion in 1974 to $8.6 billion in 1978 (Direction of Trade, 1982).

The three Saudi models show that the two countries were able to reap the benefits of this increased trade and moved toward more cooperative interactions. Saudi trade with the United States played a major role in the Saudi economy. In addition to the static gains from that trade, such as foreign-exchange savings and others, Saudi trade with the United States provided other dynamic benefits such as capital goods, the technical and managerial skills and services gained by the Saudis and the huge infrastructure requirements accompanied the expansion of development. All were indispensible to Saudi economic development. Static and dynamic benefits of Saudi trade with the United States were enhanced even more by the creation and continuing evolution of the Joint Economic Commission. This is clearly indicated by the measures of interdependence as well as the indicators of conflict and cooperation in the Saudi data set (Table 27, Appendix B), and from the graphical display of the interdependence measures (see Appendix C). For

instance, Figure 1 shows the period from 1960 to 1962 to exhibit a low level of conflict, and as the two countries began to engage in more bilateral trade as indicated by Figure 7, the relationship began to exhibit an increased cooperation except for periods of tension between the two countries such as the 1967 war, the rise in oil prices in 1971, and the 1973 War. Figure 7 illustrates the gradual increase in Saudi interdependence as indicated by the United States total trade from 1960 to 1978.

Despite the inverse relationship between the interdependence measure, Saudi Arabia total imports from United States (SAIUS) and the cooperation measure (SAWCO) because of the sensitivity of the arms trade issue between the two countries, the relationship has limited impact on the dependent variable in comparison with the interdependence measure SAEUW. SAEUW remains statistically significant in the three Saudi models and shows consistency with the assertions of the first school of thought related to the positive relationship between interdependence and cooperation (Angell, 1969; Gasiorowski and Polachek, 1982; Haas and Schmitter, 1966; Keohane and Nye, 1977; Nye, 1971; Polachek, 1978, 1980; Rosecrance et al., 1977; Spiro, 1974; Young, 1969).

The Impact of United States Trade

The results of the analysis displayed by the United States models I, II, and III also support the expectations of the mixed consequences of interdependence, and are consistent with the findings of Gasiorowski (1986).

Interdependence is found to be inversely related to conflict as indicated by the interdependence measures, the ratio of United States total foreign trade/GNP (USTGP), the ratio of United States oil import prices from Saudi Arabia/ United States oil import prices (USOPW), and the ratio of United States total exports to Saudi Arabia/United States total foreign exports (USESW). But the measures of interdependence the ratio of United States total imports from Saudi Arabia/United States total foreign imports (USISW) and the ratio of United States total arms exports to Saudi Arabia/ United States total arms exports (USASW) show the positive impact on conflict due to the costs associated with such sensitive commodities as arms and oil. Arms and oil constitute the backbone of Saudi-United States relations. From a purely commercial point of view, they are very beneficial transactions provided they are not manipulated and used to influence the trading partner, otherwise they can be a tension-producing issue area. This finding has important implications for policy makers in both countries in their quest to further their beneficial relations with each other and their trading partners. Plots of the

interdependence measures from 1960 to 1978 show the positive impact of trade on cooperation. For instance, Figures 1 and 2 in Appendix B show that the measures of cooperation and conflict exhibited varying degrees of increasing and decreasing levels, with cooperation exceeding conflict except for a few periods of tension such as the 1967 War, the rise of oil prices in 1971, and the 1973 War. This level of cooperation corresponds to the increase in the level of interdependence as indicated by the indicator of United States-Saudi total trade in Figure 7. The agreement between Saudi Arabia and the United States for a Joint Economic Commission to coordinate and facilitate bilateral trade relations relates to the increased trade between the two and the level of cooperation in 1974.

Data analysis of the United States interdependence measures (Table 28, Appendix B) shows that the United States exports many agriculture and manufactured goods, while a growing share of its imports consists of items such as oil and critical raw materials, which are either not produced in the United States or are not available in adequate supply at an adequate price (The Export Imperative, 1980, I and II).

The United States recognizes that the introduction of barriers to United States imports would not only be harmful to the welfare of United States consumers, but would also be detrimental to the United States competitive position. It is understood by United States policy makers and economists

that, in a protected market, United States prices would be higher and United States producers would have less incentive to innovate and to adopt their output to the changing structure of world demand. Measures to restrict imports would likely induce foreign retaliation and increased conflict against export producing industries. To challenge the actions and policies of other governments to increase their exports or decrease their imports, the United States resorted to developing international norms such as those embodied in the General Agreement on Tariffs and Trade (GATT), insisting that these be rigorously observed by all countries (Twenty-second, Twenty-third, and Twenty-fourth Annual Report of the President of the United States on the Trade Agreements Program, 1977-1979).

Trade between the United States and Saudi Arabia has grown considerably. United States exports to Saudi Arabia exceed $5 billion annually and Saudi exports of oil to the United States total more than $12 billion annually. United States oil imports from Saudi Arabia during the late 1970s reached 1.25 million barrels per day (Arms Sales Package to Saudi Arabia, 1981, p. 147).

United States exports to Saudi Arabia are increasing. Saudi total imports increased 49% in 1972 and approximately 55% in 1973 and again in 1974. United States exports to Saudi Arabia doubled in 1972, increased 40% in 1973, and doubled again in 1974 (Direction of Trade, 1977). The

volume of Saudi imports reflects the dynamic processes of development which the Saudi economy experienced. The total value of imports increased approximately 30 times during the period from 1960 to 1978. From 1968 to 1978 total imports (C.I.F.) increased from SR 2,578 million to SR 69,180 million. The largest increases have occurred since 1973 (see Figures 7-11, Appendix C) (Direction of Trade, 1980).

The major sources of Saudi imports in 1978 were Western Europe, the United States, and Japan. The United States supplied approximately 19% of Saudi import demands between 1970 and 1978. This increased to almost 21% in 1978 (Direction of Trade, 1980). With the growing participation of United States firms in development programs, United States exports to Saudi Arabia are expected to increase. The United States' benefits from Saudi Arabia's development programs are greater than any other industrialized country.

The efforts of Saudi Arabia at development are consistent with the interests of the United States. As it becomes better integrated into the world economy, Saudi Arabia is likely to acquire vested interests in international economic stability as other rich countries have. The United States is becoming a major trading partner of Saudi Arabia, both in exports and imports, and both countries will gain from this growth in trade. The measures of interdependence in this study show that clearly, as Figures 1 through 16, Appendix C, illustrate. For the most part, United States policies

seem to recognize these mutual interests, and future policies of the United States needs to encourage the current attitudes of Saudi Arabia toward the disposition of its wealth.

The Impact of United States Arms Exports to Saudi Arabia

The results of the analysis of United States model III (USWCN) show the independent variable, the ratio of United States total arms exports to Saudi Arabia/United States total arms exports (USASW) to be positively related to the dependent variable conflict (USWCN) from 1960 to 1978. This indicates that United States arms exports to Saudi Arabia are a source of tension in the bilateral relations between the two countries--the more arms Saudi Arabia requests and receives from the United States, the more tense and conflictive the relationship will become. This is consistent with, and supports, the theoretical expectations of this study.

For many Americans the United States Congressional debate over the sale of F-15 fighter aircraft to Saudi Arabia in 1978 was their first real exposure to the impact of the United States-Saudi military relations. Data analysis shows that arms sales have constituted one of the largest sources of total United States exports to Saudi Arabia. The United States first realized the purely

commercial aspects of arms sales to Saudi Arabia in the 1960s with the implementation of major new Saudi military development plans.

This tension is due to their political sensitivity in relation to the long-standing United States commitment to Israel and the special relationship which has existed between the two countries. Generally, United States policy has been to supply Israel with military equipment in order to meet its security requirements. Every president since Truman has supported this policy on the assumption that a safe and secure Israel is in the best interests of the United States. This has caused a deep division in the Saudi-United States arms relationship. This relationship has been increasingly destabilized by the impact of Israeli and United States pro-Israeli politics on United States arms sales to Saudi Arabia (Arms sales 1981 and military sales to Saudi Arabia 1975).

The late 1970s saw a serious erosion in Saudi-United States arms relations. The brutal Congressional debates over the F-5E and F-15 sales to Saudi Arabia and their impact on Israel reinforced Saudi doubts as to United States reliability as a supplier of military equipment (Proposed aircraft sales 1978).

The differing political systems of the two countries provide another source of tension in United States arms

exports to Saudi Arabia. For example, Saudi defense officials have often been in office longer than those in the United States. They have knowledge of Saudi-United States military relations, have met many United States officials, have considerable personal decision-making authority, and are concerned with only Saudi security. In contrast, most United States officials average less than three years in dealing with this area of responsibility, have little historical background in Saudi-United States staff relations, have little staff continuity, and have limited authority over Saudi-United States relations. As a result, the perceptual differences between United States and Saudi officials have been immense (Cordesman, 1984).

The critics of arms sales to Saudi Arabia (particularly in Congress) believe that supplying arms to the Saudis is potentially fueling tension in an already volatile area of the world. It is argued that it is in the best interest of the United States to stop the spread of weapons into that area of the world.

Arms sales to the Saudis are not seen as promoting peace in the Middle East, but as adding a destabilizing element to the peace process. Many members of the United States Congress view the Middle East region as the most heavily armed region of the world (The Persian Gulf 1975.) This view, at times, may not be shared by the executive

branch, which puts it on a collision course with the legislative branch. For example: (a) Congress sees the push to sell arms to Saudi Arabia by the executive branch in recognition of Saudi moderation on oil prices and Arab-Israeli politics as subjecting the United States to a cycle of blackmail as the United States attempts to keep Saudi Arabia moderate; (b) the interjection of the executive branch into the prerogatives of the legislative branch is a source of resentment, especially when Congress perceives the concept of linking arms sales to one country (such as Saudi Arabia) by the other (such as Israel) as an abrogation of the power entrusted to Congress (Proposed Aircraft Sales to Israel, Egypt and Saudi Arabia, 1978, pp. 1-30); (c) Congress believes that such pressures, directed by the executive branch on Congress during periods of arms sales, make Congress look weak or yielding to the executive branch and Congress wants to change that image (United States arms sales 1975, United States interests 1972, and the Persian Gulf 1975).

Another concern which is shared at times by the executive and legislative branches is the security of United States arms. Congress is concerned with how they can adequately guarantee that United States arms will not be transferred to other countries. The United States wants

assurance that the Saudis can maintain the security of these weapons so that Russia does not have access to the secrets of advanced weapons design (Proposed aircraft sales 1978).

Other possible sources of tension related to United States arms exports to Saudi Arabia include: (1) the belief that Saudi Arabia can buy arms from other countries (if the United States rejects its arms requests) but that Israel can only look to the United States for advanced arms and equipment; (2) Saudi commitment of its military resources against Israel and for Islamic and Arabic causes; and (3) resentment of threats made by leaders of other nations of economical hardship if unfavorable decisions are made (Arms sales package 1981 and proposed aircraft sales 1978).

Arms trade, from a purely commercial point of view, can have a cooperative impact on the relationship between Saudi Arabia and the United States. However, because of its political and strategic sensitivity, it is a source of tension and a test for Saudi Arabia of the presence of genuine friendship, or lack of it, on the part of the United States. The finding related to a positive association between United States arms exports to Saudi Arabia and conflict shown in United States model III has important implications for policy makers in their quest to reduce obstacles in the road to mutually beneficial relations between the two countries.

Some possible courses of action that can be implemented by Saudi and United States officials to reverse the positive association between arms sales and conflict include: (1) increased visits by high- and low-level officials to put together workable arms requests that will reduce the sensitivity aspects of arms trade; (2) selecting, for instance, the appropriate time to submit arms requests, identify possible sources of opposition for such arms requests in and out of the United States Congress those that may adversely affect the decision to pass arms requests and target them for appropriate intense lobbying; and (3) compilation by officials of a list of major issues and concerns raised by arms exports to Saudi Arabia and addressing them in a satisfactory manner. Such issues or possibly new issues need to be addressed in a consistent and continuous process not just at times of submitting arms requests. Such issues include the Arab-Israeli conflict and the possible impact of arms sales on the peace process, the stability of the region, the security of Israel, and the security and transfer of arms to another hostile country.

Conclusion

The analysis of the interdependence measures in both the Saudi and United States data sets in Tables 27 and 28

(Appendix B) shows clearly the increase in the level of interdependence between Saudi Arabia and the United States from 1960 to 1978.

As to the analysis of the regression models that were developed to assess the relationship between the increasing level of interdependence and the dependent variables (conflict and cooperation), it reveals the following general findings: (1) the ratio of Saudi total exports to United States/Saudi total foreign exports (SAEUW) is positively related to cooperation and inversely related to conflict; (2) the ratio of United States total foreign trade/GNP (USTGP) is positively related to cooperation and inversely related to conflict; (3) the ratio of United States total exports to Saudi Arabia/United States total exports (USESW) is positively related to cooperation and inversely related to conflict; (4) the ratio of United States oil import prices from Saudi Arabia/United States oil import prices (USOPW) is positively related to cooperation and inversely related to conflict; (5) Saudi Arabia total money supply (SATMS) is positively related to cooperation and inversely related to conflict; (6) the ratio of United States total imports from Saudi Arabia/United States total imports (USISW) is positively related to conflict and inversely related to coooperation; (7) the ratio of United States total arms exports to Saudi Arabia/United States

total arms exports (USASW) is positively related to conflict and inversely related to cooperation; (8) United States total money supply (USTMS) is positively related to conflict and inversely related to cooperation; (9) Saudi Arabia total imports from United States (SAIUS) is positively related to conflict and inversely related to cooperation.

It is the conclusion of this study that the increased level of interdependence between Saudi Arabia and the United States (as indicated by the measures of interdependence) did affect the levels of conflict and cooperation between the two countries from 1960 to 1978. The findings of the models relating to the relationship between interdependence, conflict, and cooperation do not dispute the assertions of the two schools of thought on the relationship between these concepts. The first asserts that increasing interdependence leads to cooperation and reduction of conflict among nations (Angell, 1969; Gasiorowski and Polachek, 1982; Keohane and Nye (1977), Nye, 1971; Polachek, 1978, 1980; Young (1969). The second school of thought holds that increasing interdependence can lead to greater conflict between countries (Bergsten, Keohane, and Nye, 1975; Hirschman, 1945; Keohane, 1975; Keohane and Nye 1975; Knorr, 1977; Van Dyke, 1966; Waltz, 1970).

The analysis of the models also reveals that Saudi-United States cooperation will be positively associated with increased interdependence. Based upon these findings, one

would expect the two countries to engage in increased cooperative behavior on a routine basis despite the sporadic increases in tension in the areas of arms transfer and the Arab-Israeli conflict. Therefore, on the basis of these findings, the three null hypotheses tested in this study are rejected.

CHAPTER VI

SAUDI-UNITED STATES BILATERAL INTERDEPENDENCE GRAPHICAL PRESENTATION AND POLICY IMPLICATIONS

In this chapter, a graphical display of the Saudi-United States bilateral interdependence and its consequences is presented. Secondly, the policy implications of the findings of this study, based on the models developed and the graphical presentation, are discussed.

Introduction

This graphical display is not an end in itself, but constitutes only part of the investigation of the relationships involved under study. Graphical display and analysis of data are utilized to show their usefulness in the study of conflict and cooperation with the hope that they will be incorporated into the analysis of international relations and accepted as tools for analyzing international relations.

The plots of Saudi-Unites States bilateral interdependence and its consequences in terms of cooperation and conflict from 1960 to 1978 are given in Figures 1 through 18, Appendix C. The various dependent variables (measures of conflict and cooperation) are plotted in Figures 1 through 6, Appendix C, and the independent variables

(measures of interdependence) are plotted in Figures 7 through 18, Appendix C. When the plotted measures of interdependence (Figures 7 through 18, Appendix C) are compared collectively or individually with the measures of conflict and cooperation (Figures 1 through 6, Appendix C) they confirm the findings of this study from the perspective of the graphical presentation of the dependent and independent variables.

The plotted measures of interdependence, Figures 7 through 18, when superimposed on the plotted measures of conflict and cooperation, Figures 1 through 6, from 1960 to 1978 show clearly the increasing trend in interdependence between the two countries from 1960 to 1978 (as indicated by the interdependence measures) and as interdependence increased, cooperation and conflict show also an increase at times and decrease at another (as indicated by the measures of conflict and cooperation). For example, in the early 1960s, with low level of interdependence, conflict showed an increase particularly in 1960 and 1963. Conflict also increased during the 1967 Arab-Israeli War, the 1973 war and in 1977 and 1978 during the debate concerning arms sales to Saudi Arabia. In the case of cooperation, it characterized the relationship, particularly the period following the 1973 war, with 1974 marking the beginning of institutionalizing the "special relationship" between Saudi Arabia and the United States by signing the 1974 Joint Economic Commission.

To illustrate this, Figure 1 is chosen to be discussed and compared to the Saudi model I. Generally, Saudi model I shows the inverse relationship between Saudi exports to the United States and conflict from 1960 to 1978. Examination of Figure 1 shows that, from 1960 to 1962, the relationship with the lower level of trade between the two countries at that time exhibited an increase in the level of tension. As the two countries began to engage more in trade from 1963 to 1968, the relationship exhibited a marked increase in the level of cooperation. From 1967 to 1972, the level of cooperation and conflict fluctuated, with conflict increasing noticeably in 1967 due to Arab-Israeli war and in 1971 due to the increase in oil prices. Figure 1 shows clearly the impact of the 1973 war and the oil embargo on the relationship and the increase in conflict to the highest level recorded between the two countries during the period of this study--1960 to 1978.

Figure 1 also shows the impact of increased trade and the effort of the two countries to cement their special relationship by signing the historic 1974 Joint Economic Commission. This resulted in a sharp increase in the level of cooperation between the two countries, to the highest level recorded during the period of this study. The relationship from 1975 to 1978 exhibited a fluctuation in the level of conflict and cooperation related to issues of arms sales and the Camp David Accord.

Saudi-United States Bilateral Interdependence

This discussion is presented in order to compare with the graphical display (Appendix C) of Saudi-United States bilateral interdependence and its consequences in terms of conflict and cooperation between the two countries from 1960 to 1978.

Saudi-Egyptian relations in the late 1950s and early 1960s were a major impediment to United States-Saudi relations. The rise in the level of conflict from 1960 to 1962 is illustrated in Figures 5 and 6. Following the renewal of the Dhahran Air Base Agreement in 1957, United States-Saudi relations were criticized by radical Arab states. This made the airfield agreement an increasing liability to the Saudis, and in 1962, Saudi Arabia cancelled the agreement.

In spite of increased United States-Saudi tensions, the Saudis continued to seek United States arms. In 1963, Saudi Arabia and the United States signed a contract for a national air defense system worth more than $300 million. Figures 3, 16, 17, and 18 show the increasing level of cooperation between the two countries. Although rapidly expanding Saudi military programs created additional problems in the negotiation and implementation of United States military sales, agreements between the two countries in 1965 alone totaled $342 million (Long, 1985, p. 43). These increasingly important military transfers resulted in

heightened sensitivity to price increases, delivery delays, and specification compliance. For example, Figures 1 and 5 show the 1967 Six Day War with a sharp increase in the level of conflict. It became a turning point in the security position of Saudi Arabia as well as in its relations with the United States. Between the years 1968 and 1972, the two countries experienced a stable but tense relationship and low cooperation level as indicated by Figures 2 and 6.

The continuing stalemate in the Arab-Israeli conflict became a major roadblock to stable Saudi-American relations. The 1973 war put Saudi Arabia in direct conflict with the United States and compelled Saudi Arabia to impose an oil embargo on the United States. Figures 1 and 5, when compared with Figures 14 and 15, show clearly the impact of the war and the oil embargo on the level of conflict between the two countries. The oil embargo had a profound effect on Saudi-American postwar diplomacy and resulted in an unanticipated chain reaction which led to quadrupled oil prices as illustrated by Figure 15. The world economy was adversely affected, as a result, and a revolutionary transformation in Saudi Arabia's domestic, regional, and international political-strategic position developed. The aftermath of the embargo also resulted in a marked transformation in the character and scope of Saudi-American relationships. The two countries began to exhibit a much more complex relationship of interdependence involving shared and

divergent interests. Thus, the potential developed for adversarial bargaining as well as agreement, and antagonism as well as cooperation. Figures 7, 8, and 9 show that the relationship exhibited an increase in the level of interdependence as indicated by the measure of interdependence in the six specified models for Saudi Arabia and the United States. The relationship also exhibited generally increased cooperation as well as sporadic tensions related to arms transfer and increased oil prices. Examination of the bilateral relation shows that the United States needed Saudi cooperation in controlling the supply and price of oil and the recycling of petroleum dollars. Saudi Arabia, in turn, needed continued American support for security and additional assistance in the development and execution of plans for economic stability. The translation of interdependence, however, involved attempts by both countries to obtain the most advantageous terms. For instance, while using its pivotal position in OPEC to restrain price increases, Saudi Arabia used its power to keep the oil prices which were attained at the peak of the embargo period. Saudi Arabia attempted to use its leverage to secure American technical and military assistance and to influence United States policy toward Israel and third Arab parties.

Relationships between Saudi Arabia and the United States after 1973 were prosperous. The two countries quietly cooperated on economic and military affairs as

illustrated in Figures 10, 11, 12, and 13. The few demands made at the political-strategic level did not create unnecessary difficulties for either country. However, by 1977 and throughout 1978, problems gradually began to build when Saudi Arabia refused to support the Camp David Agreement. Generally, examination of the bilateral relations from 1960 to 1978 shows that the unresolved Arab-Israeli conflict remains a source of strain and tension in the Saudi-American relationship.

In the following section, policy implications of increased interdependence and methods for policy makers to cope with it are discussed.

Policy Implications: Coping with Saudi-United States Interdependence

The findings of this study pertain not only to theory but to policy as well. "Policy is based on (often implicit) theoretical assumptions" (Keohane and Nye, 1977, p. 216). Although this study does not purport to provide a prescription for policy, it does reveal that on the basis of the findings of the Saudi and United States models, as well as the graphical presentation, more attention should be given to the effect of governmental policies on the two countries because bilateral relations between countries differ in such dimensions as cultural apparatus, level of economic development, and the intensity of transactions. Cooperative interaction in foreign policy of two countries toward each

other on issues involving bilateral interdependence from trade to arms transfer is likely only when there exists an understanding of interdependence and its consequences in terms of conflict and cooperation as demonstrated in the models developed in this study.

For example, Keohane and Nye (1977) suggest that United States policy makers should give consideration to (1) resisting the impulse to act immediately and unilaterally; (2) giving more attention to domestic politics; (3) focusing on long-term, systemic interests; and (4) paying attention to international linkages present in bargaining situations (pp. 236-237).

It is obviously impossible for states to participate in international relations as a self-contained and sealed unit. States realize and appreciate the constraints and demands imposed by interdependence and the linkage between domestic and international issues. Policy makers should adapt to increasing interdependence by paying attention to the characteristics that are likely to affect a country's foreign policy-making.

Since the 1970s Saudi Arabia has assumed an increasingly significant role in regional and world affairs because of its geographical location, its control over key deposits of oil, and its petrodollar surpluses. Its considerable oil reserves and production capabilities give it an influence which is out of proportion to its small population base and

military capacity. Its political leverage in international affairs stems primarily from economic factors. The United States and Saudi Arabia have established a special relationship through United States oil companies in the development of Saudi petroleum resources. This relationship has been fostered by mutual government assistance and cooperation. It has become apparent that the preservation and enhancement of this relationship could provide a basis for resolving political, security, economic, and energy issues facing both countries.

The models developed for both countries show the importance of trade between the two countries as a basic policy instrument that can be utilized by the United States and Saudi Arabia in promoting their bilateral relations. Trade in terms of oil, arms, goods, and services are interrelated and can be used to achieve stable and mutually beneficial relations which require coordination and consistency between the two countries. For example, the three Saudi models show consistently the importance and impact of Saudi exports on the relationship between Saudi Arabia and the United States as indicated by the interdependence measure, Saudi total exports to United States/Saudi total foreign exports (SAEUW). And the three United States models show the cooperative impact of United States trade not only with Saudi Arabia but also with the rest of the world. The interdependence measure, United States total arms exports to

Saudi Arabia/United States total arms exports(USASW) in the third United States model shows the sensitivity associated with arms trade and its potential as a major source of tension in the Saudi-United States bilateral relations.

Some specific implications for Saudi and United States policies include:

1. The analysis of the three Saudi models which show the cooperative impact of Saudi exports (SAEUW) on the relationship between the two countries, indicates clearly the need for United States policy makers to take into account that the facilitation of implementing Saudi development plans will ensure the Saudi cooperative behavior in maintaining a stable flow of its petroleum not only to the United States but also to the Western allies. This interest can also be advanced if Saudi Arabia has a similar interest in maintaining imports of goods and labor as part of the implementation of its development plans. Industrialization will help to integrate Saudi Arabia into the world economy and will also create a concern for the stability of the existing international economic institution.

2. With the cooperative and conflictive consequences of increased interdependence worldwide in general and between Saudi Arabia and the United States in particular (as it is shown in the findings of the six specified models for each country), Saudi and United States economic welfare is increasingly determined not only by bilateral developments

but also by development abroad. Thus, each country has an interest in the economic policies of the other. For this reason, institutions for international consultation and collaboration to meet common economic problems are essential (an example is the United States-Saudi Joint Economic Commission established in 1974).

3. The United States has an increasingly large number of ties with Saudi Arabia. However, Western Europe and Japan are larger markets for Saudi oil exports than the United States. In part, United States interest in Saudi Arabia results from the greater dependence of United States allies on Saudi exports. That is because the United States serves the collective security interests of industrialized countries. The United States cannot remain unaffected by developments which reduce the security and adequacy of supply to its allies.

4. Because of the importance of exports from Saudi Arabia as indicated by the interdependence measure SAEUW in the three Saudi models, a move by a third power to interrupt them would be a major threat to the United States and its allies. A United States commitment to the defense of Saudi Arabia and to the political stability in the region must constitute one of the most vital and enduring interests of the United States.

CHAPTER VII

CONCLUSIONS

In this chapter, conclusions, contributions, limitations, and directions for future research are addressed.

The Purpose of the Study

The purpose of this study was to identify and assess how increased bilateral interdependence between Saudi Arabia and the United States from 1960 to 1978 relates to the concepts of cooperation and conflict.

The decision to study the bilateral interdependence between an industrialized and developed country and a Third World developing country was encouraged by the desire to fill the gap in interdependence research. Previous research on interdependence focused primarily on interdependence between Western industrialized countries. Keohane and Nye (1977) indicate the need for studies that examine the effects, for example, of cultural distance and different levels of economic development. An additional impetus was the need for more systematic research designed to evaluate the consequences of bilateral interdependence. A final reason for the study was the lack of theoretical frameworks for Saudi-United States bilateral studies on the impact and

implications of interdependence for international politics and foreign policy.

Major Findings and Implications

Two schools of thought were utilized to examine this relationship. The first shows interdependence contributing to greater cooperation and hence less conflict between the countries involved. See, for example: Angell (1969), Gasiorowski and Polachek (1982), Haas and Schmitter (1966), Keohane and Nye (1977), Nye (1971), Polachek (1978, 1980), Rosecrance et al. (1977), Spiro (1974), and Young (1969). The second school advocates that interdependence contributes to greater conflict between the countries involved. See, for example: Bergsten, Keohane, and Nye (1975), Gasiorowski (1986), Hirschman (1945), Keohane (1975), Keohane and Nye (1973), Knorr (1977), and Van Dyke (1966). This study examines both relationships in terms of covariance rather than causality, as well as the relative strength of the association and positive or negative covariance of the concepts.

The primary conclusion of this study is that increased bilateral interdependence between Saudi Arabia and the United States from 1960 to 1978 produced increased cooperation as well as conflict in varying degrees. This conclusion is based upon (1) the positive relationship found between the dependent variable, cooperation, and the

following interdependence measures: the ratio of Saudi total exports to United States/Saudi total foreign exports (SAEUW), the ratio of United States total foreign trade/GNP (USTGP), the ratio of United States total exports to Saudi Arabia/United States total exports (USESW), the ratio of United States oil import prices from Saudi Arabia/United States oil import prices (USOPW), and Saudi total money supply (SATMS), and (2) the positive relationship found between the dependent variable, conflict, and the following interdependence measure: the ratio of United States total arms exports to Saudi Arabia/United States total foreign arms exports (USASW), the ratio of United States total imports from Saudi Arabia/United States total imports (USISW), Saudi total imports from United States (SAIUS), and United States total money supply (SATMS).

Since Saudi Arabia and the United States have never engaged in armed conflict, the conflict data used in this study measure a broad spectrum of conflictive behavior including armed conflict. The conclusion does not imply that bilateral interdependence between the two countries leads to increased violence or armed conflict, but that bilateral interdependence between Saudi Arabia and the United States is associated with increased cooperation and increased bilateral tension related to arms transfer from 1960 to 1978.

These findings facilitate an understanding of how bilateral cooperation and conflict can be increased or reduced between the two countries. These results have important implications by illustrating how policy makers can manipulate issues such as trade and arms transfer to gain increased cooperation from other actors in the international arena.

Results of this study support those of Gasiorowski and Polachek (1982), who point out that increased interdependence is associated with decreased conflict due to the fact that incentives to reduce hostilities result when one country is particularly sensitive or vulnerable to another's actions. Such incentives are the result of a country's desire to decrease threats created by sensitivities and vulnerabilities that can interfere with anticipated benefits of interaction (p. 711). Despite the sensitivities and vulnerabilities that may accompany it, international trade is frequently associated with improved relations between countries.

Contributions of the Study

The first contribution of this study is the empirical investigation of measures hypothesized to be associated with the changing levels of interdependence on conflict and cooperation. A second contribution is the examination of bilateral interdependent relations; not between two

industrialized and developed countries, but between two countries with different levels of economic and political developments. A third contribution is the development of three scales to interpret the predicted values of the dependent variables (cooperation and conflict).

The analytical techniques employed, which have been lacking in previous studies, provide a solid base for further studies of Saudi-United States bilateral relations. Specifically, this study makes the following contributions to the study of interdependence:

1. Theoretical contributions.

The development of theoretically-based models, by which the impact of interdependence on international politics and foreign policy is examined, provides the needed theoretical and conceptual foundations for policy-makers and international relations scholars. A study by Gasiorowski (1986) points out a lack of comparative analyses of the impact of interdependence on international politics (p. 23). Smith (in Jones and Willett, 1984) contends that the emergence of interdependence has a significant effect upon the formulation and conduct of foreign policy, thus having powerful implications for its study and analysis (pp. 65-80). Previous studies had a tendency to focus on the problems interdependence creates for domestic and foreign policy-making as well as whether it is increasing or declining (see

Cooper, 1968, 1972; Katzenstein, 1975; Morse, 1972; Rosecrance and Stein, 1973).

The three scales developed to interpret the predicted values of the dependent variables in the models developed in this study offer a way to measure the magnitude, rank, and intensity of conflictive and cooperative behavior in bilateral relationships. The usefulness of the scales is not limited to this study, rather they can be utilized by similar studies for similar purposes.

2. Empirical contributions.

The empirical contributions of this study are related to the determination that the independent variables (SAEUW, USTGP, USASW, USOPW, USESW, USISW, USTMS, SAIUS, and SATMS) are statistically significant and seem to offer the best explanation, compared with the other variables used in the study.

The analysis of the models developed in this study reveals that Saudi-United States bilateral relations exhibit an increase in the level of interdependence as indicated by the following interdependence measures. The ratio of Saudi total exports to United States/Saudi total foreign exports (SAEUW), the ratio of United States total foreign trade/GNP (USTGP), the ratio of United States total exports to Saudi Arabia/United States total exports (USESW), the ratio of United States oil import prices from Saudi Arabia/United States oil import rpices (USOPW), the ratio of United States

total imports from Saudi Arabia/United States total imports (USISW), Saudi total imports from United States (SAIUS), United States total money supply (USTMS), the ratio of United States total arms exports to Saudi Arabia/United States total foreign arms exports (USASW) and Saudi total money supply (SATMS).

In terms of conflict and cooperation, the analysis also shows, that: (1) the ratio of Saudi total exports to United States/Saudi total foreign exports (SAEUW) is positively related to cooperation and inversely related to conflict; (2) the ratio of United States total foreign trade/GNP (USTGP) is positively related to cooperation and inversely related to conflict; (3) the ratio of United States total exports to Saudi Arabia/United States total exports (USESW) is inversely related to conflict; and (4) the ratio of United States oil import prices from Saudi Arabia/United States oil import prices (USOPW) is positively related to cooperation and inversely related to conflict; (5) Saudi total money supply (SATMS) is positively related to cooperation; (6) the ratio of United States total arms exports to Saudi Arabia/United States total foreign arms exports (USASW) is positively related to conflict; (7) the ratio of United States total imports from Saudi Arabia/United States total imports (USISW) is positively related to conflict and inversely related to cooperation; (8) United States total money supply (USTMS) is positively related to conflict and

inversely related to cooperation; and (9) Saudi total imports from United States (SAIUS) is inversely related to cooperation.

3. Methodological contributions.

The use of events data (COPDAB) and various interdependence measures identified in the literature to construct regression models in order to test the association between bilateral interdependence and bilateral conflict and cooperation between Saudi Arabia and the United States had never been attempted, either in interdependence research or Saudi bilateral studies. (See Chapters IV and V for discussion of the usefulness of regression technique as a tool used in the social sciences.) Based on the study's analytical process and findings, it is possible to determine the usefulness of simple and multiple regression models in accounting for change in the Saudi-American dyadic behavior. This is perhaps the first step toward further analysis in this direction, using additional observations to facilitate the use of multiple regression models to reflect and depict reality and to forecast the direction of the relationship with greater precision.

Limitations of the Study

This study was subject to the following limitations:

1. Data-related limitations:

A. The availability of data such as the short- and long-term capital flows and arms transfer data was a problem. It forced the elimination of an important variable--capital flows.

B. There was not a single reliable source for all the needed data. As a result, data were collected from many different sources which sometimes resulted in conflictive and inconsistent figures. To overcome this problem, a concerted effort was made to collect data from the most reliable and consistent sources such as the International Monetary Fund, the Saudi Arabian Monetary Agency and the World Military Expenditures and Arms Trade Annual.

C. The number of data observations from 1960 through 1978 was limited to 19 observations. This limitation was imposed by the data bank utilized. The Conflict and Peace Data Bank (COPDAB) project covers only the years from 1948 to 1978.

An attempt was made to include as many observations as possible starting from 1948 to 1978, but it was found that genuine activities pertaining to the bilateral relations between Saudi Arabia and the United States other than political recognitions, low level contacts, and sporadic correspondence did not start until 1960. Even though the

study focus was limited to the period from 1960 through 1978, difficulty was experienced in finding needed data for the early 1960s, which resulted in estimations being made for some variables.

2. Methodological limitations:

Two or more independent variables used in the regression model often contribute redundant information. This is because the independent variables are correlated. In practice, it is not uncommon to observe correlations among independent variables. However, when serious multicollinearity exists in the regression analysis: (1) high correlation among the independent variables increases the likelihood of rounding errors in the calculation of the β estimates, standard errors, and so forth, and (2) multicollinearity can also affect the signs of the parameter estimates. That is, a value of β may have the opposite sign from what is expected. It is dangerous to interpret a β coefficient when the independent variables are correlated. Because the variables contribute redundant information, a cause-and-effect relationship cannot be established between Y and the predictor variables based on observational data. The problem of multicollinearity is fully addressed in Chapter V.

Directions for Future Research

Based on the results of this research, several areas have been identified which warrant further research. Specific research directions in each of these areas are outlined below, and indicate how the results of this study can be used as a basis for future research.

1. Various models of bilateral interdependence were developed, but only economic interdependence was investigated. Sufficient opportunities exist for the investigation of other issues in interdependence as well as the inclusion of additional measures of interdependence focusing on areas such as political and societal interdependence.

2. Further research is needed at both the bilateral and systemic levels to test propositions advanced by the interdependence approach, particularly those pertaining to the consequences of interdependence.

3. New measures of interdependence need to be devised and existing ones need more precise identification. There is a need to identify the levels and conditions of their usage.

4. Studying the consequences of interdependence should not be limited to international politics, rather, it should include foreign policy with the same precision used when studying the consequences of interdependence on international politics.

APPENDIX A

TRADE AND FINANCIAL DATA SOURCES

Balance of Payment Year Book. 1960-1986. Washington International Monetary Fund.

Business International Corporation. 1982-1985. Annual Comparative Statistics. World Wide Economic Indicators. New York: Business International Corporation.

Direction of Trade Statistics Yearbook. 1960-1986. Washington: International Monetary Fund.

The Europa Yearbook. 1986. London: Europa Publication, Ltd.

Geographical Distribution of Financial Flows to Developing Countries. 1977. Paris: Organization for Economic Cooperation and Development.

International Financial Statistics Yearbook. 1979-1986. Washington: International Monetary Fund.

Ministry of Petroleum and Mineral Resources. 1979. Petroleum Statistical Bulletin. Riyah: Economics Department, Kingdom of Saudia Arabia.

National Accounts Statistics: Main Aggregates and Detailed Tables. 1970-1986. New York: United Nations.

OPEC Annual Report. 1970-1985. Vienna: Public Relations Department, Organization of Petroleum Exporting Countries.

Paxton, John, ed. 1966. Statesman's Yearbook. 1960-1986. New York: St. Martin's Press.

Saudi Arabian Monetary Agency. 1380-1405 A.H. Annual Reports. Riyadh. Saudi Arabian Monetary Agency.

Statistical Abstracts of the United States. 1960-1985. Washington: Government Printing Office.

United Nations Statistical Yearbook, 1983-1984. 1983-1984. New York: United Nations Department of International Economic and Social Affairs.

United Nations Yearbook of International Trade Statistics. 1959-1986. New York: United Nations.

United States Department of Commerce. 1972-1981. U.S. Foreign Trade Annual. Washington: U.S. Government Printing Office.

United States Department of Commerce. 1960-1985. U.S. Foreign Trade Highlights. Washington: U.S. Government Printing Office.

United States Department of Commerce. 1972-1980. United States Trade with Major Trading Partners. Washington: U.S. Government Printing Office.

United States Department of Defense. 1978-1986. Security Assistance Agency: Foreign Military Sales, Foreign Military Construction Sales and Military Assistance Facts. Washington: U.S. Government Printing Office.

United States Department of Energy. 1979-1985. International Energy Annual. Washington: U.S. Government Printing Office.

United States Department of State. 1973-1986. Foreign Economic Trends and Their Implications for the United States. Washington: U.S. Government Printing Office.

United States Department of State. 1977-1978. The Planetary Product. Special Report No. 58. Washington: U.S. Government Printing Office.

United States Department of State. May 1986. Post Report: Saudi Arabia. Washington: U.S. Government Printing Office.

World Atlas. 1977, 1978. Washington: The World Bank.

World Development Report. 1980-1985. London: Oxford University Press.

The World Bank. World Tables. 1976-1983. Baltimore: Johns Hopkins University Press.

World Military Expenditures and Arms Trade Annual. 1963-1985. Washington: United States Arms Control and Disarmament Agency.

APPENDIX B

TABLES

TABLE 23

THE AZAR-SLOAN SCALE FOR INTER-NATION EVENTS

The scale used to measure interactions between nations is the Azar-Sloan Scale for inter-nation events. The scale values range from 1 to 15, where 1 represents the most cooperative event and 15 represents the most conflictive event. The value 8 is taken as the neutral point.

Weights were assigned to each scale value as a measure of the intensity of the act in relation to the neutral point which was assigned an arbitrary value of 1. The following is the weighted scale values.

Scale Point	Weighted Value	Exemplary Event
15	102	Nation A initiates or engages in very hostile war actions against Nation B and occupies territory of the latter + causes many deaths and dislocations + captures enemy soldiers.
14	65	Nation A engages in limited hostile acts against Nation B; bombards military units or hits territory of B; minor costs to B
13	50	Nation A engages in subversion against Nation B; they engage in small clashes (air or border) and police acts, skirmishes or blockades.
12	44	Nation A breaks up diplomatic relations with B; A incites riots or rebellion in B (either through aid to rebels or radio war); terrorists or demonstrators in A bomb B's property, nationalize B's companies.
11	29	Nation A increases its military capabilities and politico-economic resources to counter Nation B's actions or the latter's contemplated actions; A places sanctions on B or hinders B's movement in water ways or on land and attempts to cause economic problems for B.
10	16	Nation A engages in verbal threats, warnings, demands and accusations against B; verbal, hostile behavior (to imply major dissatisfaction with B).
09	6	Nation A expresses mild disaffection toward B's policies, objectives, goals, behavior with A's government objection to these protestations; A's communique or note dissatisfied with B's policies in third party.

TABLE 23—Continued

Scale Point	Weighted Value	Exemplary Event
08	1	Nations A and B demonstrate indifference to each other's policies, moves, actions or make no comment-type statement toward one another (an act among sub-groups not aimed at government); non-governmental visitors.
07	6	Nations A and B communicate, meet or propose talks regarding problems of mutual interest; A's officials visit B; there are public supports in A toward B (with officials or A favoring such support); issue joint communiques; appoint ambassador (routine).
06	10	Nation A supports B's policies, recognizes B's regime, etc., or solicits support of B against a third party.
05	14	Nation A establishes friendship, cultural, or similar limited agreements with B; start of diplomatic relations; head of state of A visits or meets B; A thanks B for aid.
04	27	Nation A extends economic aid to B; draws up economic pacts; gives assistance and famine relief; industrial and economic assistance to B.
03	21	Nation A extends military aid to B; military technical assistance to strengthen B; gives B facilities and special privileges.
02	47	Nations A and B establish international or dyadic alliance; economic market; joint military command and maneuvers.
01	92	Nations A and B unite voluntarily into one nation-state.

Source: Azar, Edward E., and Thomas J. Sloan. 1976. Dimensions of Interaction (ICPSR7426), 1st ed. Ann Arbor, Michigan: Inter-University Consortium for Political and Social Research.

TABLE 24

DEPENDENT AND INDEPENDENT VARIABLES USED IN THE STUDY

The Dependent Variables	Saudi Arabia (S.A.)	The United States (U.S.)
Net weighted conflict measure	S.A. Actor/U.S. Target	U.S. Actor/S.A. Target
Weighted cooperation measure	S.A. Actor/U.S. Target	U.S. Actor/S.A. Target
Weighted conflict measure	S.A. Actor/U.S. Target	U.S. Actor/S.A. Target
*The independent variables (1) National Characteristics Variables	S.A.	U.S.
Population	Millions	Millions
GNP	Million U.S. $	Billions U.S. $
GDP	Million U.S. $	Billion U.S. $
Consumer prices	Index 1980 = 100	Index 1980 = 100
Oil	S.A. oil prod. index 1980 = 100 S.A. oil exp. vol. index = 100 S.A. oil exp. prices index = 100 S.A. oil prod. - millions of bar. S.A. oil revenue	U.S. total oil imports from the world - millions of barrels U.S. oil import prices from the world - million U.S. $
Arms	S.A. total arms imports from the world - million U.S. $ S.A. military expenditures - million U.S. $	U.S. total arms exports to the world - million U.S. $

TABLE 24--Continued

Independent Variables	S.A.	U.S.
Trade:		
1. Dollars Value of Trade	Total foreign trade with the world (exports & imports) million U.S. $	Total foreign trade with the world (exports & imports) million U.S. $
	Total exports to the world - million U.S. $	Total exports to the world - million U.S. $
	Total imports from the world - million U.S. $	Total imports from the world - million U.S. $
2. Trade ratios		
GNP	Total foreign trade/GNP	Total foreign trade/GNP
	Total exports/GNP	Total exports/GNP
	Total imports/GNP	Total imports/GNP
GDP	Total foreign trade/GDP	Total foreign trade/GDP
	Total exports/GDP	Total exports/GDP
	Total imports /GDP	Total imports/GDP
Money supply	Money - million U.S. $	Money - million U.S. $
	Reserve Money - million U.S. $	Reserve money - million U.S. $
(2) Dyadic Characteristics Variables	S.A.	U.S.
Oil	S.A. oil exports to U.S. - million barrels	U.S. oil imports from S.A. - million barrels
		U.S. oil import prices from S.A. - million U.S. $

TABLE 24—Continued

The independent variables	S.A.	U.S.
Arms	S.A. arms imports from U.S.- thousands U.S. $	U.S. arms exports to S.A. - thousands U.S. $
Bilateral trade		
1. Dollars value of trade	Total trade with U.S. (exports & imports) million U.S. $ Total exports to U.S. - million U.S. $ Total imports from U.S. - million U.S. $	Total trade with S.A. (exports & imports) million U.S. $ Total exports to S.A. - million U.S. $ Total imports from S.A. - million U.S. $
2. Trade Ratios		
GNP	Total trade with U.S./GNP Total exports to U.S./GNP Total imports from U.S./GNP	Total trade with S.A./GNP Total exports to S.A./GNP Total imports from S.A./GNP
GDP	Total trade with U.S./GDP Total exports to U.S./GDP Total imports from U.S./GDP	Total trade with S.A./GDP Total exports to S.A./GDP Total imports from S.A./GDP
Percentage ratios	S.A. oil exports to U.S./S.A. oil production	U.S. oil imports from S.A./U.S. total oil imports from the world
	S.A. arms imports from U.S./S.A. total arms imports from the world	U.S. oil import prices from S.A./ U.S. oil import prices from the world

TABLE 24--Continued

The independent variables	S.A.	U.S.
	S.A. imports from U.S./S.A. to total imports from the world	U.S. arms exports to S.A./U.S. total arms exports to the world
		U.S. exports to S.A./U.S. total exports to the world
		U.S. imports from S.A.U.S. total imports from the world

TABLE 25

THE SAUDI DATA SOURCES

Variables	Sources
The net weighted conflict Measure The weighted cooperation Measure The weighted conflict Measure	*Azar (1982) and Azar and Sloan (1976) *COPDAB data bank 1960-1978
S.A. Population S.A. GNP S.A. GDP	*Saudi Arabian Monetary Agency (SAMA), Annual report (various years 1960-1980) *IMF Tapes and Yearbooks, International Financial Statistics and Balance of Payments Yearbook
S.A. total exports to world S.A. total imports from the world S.A. exports to U.S. S.A. imports from U.S. Foreign	*SAMA Annual Report (various the years 1960-1980) *IMF Tapes and Yearbooks,Direction of Trade and International Financial Statistics *U.S. Dept. of Commerce; U.S. Trade Annual; Foreign Trade Highlights; U.S. Trade with Major Trading Partners (various years 1960-1980)
S.A. Consumer price index	IMF, International Financial Statistics Yearbook (various years 1960-1980)
S.A. oil production index S.A. oil exports volume index S.A. oil export prices index S.A. oil production S.A. oil revenue S.A. oil exports to U.S.	*IMF Tapes and Yearbooks, International Financial Statistics Yearbooks (various years 1960-1986) *Statistical Abstract of the United States (various years 1960-1986) *U.S. Dept. of Energy, International Energy Annual (various years 1979-1980)

TABLE 25--Continued

Variables	Sources
	*OPEC Annual Report (various years 1970-1985) *SAMA Annual Report (various years 1960-1980) *Petroleum Statistical Bulletin - Ministry of Petroleum and Mineral Resources 1979 Kingdom of Saudi Arabia
S.A. total money supply	*UN Statistical Yearbook (various years 1970-1980)
S.A. Arms expenditures S.A. Arms imports from the world S.A. Arms imports from U.S.	*World Military Expenditure and Arms Trade Annual; U.S. Arms Control & Disarmament Agency (ACDA) (various years 1963-1986) *U.S. Dept. of Defense, Security Assistance Agency, Foreign Military Sales, Foreign Military Construction Sales and Military Assistance Facts (various years 1978-1986) *For the variable S.A. arms imports from U.S., figures from 1960-1971 were estimated on the basis of cumulative figures given by ACDA under "values of arms transfer by major supplier and recipient" in various editions (1963-1985) as well as from U.S. Dept. of Defense, foreign military sales facts in various years (1960-1986) from cumulative figures given for military sales only from 1950-1973. *Figures for the variable S.A. arms imports from U.S., from 1972-1978 represent actual U.S. foreign military sales to Saudi Arabia supplied both by ACDA and the Dept. of Defense. These figures do not include foreign

TABLE 25--Continued

Variables	Sources
	military construction sales, only foreign military sales are included. U.S. Dept. of Defense Security Assistance Agency, Foreign Military Sales, Foreign Military Construction Sales and Military Assistance Facts (various years 1978-1986) *ACDA figures naturally do not include construction sales but the Dept. of Defense foreign military sales facts prior to 1981 used to combine foreign military sales and foreign military construction sales in one table.

TABLE 26

UNITED STATES DATA SOURCES

Variables	Sources
The net weighted conflict measure The weighted cooperation measure The weighted conflict measure	*Azar (1982) and Azar and Sloan (1976) *COPDAB data bank 1960-1978
U.S. population, U.S. GNP and U.S. GDP	*IMF: International Financial Statistics Yearbook and Balance of Payments Yearbook (various years 1960-1980) *Statistical Abstract of the United States (various years (1960-1980)
U.S. total exports to the world U.S. total imports from the world U.S. exports to Saudi Arabia U.S. imports from Saudi Arabia	*IMF Tapes and Yearbook, Direction of Trade, Balance of Payments & INternational Financial Statistics, Various years (1960-1980) *U.S. Dept. of Commerce; U.S. Foreign Trade Annual; Foreign Trade Highlights; U.S. Trade with Major Trading Partners (various years 1960-1080)
U.S. Consumer price index	*IMF International Financial Statistics Yearbook (various years 1970-1986)
U.S. oil imports from the world U.S. oil import prices from the world U.S. oil import from Saudi Arabia U.S. oil import prices from Saudi Arabia	*IMF International Financial Statistics Yearbook (various years 1970-1986) *Statistical Abstract of the United States (various years 1960-1986) *U.S. Dept. of Energy, International Energy Annual (various years 1979-1980) *OPEC Annual Report (various years 1970-1985)

TABLE 26--Continued

Variables	Sources
U.S. total money supply Money and reserve money	*UN Statistical Yearbook (various years 1970-1980)
U.S. total arms exports to the world U.S. arms exports to Saudi Arabia	*World Military Expenditure and Arms Trade Annual; (various years 1963-1986) *U.S. Dept. of Defense, Security Assistance Agency, Foreign Military Sales, Foreign Military Construction Sales and Military Assistance Facts (various years 1978-1986) For the variables U.S. arms exports to S.A., figures from 1960-1971 were estimated on the basis of cumulative figures given by ACDA under "values of arms transfer by major supplier and recipient" in various editions (1963-1985) as well as from U.S. Dept. of Defense, foreign military sales facts in various years (1960-1986) from cumulative figures given for military sales only from 1950-1973. Figures for the variable U.S. arms exports to S.A. from 1972-1978 represent actual U.S. foreign military sales to Saudi Arabia supplied both by ACDA and the Dept. of Defense. These figures do not include foreign military construction sales, only foreign military sales are included. ACDA figures naturally do not include construction sales, but the Dept. of Defense Foreign military sales facts annual prior to 1981 used to combine foreign military sales and foreign military construction sales in one table.

TABLE 27

DATA SET: SAUDI ARABIA

*SANWC	Net weighted conflict measure--S.A. actor/U.S. target
*USNWC	Net weighted conflict measure--U.S. actor/S.A. target
*SAWCO	Weighted cooperation measure--S.A. actor/U.S. target
*SAWCN	Weighted conflict measure--S.A. actor/U.S. target
SAPOP	S.A. population--million
SAGNP	S.A. GNP--$ million
SAGDP	S.A. GDP—$ million
SAEXP	S.A. total foreign exports--$ million
SAIMP	S.A. total foreign imports--$ million
SAEUS	S.A. total exports to U.S.--$ million
SAIUS	S.A. total imports from U.S.--$ million
SACOP	S.A. consumer prices--index 1980 = 100
SAOPI	S.A. oil production--index 1980 = 100
SAOEV	S.A. oil exports volume--index 1980 = 100
SAOEP	S.A. oil export prices--index 1980 = 100
SAOPR	S.A. oil production--million barrels
SAORE	S.A. oil revenue--$ million
SAMEP	S.A. arms expenditures--$ million
SAMSM	S.A. money supply--money--$ million
SAMRM	S.A. Moneyu supply--reserve money--$ million
SAAIM	S.A. total arms imports from the world--$ million
SAAIU	S.A. total arms imports from U.S.—$ thousands
SAOEU	S.A. total oil exports to U.S.--million barrels
SATMS	S.A. total money supply--$ million
SAFTR	S.A. total foreign trade (exports & imports)--$ million
SATUS	S.A. total trade with U.S. (exports & imports)--$ million
SATGP	S.A. total foreign trade/GNP
SATUP	S.A. total trade with U.S./GNP
SAEGP	S.A. total foreign exports/GNP
SAIGP	S.A. total foreign imports/GNP
SAEUP	S.A. total exports to U.S./GNP
SAIUP	S.A. total imports from U.S./GNP
SATGD	S.A. total foreign trade/GDP
SATUD	S.A. total trade with U.S./GDP
SAEGD	S.A. total foreign exports/GDP
SAIGD	S.A. total foreign imports/GDP
SAEUD	S.A. total exports to U.S./GDP
SAIUD	S.A. Total imports from U.S./GDP
SAAUW	S.A. total arms imports from U.S./S.A. total arms imports
SAEUW	S.A. total exports to U.S./S.A. total foreign exports
SAIUW	S.A. total imports from U.S./S.A. total foreign imports
SAOOP	S.A. total oil exports to U.S./S.A. oil production

*Indicates dependent variables

TABLE 27--Continued

DATA SET: SAUDI ARABIA

OBS	USNWC	SANWC	SAWCO	SAWCN	SAPOP	SAGNP	SAGDP	SAEXP	SAIMP
1	16	60	0	60	4.79	819	1704.9	891	234
2	-32	86	0	86	4.90	876	1794.7	956	261
3	-92	45	34	79	5.02	950	1869.5	1046	308
4	-215	-123	145	22	5.14	1456	1927.3	1119	320
5	-54	-26	26	0	5.27	1638	2070.8	1185	394
6	-178	-143	143	0	5.41	1823	2312.0	1395	506
7	-164	-57	64	7	5.55	2022	2653.1	1650	592
8	-139	76	45	121	5.70	2281	2920.4	1786	574
9	-108	-76	82	6	5.86	2541	3257.1	2026	573
10	-6	0	0	0	6.03	2813	3550.0	2110	750
11	-6	-6	6	0	6.20	3086	3866.4	2424	710
12	-32	29	0	29	6.38	3540	5093.5	3856	818
13	-44	-42	74	32	6.57	4870	6279.3	5492	1136
14	-269	136	170	306	6.76	8010	9474.7	7802	1972
15	-395	-403	485	82	6.97	23510	22883.8	3556	2859
16	-144	-67	89	22	7.25	31580	33801.6	29683	4214
17	-136	22	22	44	7.62	46570	40128.5	38287	8694
18	-215	-188	210	22	8.01	58930	48248.4	43463	14656
19	-106	-126	222	96	8.42	65290	51913.4	40665	20350

SAEUS	SACOP	SAOPI	SAOEV	SAOEP	SAOPR	SAORE	SAMEP	SAMSM
53	25.0	13.3	11.7	5.7	481.3	334	49	204.6
61	26.0	14.9	13.3	5.5	540.7	378	54	215.3
73	27.0	16.6	14.9	5.5	599.7	410	72	240.4
85	28.1	18.0	16.1	5.5	652.0	608	109	290.6
94	28.8	19.2	17.4	5.5	694.3	523	116	305.1
114	29.0	22.2	20.1	5.5	805.0	664	104	332.4
103	29.4	26.2	24.6	5.5	950.0	789	127	382.8
62	30.0	28.3	26.3	5.5	1024.0	904	258	426.4
62	30.5	30.7	28.7	5.5	1114.1	926	165	489.3
43	31.6	32.4	31.7	5.5	1174.0	949	193	516.4
21	31.6	38.3	34.8	5.5	1387.0	1214	190	534.2
105	33.0	48.0	45.3	6.7	1741.0	1885	211	534.2
206	34.5	60.8	58.9	7.2	2202.0	2745	651	839.3
558	40.2	76.5	75.8	9.8	2773.0	4340	1072	1234.8
1888	48.8	85.4	85.6	34.9	3095.1	22574	3182	1689.6
3102	65.6	71.3	71.3	37.5	2582.5	25676	7104	3433.6
5867	86.4	86.6	87.0	40.2	3139.3	30755	9288	5919.7
7100	96.2	92.7	93.0	43.0	3358.0	365401	8952	9038.5
5821	94.7	83.6	83.2	44.1	3030.0	32234	10284	11417.6

TABLE 27--Continued

OBS	SAMRM	SAAIM	SAAIU	SAIUS	SAOEU	SATMS	SAFTR
1	146.8	1.0	759	46	28	351.4	1125
2	152.6	1.2	842	60	26	367.9	1217
3	176.0	3.6	2687	84	27	416.4	1354
4	216.6	5.0	3289	69	39	507.2	1439
5	226.0	7.0	5449	95	48	531.1	1579
6	252.4	27.0	23118	137	48	584.8	1901
7	280.6	25.0	18650	152	46	663.4	2242
8	318.8	47.0	24673	169	30	745.2	2360
9	369.5	80.0	29443	187	19	858.8	2599
10	396.6	80.0	29992	154	13	913.0	2860
11	404.6	30.0	21213	141	15	938.8	3134
12	404.6	20.0	19276	164	42	938.8	4674
13	636.6	100.0	30146	314	75	1475.9	6628
14	1013.0	80.0	64109	442	145	2247.8	9774
15	1348.6	340.0	211385	835	155	3038.2	6415
16	2866.5	250.0	190712	1502	238	6300.1	33897
17	4665.8	625.0	461417	2774	437	10585.5	46981
18	7325.8	1300.0	1066114	3575	506	16364.3	58119
19	10070.5	1500.0	1129185	4370	411	21488.1	61015

SATUS	SATGP	SATUP	SAEGP	SAIGP	SAEUP
99	1.37363	0.120879	1.08791	0.285714	0.064713
121	1.38927	0.138128	1.09132	0.297945	0.069635
157	1.42526	0.165263	1.10105	0.324211	0.076842
154	0.98832	0.105769	0.76854	0.219780	0.058379
189	0.96398	0.115385	0.72344	0.240537	0.057387
251	1.04279	0.137685	0.76522	0.277564	0.062534
255	1.10880	0.126113	0.81602	0.292779	0.050940
231	1.03463	0.101271	0.78299	0.251644	0.027181
249	1.02283	0.097993	0.79732	0.225502	0.024400
197	1.01671	0.070032	0.75009	0.266619	0.015286
162	1.01555	0.052495	0.78548	0.230071	0.006805
269	1.32034	0.075989	1.08927	0.231073	0.029661
520	1.36099	0.106776	1.12772	0.233265	0.042300
1000	1.22022	0.124844	0.97403	0.246192	0.069663
2723	0.27286	0.115823	0.15125	0.121608	0.080306
4604	1.07337	0.145788	0.93993	0.133439	0.098227
8641	1.00883	0.185549	0.822139	0.186687	0.125982
10675	0.98624	0.181147	0.737536	0.248702	0.120482
10191	0.93452	0.156088	0.622837	0.311686	0.089156

TABLE 27—Continued

OBS	SAIUP	SATGD	SAIUD	SAEGD	SAIGD
1	0.0561661	0.65986	0.058068	0.522611	0.137251
2	0.0684932	0.67811	0.067421	0.532680	0.145428
3	0.0884211	0.72426	0.083980	0.559508	0.164750
4	0.0473901	0.74664	0.079905	0.580605	0.166035
5	0.0579976	0.76251	0.091269	0.572243	0.190265
6	0.0751509	0.82223	0.108564	0.603374	0.218858
7	0.0751731	0.84505	0.096114	0.621914	0.223135
8	0.0740903	0.80811	0.079099	0.611560	0.196548
9	0.0735931	0.79795	0.076448	0.622026	0.175923
10	0.0547458	0.80563	0.055493	0.594366	0.211268
11	0.0456902	0.81057	0.041899	0.626940	0.183633
12	0.0463277	0.91764	0.052812	0.757043	0.160597
13	0.0644764	1.05553	0.082812	0.874620	0.180912
14	0.0551810	1.03159	0.105544	0.823456	0.208133
15	0.0355168	0.28033	0.118992	0.155394	0.124936
16	0.0475617	1.00282	0.136207	0.878154	0.124669
17	0.0595662	1.17076	0.215333	0.954110	0.216654
18	0.0606652	1.20458	0.221251	0.900817	0.303761
19	0.0669321	1.17532	0.196308	0.783324	0.391999

SAEUD	SAIUD	SAAUW	SAEUW	SAOOP	SAIUW
0.031087	0.0269811	76.0521	5.9484	5.8176	19.6581
0.033989	0.0334318	70.1667	6.3808	4.8086	22.9885
0.039048	0.0449318	74.6389	6.9790	4.5023	27.2727
0.044103	0.0358014	65.7800	7.5961	5.9816	21.5625
0.045393	0.0458760	77.8429	7.9325	6.9134	24.1117
0.049308	0.0592561	85.6222	8.1720	5.9627	27.0751
0.038823	0.0572915	74.6000	6.2424	4.8421	25.6757
0.021230	0.0578688	52.4957	3.4714	2.9297	29.4425
0.019035	0.0574130	36.8037	3.0602	1.7054	32.6353
0.012113	0.0433803	37.4900	2.0379	1.1073	20.5333
0.005431	0.0364680	70.7100	0.8663	1.0815	19.8592
0.020615	0.0321979	96.3800	2.7230	2.4124	20.0489
0.032806	0.0500056	30.1460	3.7509	3.4060	27.6408
0.058894	0.0466506	80.1362	7.1520	5.2290	22.4138
0.082504	0.0364887	62.1721	53.0934	5.0079	29.2060
0.091771	0.0444358	76.2848	10.4504	9.2159	35.6431
0.146205	0.0691279	73.8267	15.3237	13.9203	31.9071
0.147155	0.0740957	82.0088	16.3357	15.0685	24.3927
0.112129	0.0841787	75.2790	14.3145	13.5644	21.4742

TABLE 28

DATA SET: UNITED STATES

*USNWC Net weighted conflict measure--U.S. actor/S.A. target
*SANWC Net weighted conflict measure--S.A. actor/U.S. target
*USWCO Weighted cooperation measure--U.S. actor/S.A. target
*USWCN Weighted conflict measure--U.S. actor/S.A. target
USPOP U.S. population--million
USGNP U.S. GNP--$ billion
USGDP U.S. GDP--$ billion
USEXP U.S. total foreign exports--$ million
USIMP U.S. total foreign imports--$ million
USESA U.S. exports to S.A.--$ million
USISA U.S. imports from S.A.--$ million
USCOP U.S. consumer prices--index 1980 = 100
USOIM U.S. total oil imports from the world--million barrels
USOIP U.S. oil import prices from the world--$ million
USOIS U.S. oil imports from S.A.--million barrels
USOPS U.S. oil import prices from S.A.--$ million
USAEX U.S. total arms exports to the world--$ million
USAES U.S. arms exports to S.A.--$ thousands
USMSM U.S. money supply--money--$ million
USMRM U.S. money supply-reserve money--$ million
USTMS U.S. total money supply--$ million
USFTR U.S. total foreign trade (exports & imports)--$ million
USTSA U.S. total trade with S.A. (exports & imports)--$ million
USTGP U.S. total foreign trade/GNP
USTSP U.S. total trade with S.A./GNP
USEGP U.S. total foreign exports/GNP
USIGP U.S. total foreign imports/GNP
USESP U.S. total exports to S.A./GNP
USISP U.S. total imports from S.A./GNP
USTGD U.S. total foreign trade/GDP
USTSD U.S. total trade with S.A./GDP
USEGD U.S. total foreign exports/GDP
USIGD U.S. total foreign imports/GDP
USESD U.S. total exports to S.A./GDP
USISD U.S. total imports from S.A./GDP
USASW U.S. total arms exports to S.A./U.S. total foreign arms exports
USESW U.S. total exports to S.A./U.S. total foreign exports
USISW U.S. total imports from S.A./U.S. total foreign imports
USOSW U.S. total oil imports from S.A./U.S. total foreign oil imports
USOPW U.S. oil import prices from S.A./U.S. oil import prices

*Indicates dependent variables

TABLE 28—Continued

DATA SET: UNITED STATES

OBS	USNWC	SANWC	USWCO	USWCN	USPOP	USGNP	USGDP	USEXP
1	16	60	6	22	180.68	506.5	502.9	20601
2	-32	86	32	0	183.69	524.6	520.7	21037
3	-92	45	99	7	186.54	565.0	560.5	21714
4	-215	-123	267	52	189.24	596.7	591.8	23387
5	-54	-26	54	0	191.89	637.7	632.3	26650
6	-178	-143	184	6	194.30	691.1	685.2	27530
7	-164	-57	176	12	196.56	756.0	750.3	30434
8	-139	76	145	6	198.71	799.6	793.7	31640
9	-108	-76	108	0	200.71	873.4	866.7	34667
10	-6	0	6	0	202.66	944.0	937.1	38032
11	-6	-6	6	0	205.05	992.7	985.4	43241
12	-32	29	32	0	207.66	1077.6	1068.5	44156
13	-44	-42	45	1	209.90	1185.9	1175.0	49783
14	-269	136	287	18	211.91	1326.4	1310.4	71404
15	-395	-403	411	16	213.85	1434.2	1414.4	98552
16	-144	-67	144	0	215.97	1549.2	1531.9	108112
17	-136	22	142	6	218.04	1718.0	1697.5	115413
18	-215	-188	244	29	220.24	1918.3	1894.9	121232
19	-106	-126	146	40	222.59	2163.9	2134.3	143766

USIMP	USESA	USCOP	USOIM	USOIP	USOIS	USOPS	USAEX
16381	46	35.9	401	895	28	49	679
15952	60	36.3	412	933	26	56	728
17802	84	36.7	450	1011	27	67	982
18640	69	37.2	455	1024	39	78	1198
20334	95	37.6	483	1080	48	86	1124
23233	137	38.2	502	1120	48	106	1490
27791	152	39.4	496	1115	46	93	1890
28819	169	40.5	470	1067	30	94	2230
35438	187	42.2	526	1184	19	43	2700
38498	154	44.5	569	1298	13	56	3500
42695	141	47.1	535	1260	15	21	3100
48755	164	49.1	671	1687	42	131	3400
59328	314	50.8	897	2369	75	194	4000
74280	442	53.9	1298	4240	145	515	5400
110875	835	59.8	1225	15253	155	1670	5000
105880	1502	65.3	1581	18290	238	2625	4900
132498	2774	69.1	2051	25456	437	5213	5900
160411	3575	73.6	2508	33398	506	6374	6700
186045	4370	79.2	2406	32298	411	5306	6500

TABLE 28—Continued

OBS	USMSM	USMRM	USAES	USISA	USIMS	USFIR	USTSA
1	144.0	50.0	759	53	194.0	36982	99
2	148.9	51.3	842	61	200.2	36989	121
3	152.0	52.8	2687	73	104.8	39516	157
4	157.8	54.7	3289	85	212.5	42027	154
5	164.6	57.7	5449	94	222.3	46984	189
6	173.1	60.5	23118	114	233.6	50763	251
7	178.6	64.4	18650	103	243.0	58225	255
8	191.9	68.2	24673	62	260.1	60459	231
9	203.8	72.8	29443	62	276.6	70105	249
10	216.2	76.0	29992	43	292.2	76530	197
11	226.0	81.0	21213	21	307.0	85936	162
12	222.0	80.0	19276	105	302.0	92911	269
13	262.5	92.2	30146	206	354.7	109111	520
14	276.0	100.0	64109	558	376.0	145684	1000
15	285.0	106.0	211385	1888	391.0	209427	2723
16	298.0	114.0	190712	3102	412.0	213992	4604
17	319.0	119.0	461417	5867	438.0	247911	8641
18	344.0	129.0	1066114	7100	473.0	281643	10675
19	372.0	145.0	1129185	5821	517.0	329811	10191

USTGP	USTSP	USEGP	USIGP	USESP	USISP
73.015	0.19546	40.6732	32.3416	0.09082	0.10464
70.509	0.23065	40.1010	30.4079	0.11437	0.11628
69.940	0.27788	38.4319	31.5080	0.14867	0.12920
70.432	0.25809	39.1939	31.2385	0.11564	0.14245
73.677	0.29638	41.7908	31.8865	0.14897	0.14740
73.452	0.36319	39.8350	33.6174	0.19823	0.16495
77.017	0.33730	40.2566	36.7606	0.20106	0.13624
75.612	0.28889	39.5698	36.0418	0.21136	0.07754
80.267	0.28509	39.6920	40.5748	0.21411	0.07099
81.070	0.20869	40.2881	40.7818	0.16314	0.04555
86.568	0.16319	43.5590	43.0090	0.14204	0.02115
86.220	0.24963	40.9762	45.2441	0.15219	0.09744
92.007	0.43849	41.9791	50.0278	0.26478	0.17371
109.834	0.75392	53.8329	56.0012	0.33323	0.42069
146.024	1.89862	68.7157	77.3079	0.58221	1.31641
138.131	2.97186	69.7857	68.3450	0.96953	2.00232
144.302	5.02969	67.1787	77.1234	1.61467	3.41502
146.819	5.56482	63.1976	83.6214	1.86363	3.70119
152.415	4.70955	66.4384	85.9767	2.01950	2.69005

TABLE 28—Continued

OBS	USTGD	USTSD	USEGD	USIGD	USESD
1	73.537	0.19686	40.9644	32.5731	0.09147
2	71.037	0.23238	40.4014	30.6357	0.11523
3	70.501	0.28011	38.7404	31.7609	0.14987
4	71.016	0.26022	39.5184	31.4971	0.11659
5	74.307	0.29891	42.1477	32.1588	0.15025
6	74.085	0.36632	40.1781	33.9069	0.19994
7	77.602	0.33986	40.5624	37.0399	0.20259
8	76.174	0.29104	39.8639	36.3097	0.21293
9	80.887	0.28730	39.9988	40.8884	0.21576
10	81.667	0.21022	40.5848	41.0821	0.16434
11	87.209	0.16440	43.8817	43.3276	0.14309
12	86.955	0.25175	41.3252	45.6294	0.15349
13	92.860	0.44255	42.3685	50.4919	0.26723
14	111.175	0.76313	54.4902	56.6850	0.33730
15	148.068	1.92520	69.6776	78.3901	0.59036
16	139.691	3.00542	70.5738	69.1168	0.98048
17	146.045	5.09043	67.9900	78.0548	1.63417
18	148.632	5.63354	63.9780	84.6541	1.88664
19	154.529	4.77487	67.3598	87.1691	2.04751

USISD	USASW	USESW	USOSW	USISW	USOPW
0.10539	0.1118	0.22329	6.9825	0.32355	5.4749
0.11715	0.1157	0.28521	6.3107	0.38240	6.0021
0.13024	0.2736	0.38685	6.0000	0.41007	6.6271
0.14363	0.2745	0.29504	8.5714	0.45601	7.6172
0.14866	0.4848	0.35647	9.9379	0.46228	7.9630
0.16637	1.5515	0.49764	9.5618	0.49068	9.4643
0.13728	0.9868	0.49944	9.2742	0.37062	8.3408
0.07812	1.1064	0.53413	6.3830	0.21514	8.8097
0.07154	1.0905	0.53942	3.6122	0.17495	3.6318
0.04589	0.8569	0.40492	2.2847	0.11169	4.3143
0.02131	0.6843	0.32608	2.8037	0.04919	1.6667
0.09827	0.5669	0.37141	6.2593	0.21536	7.7653
0.17532	0.7536	0.63074	8.3612	0.34722	8.1891
0.42582	1.1872	0.61901	11.1710	0.75121	12.1462
1.33484	4.2277	0.84727	12.6531	1.70282	10.9487
2.02494	3.8921	1.38930	15.0538	2.92973	14.3521
3.45626	7.8206	2.40354	21.3067	4.42799	20.4785
3.74690	15.9121	2.94889	20.1754	4.42613	19.0850
2.72736	17.3721	3.03966	17.0823	3.12881	16.4283

TABLE 29

THE NET WEIGHTED CONFLICT SCALE
FOR DYADIC RELATIONS

	Most	450	Conflictive
High conflict		400	9
300 - 450		350	8
		300	7
Medium conflict		250	6
150 - 299		200	5 Regions 1-9*
		150	4
Low conflict		100	3
0 - 149		50	2
			1
	Neutral	0	Point
Low cooperation		-50	1
0 - -149		-100	2
		-150	3
Medium cooperation		-200	4 Regions 1-9*
- 150 - -299		-250	5
		-300	6
High cooperation		-350	7
-300 - -450		-400	8
	Most	-450	9 Cooperative

*Indicates the intensity of the behavior

TABLE 30

THE WEIGHTED COOPERATION SCALE: THE MAGNITUDE OF COOPERATIVE DYADIC RELATIONS

	Least	0	Cooperative	
Low cooperation 0 - 149		50	1	
		100	2	
		150	3	
Medium 150 - 299		200	4	Regions 1-9*
		250	5	
		300	6	
High cooperation 300 - 450		350	7	
		400	8	
	Most	450	9 Cooperative	

*Indicates the intensity of the behavior

TABLE 31

THE WEIGHTED CONFLICT SCALE: THE MAGNITUDE OF CONFLICTIVE DYADIC RELATIONS

	Most	450	Conflictive	
		400	9	
High conflict 300 - 450		350	8	
		300	7	
		250	6	
Medium conflict 150 - 299		200	5	Regions 1-9*
		150	4	
		100	3	
Low conflict 0 - 149		50	2	
	Least	0	1	Conflictive

*Indicates the intensity of the behavior

APPENDIX C

GRAPHICAL DISPLAY OF SAUDI-U.S. INTERDEPENDENCE AND ITS CONSEQUENCES IN TERMS OF CONFLICT AND COOPERATION

Figure 1

Net Weighted Conflict Measure
SA Actor/US Target

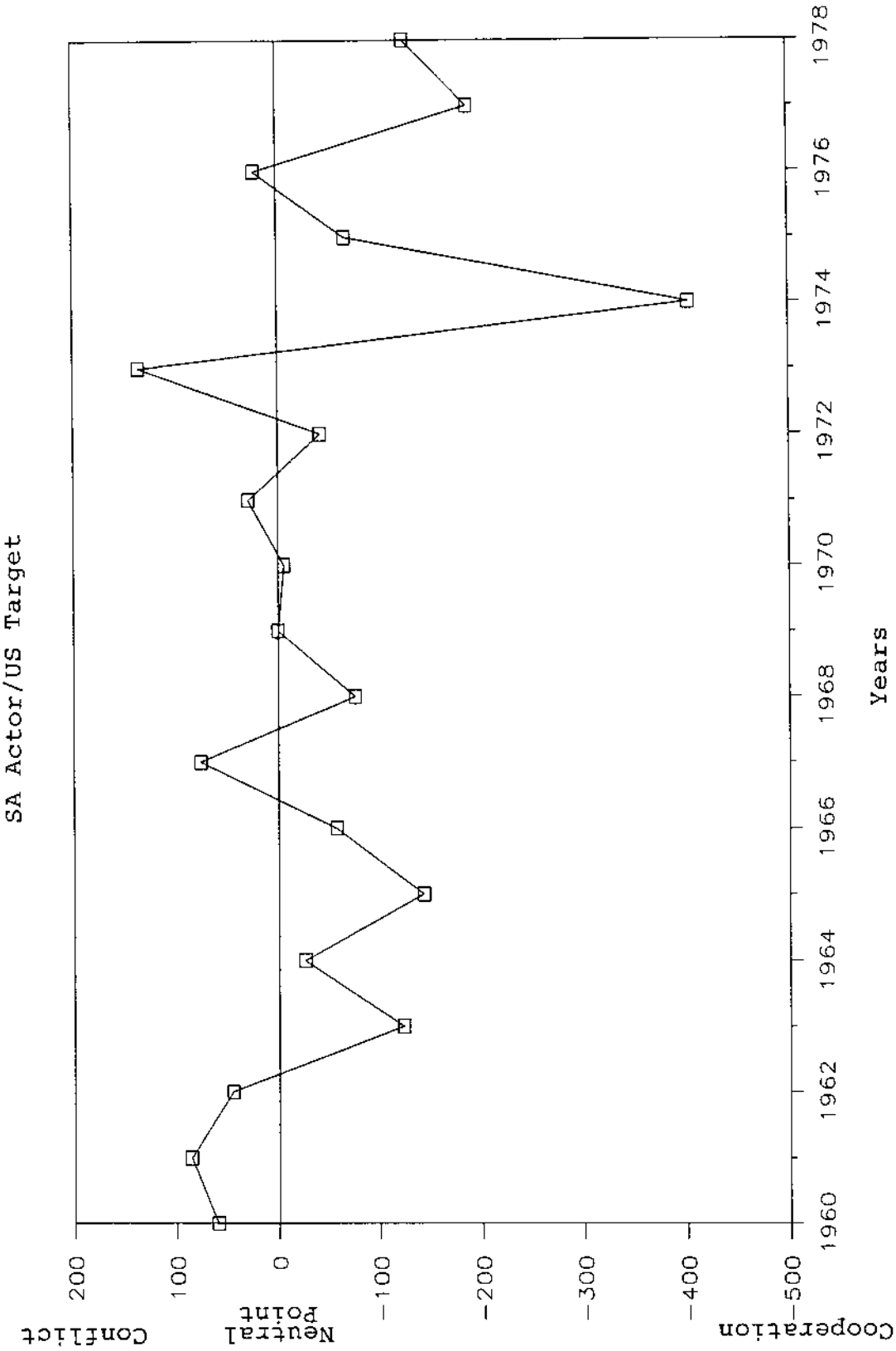


Figure 2

Net Weighted Conflict Measure
US Actor/SA Target

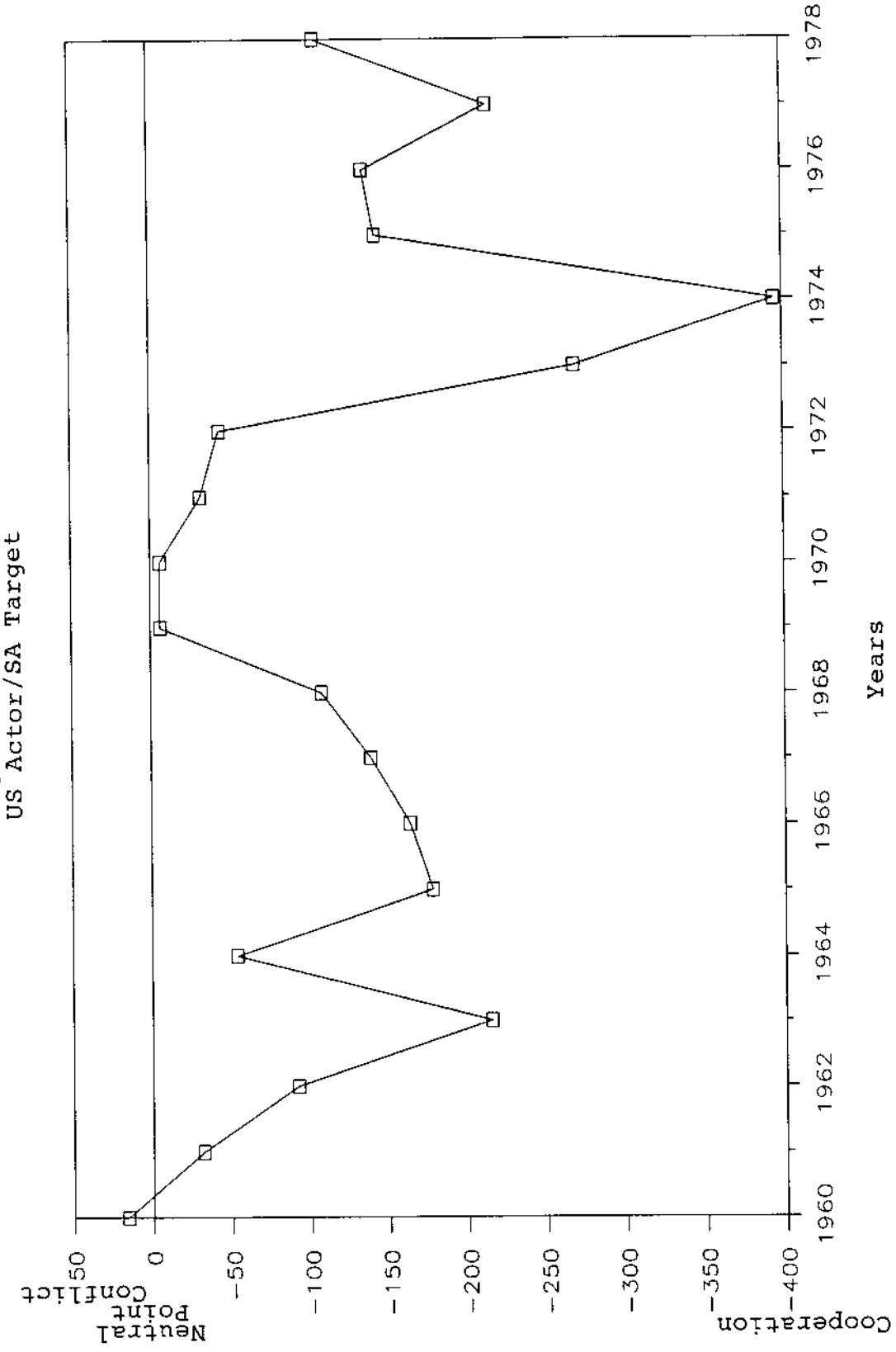


Figure 3

Weighted Cooperation Measure
SA Actor/US Target

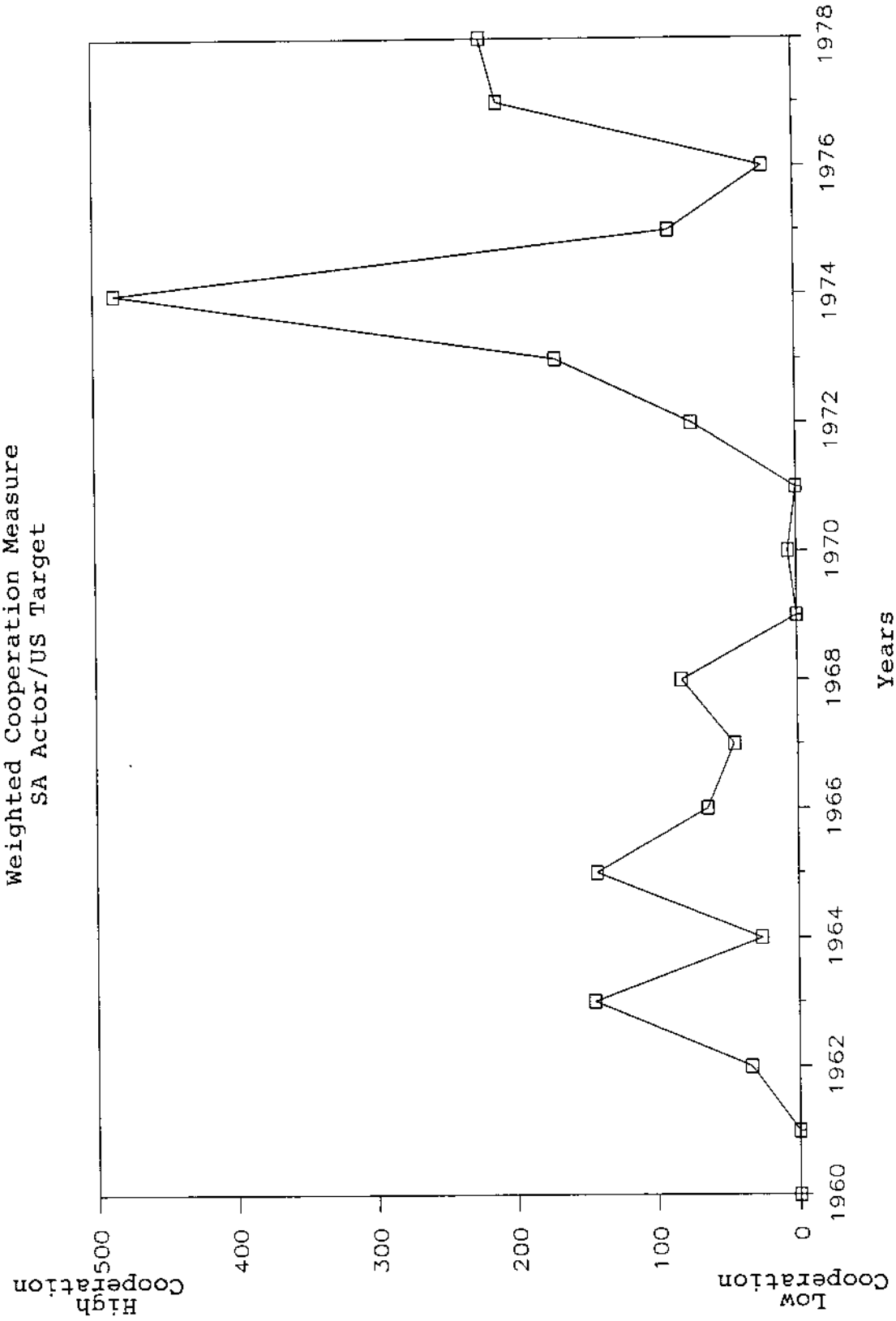


Figure 4

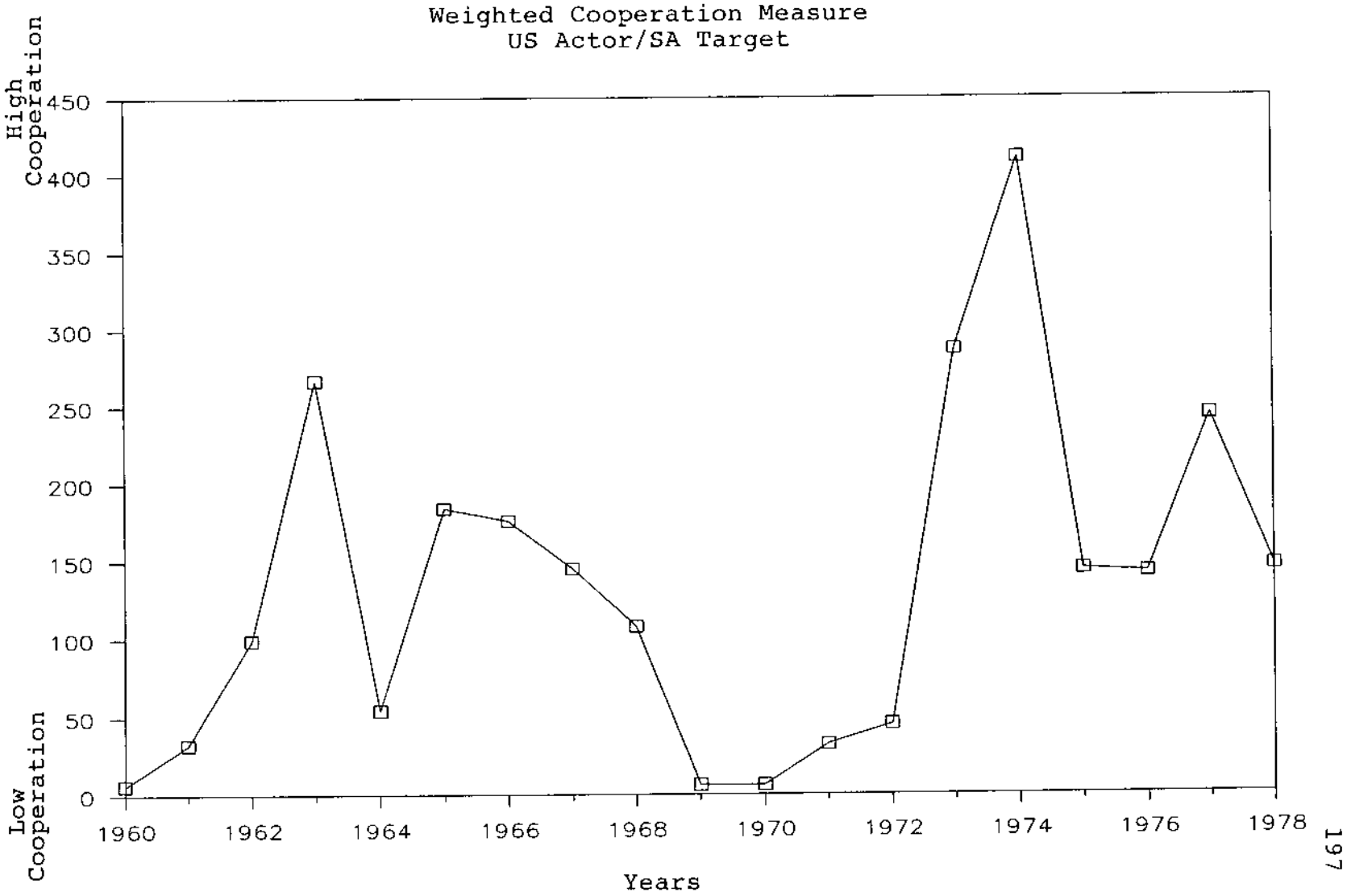

Weighted Cooperation Measure
US Actor/SA Target
High Cooperation
Low Cooperation
450
400
350
300
250
200
150
100
50
0
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
Years

Figure 5

Weighted Conflict Measure
SA Actor/US Target

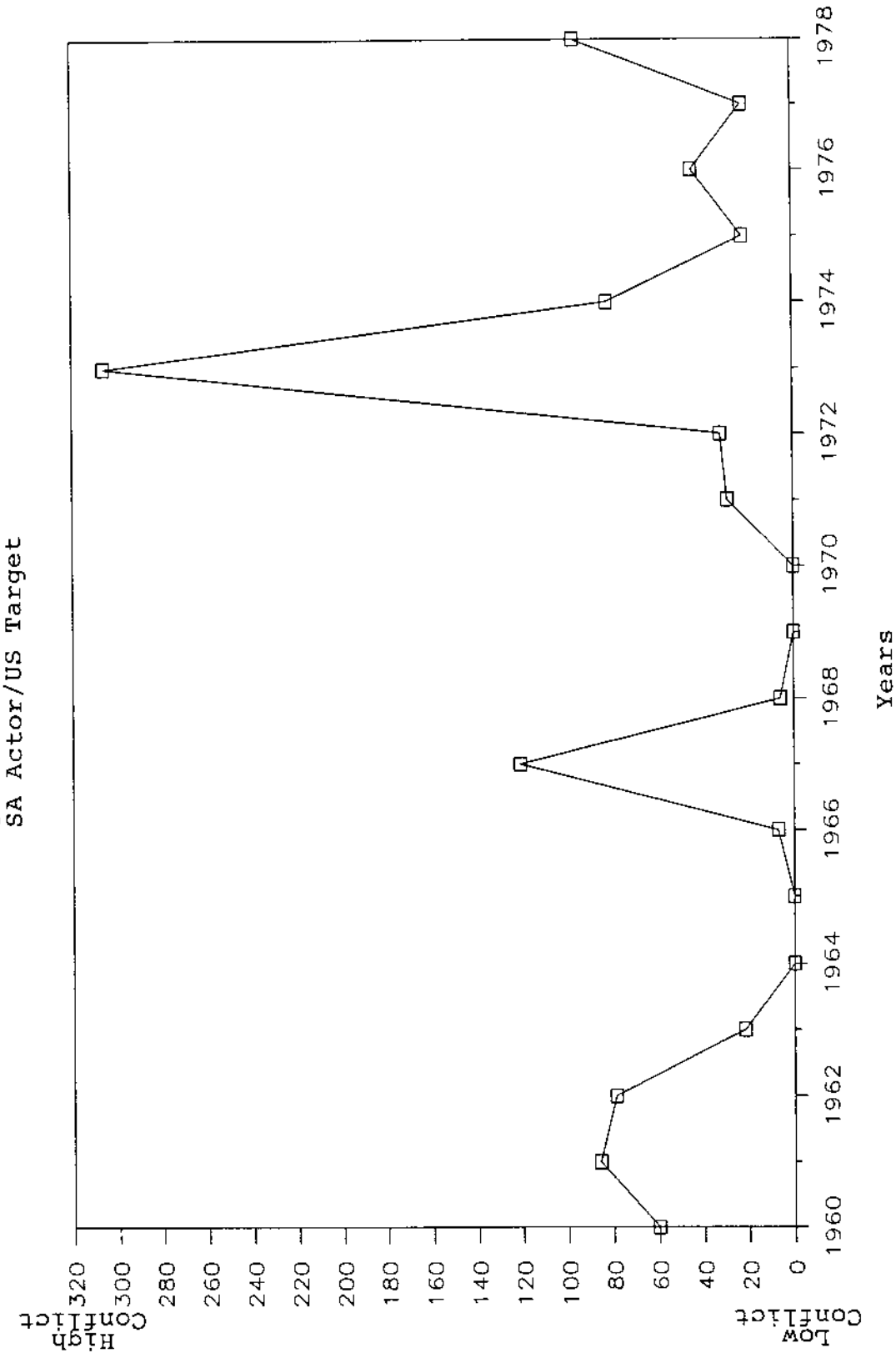


Figure 6

Weighted Conflict Measure
US Actor/SA Target

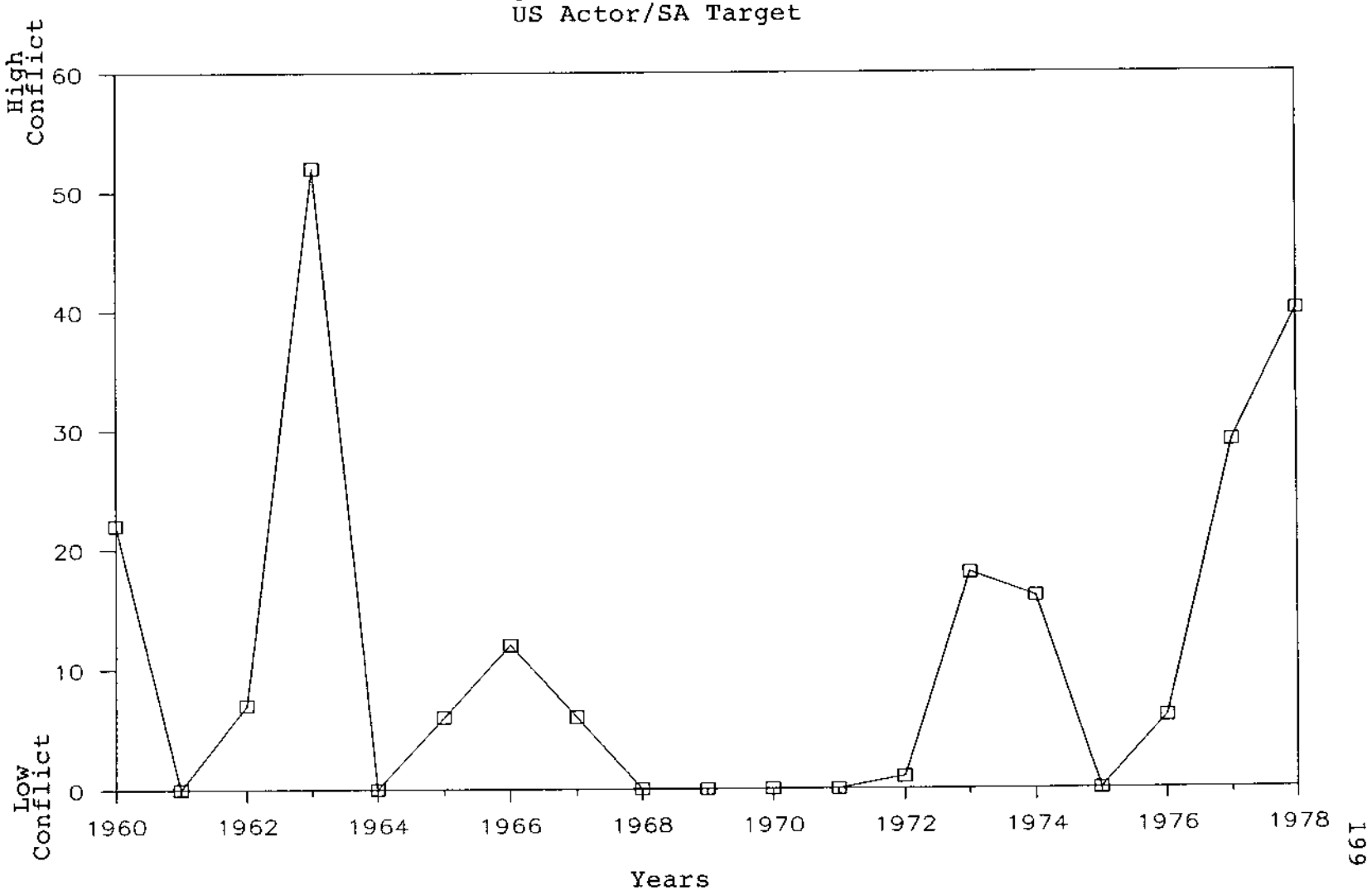


Figure 7

Saudi-US Total Foreign Trade
Billion US Dollars

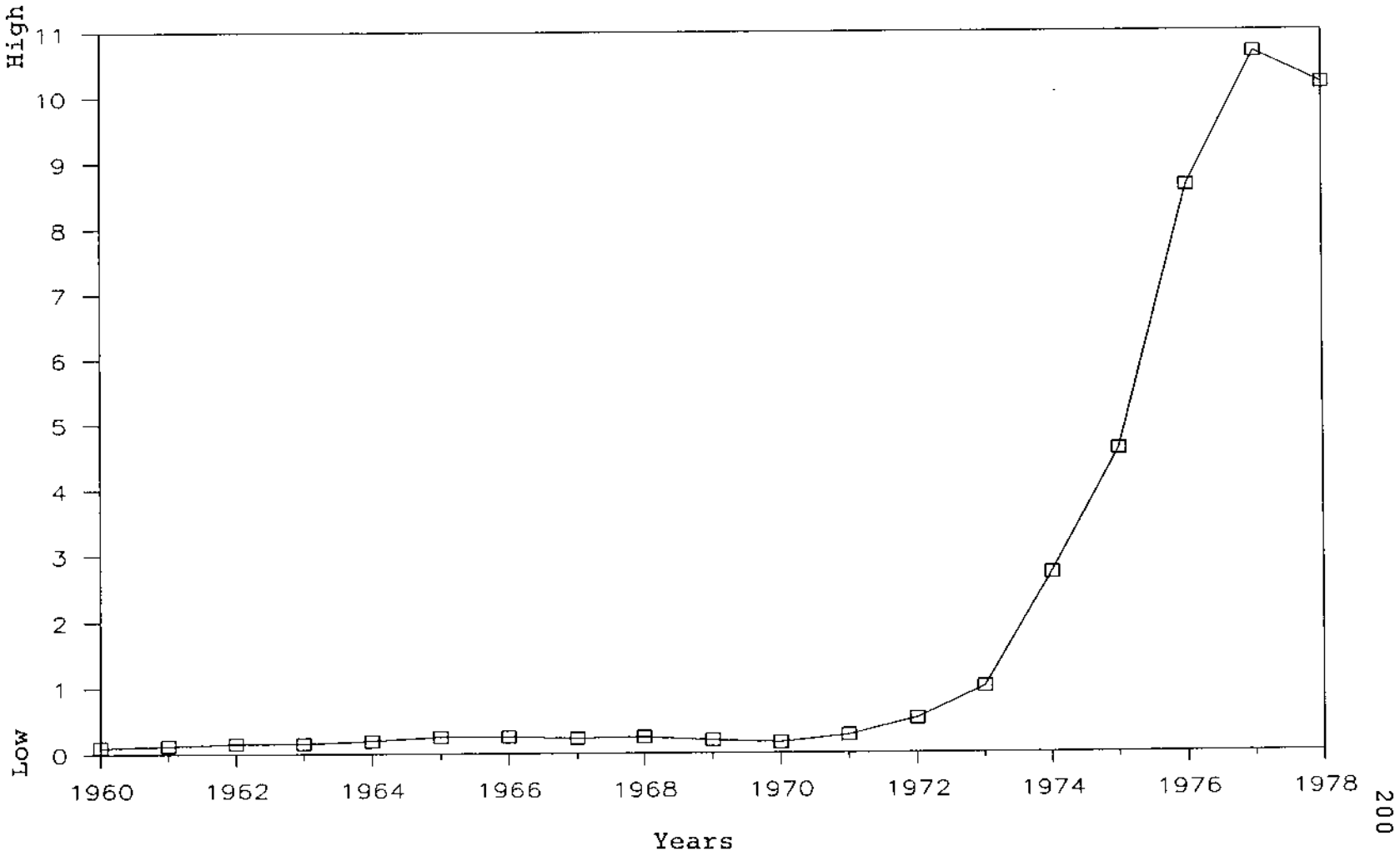


Figure 8

Saudi Total Exports to United States
Billion US Dollars

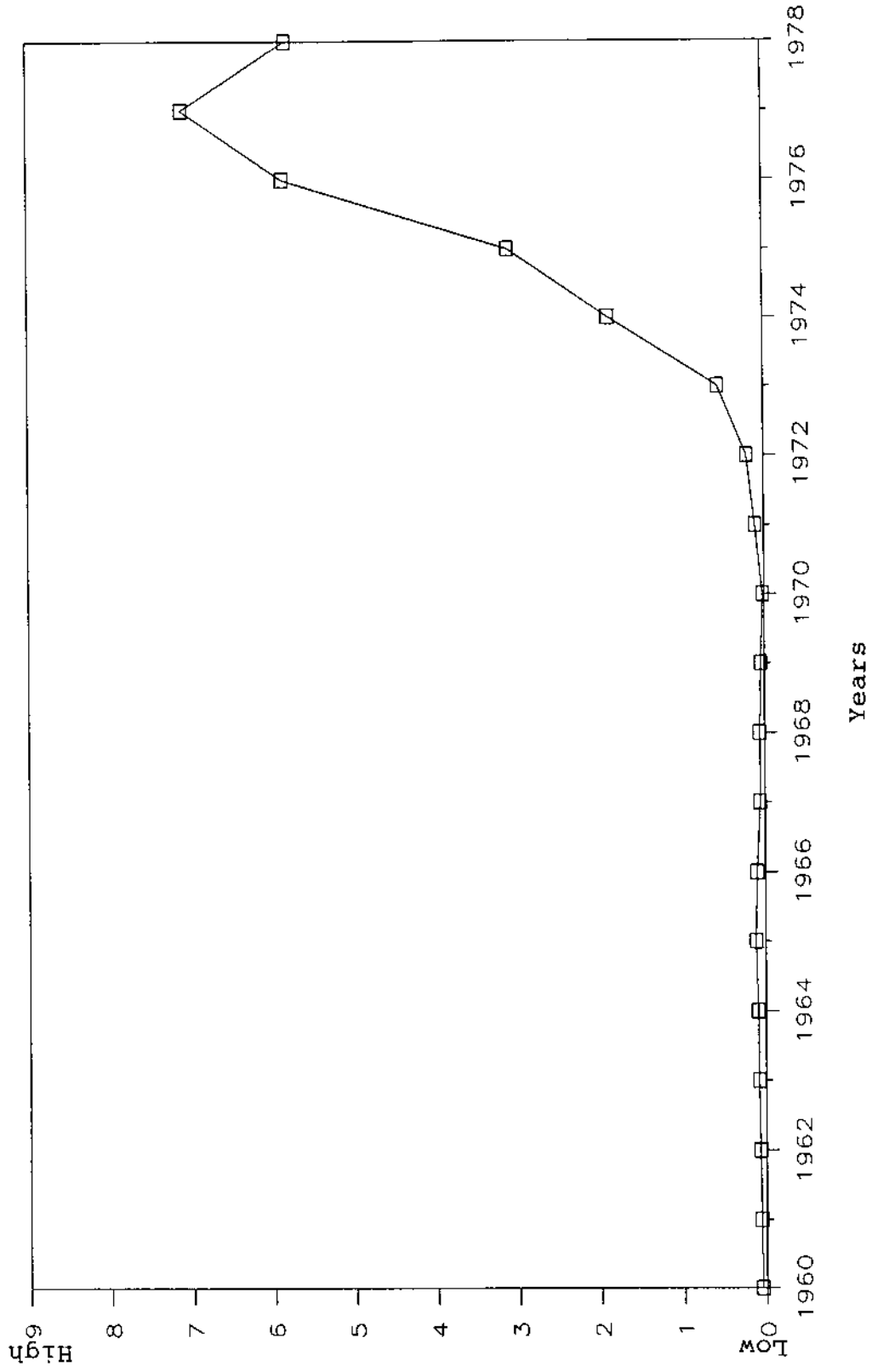


Figure 9

Saudi Total Imports from United States
Billion US Dollars

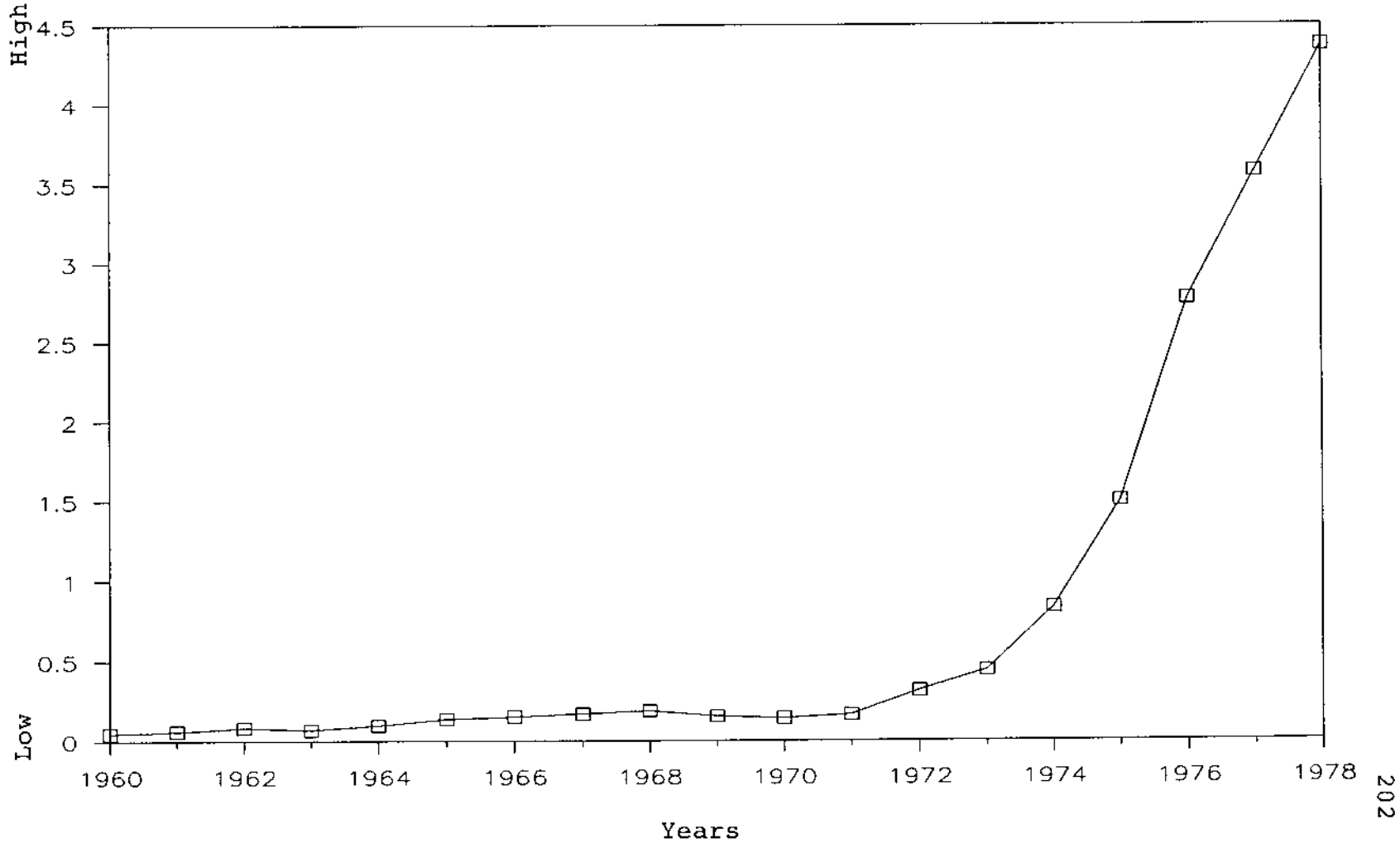


Figure 10

Ratio of SA Total Exports to US/SA Total Foreign Exports

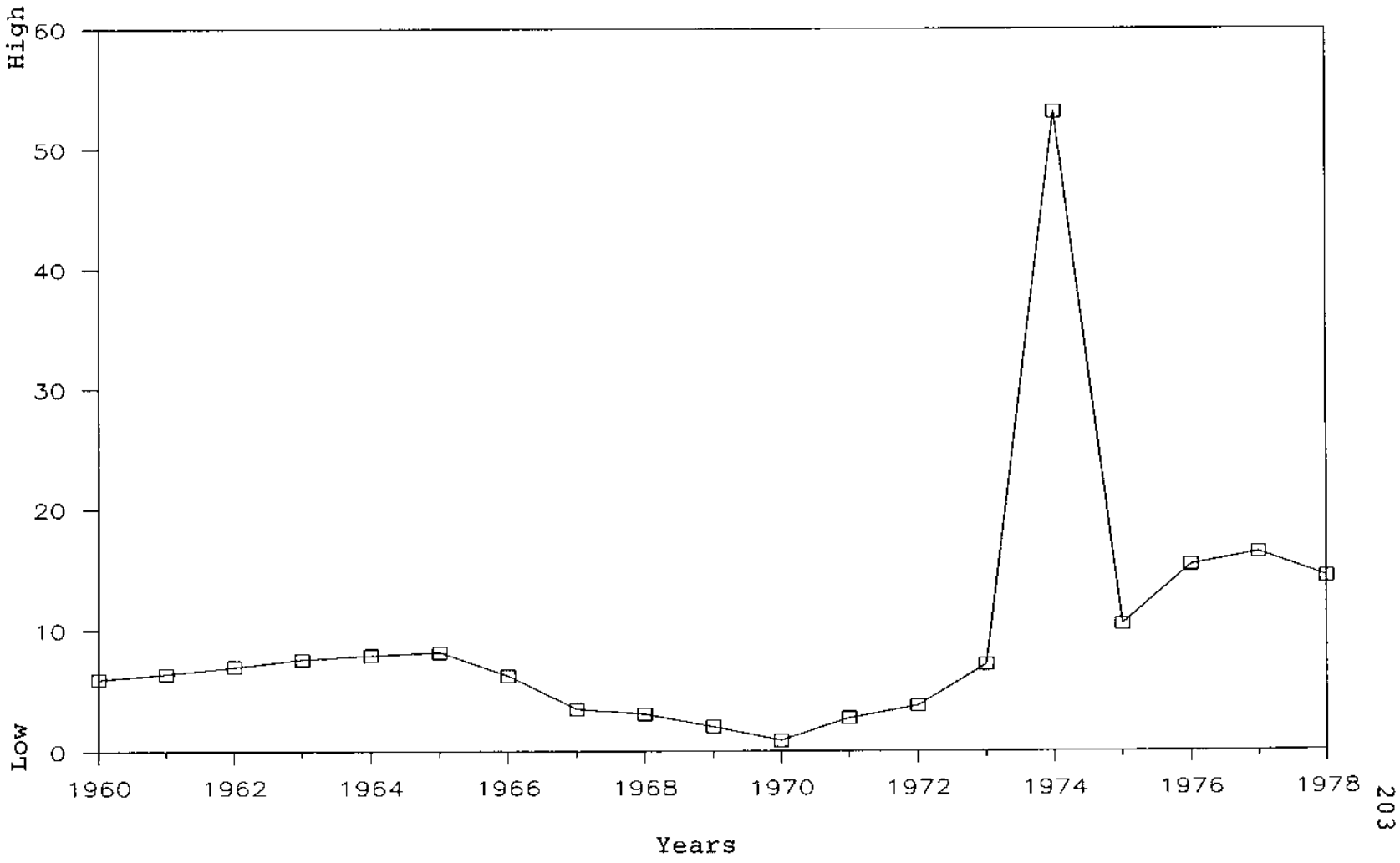


Figure 11

Ratio of US Total Exports to SA/US Total Foreign Exports

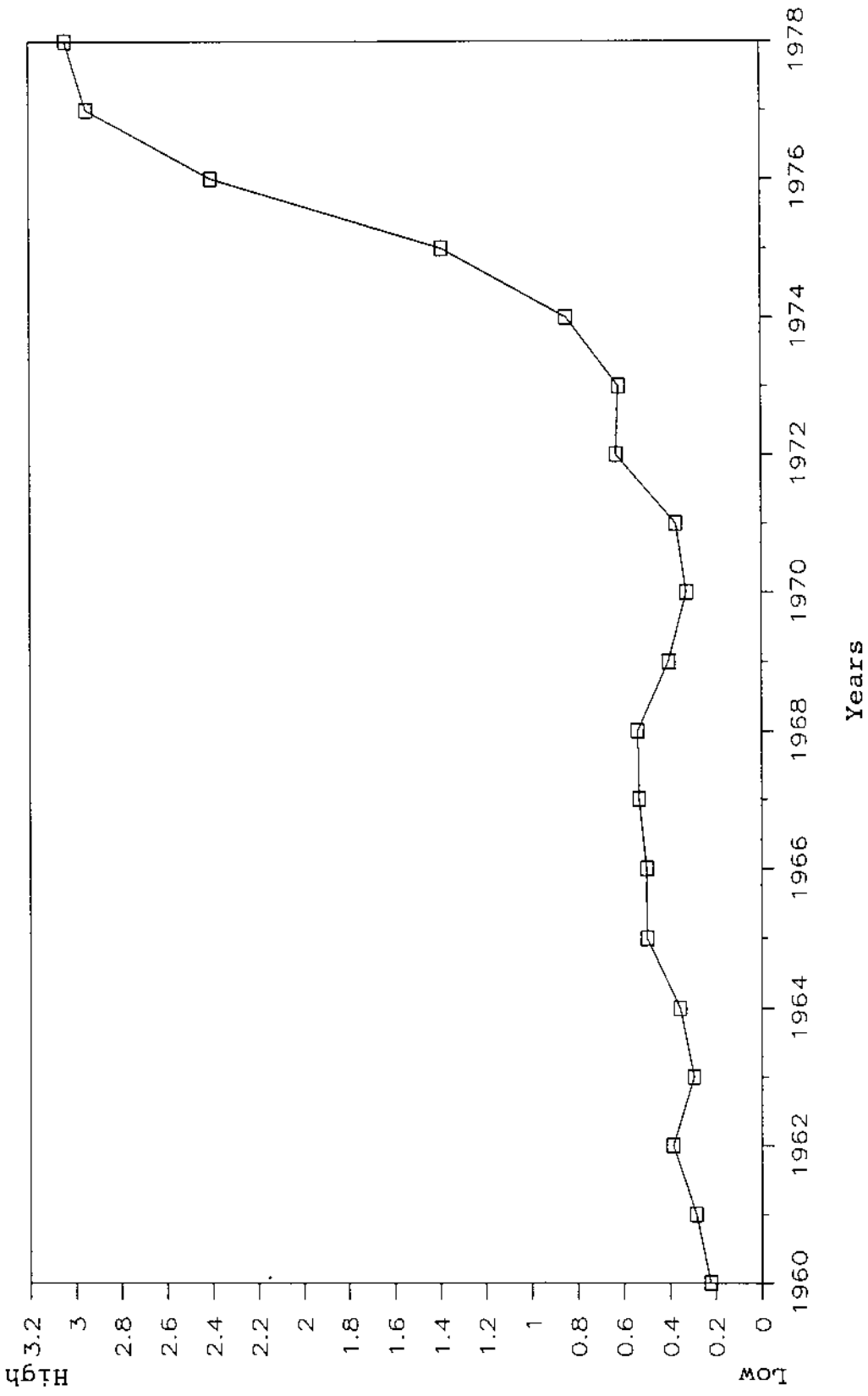


Figure 12

Ratio of US Total Foreign Trade/GNP

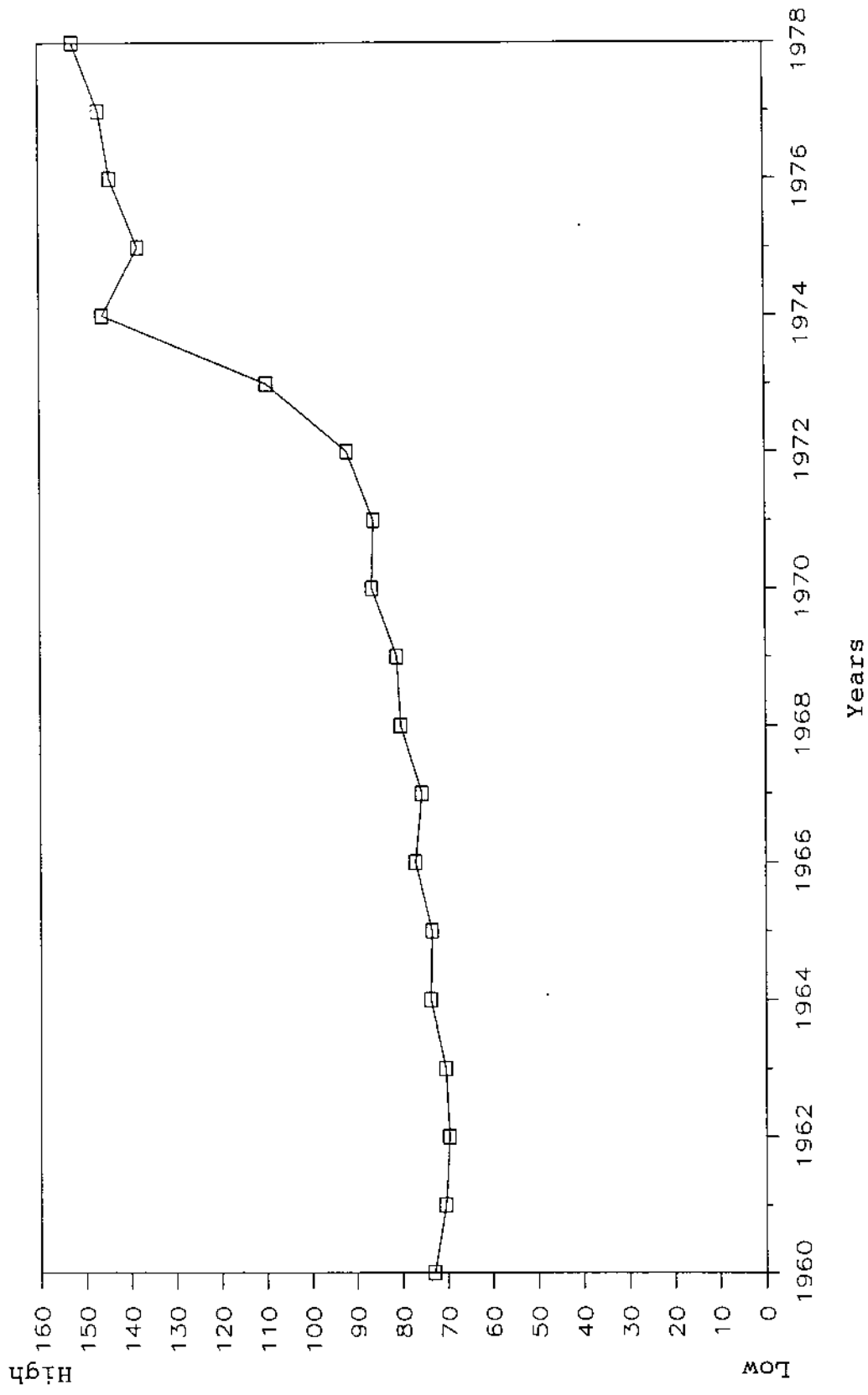


Figure 13

Ratio of US Total Trade with SA/GNP

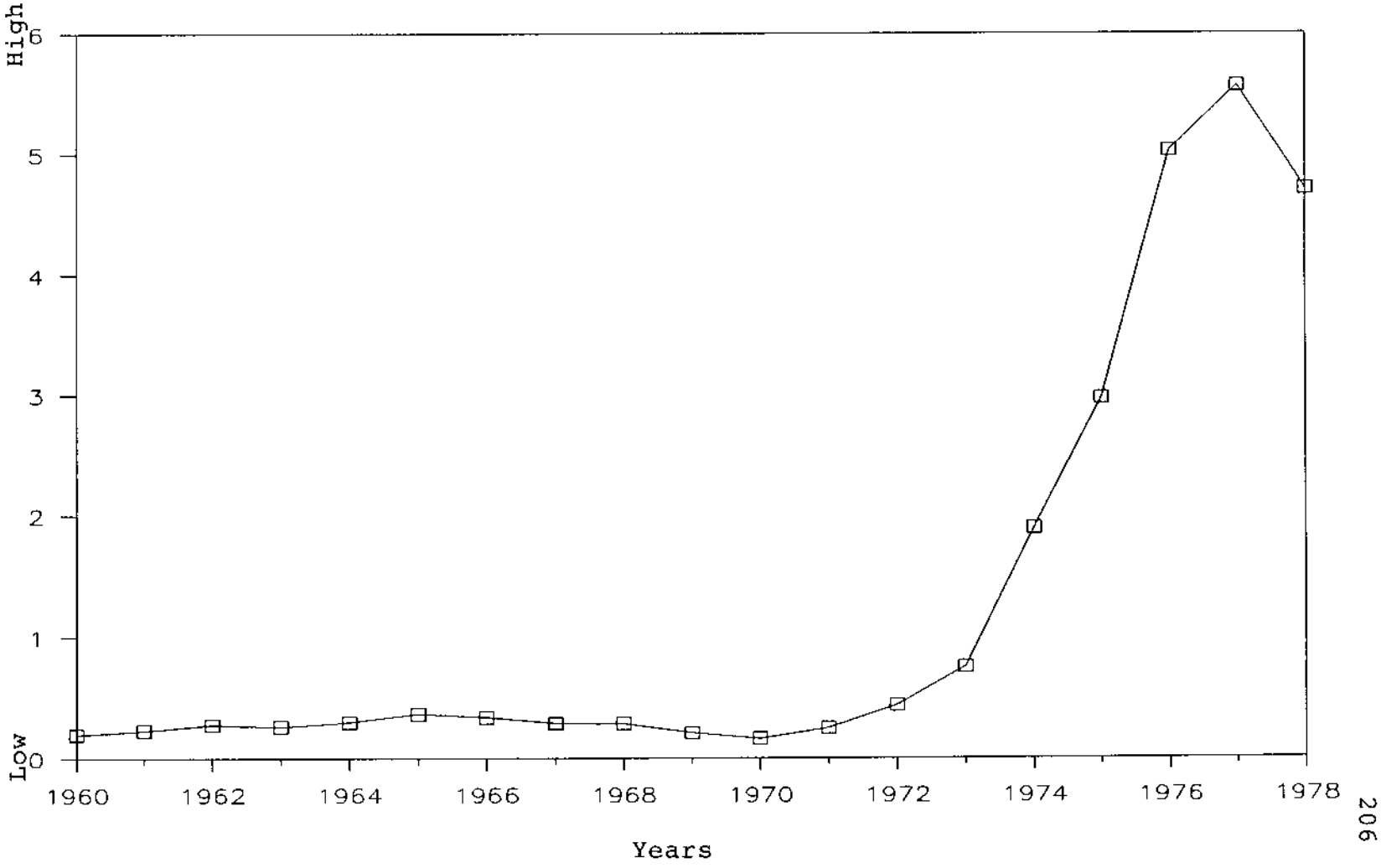


Figure 14

US Total Oil Imports from Saudi Arabia
Millions of Barrels

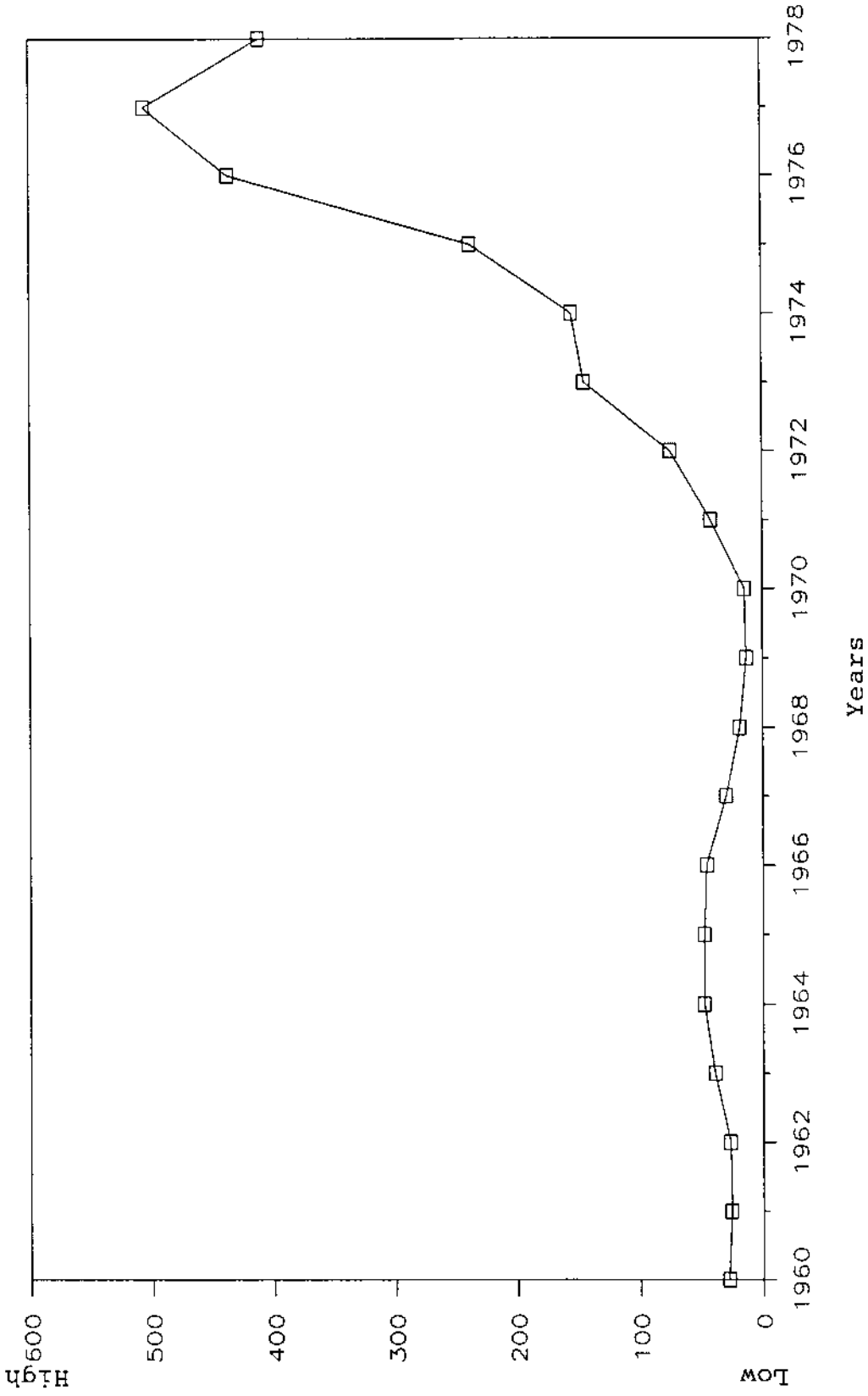


Figure 15

US Oil Import Prices from Saudi Arabia
Billion US Dollars

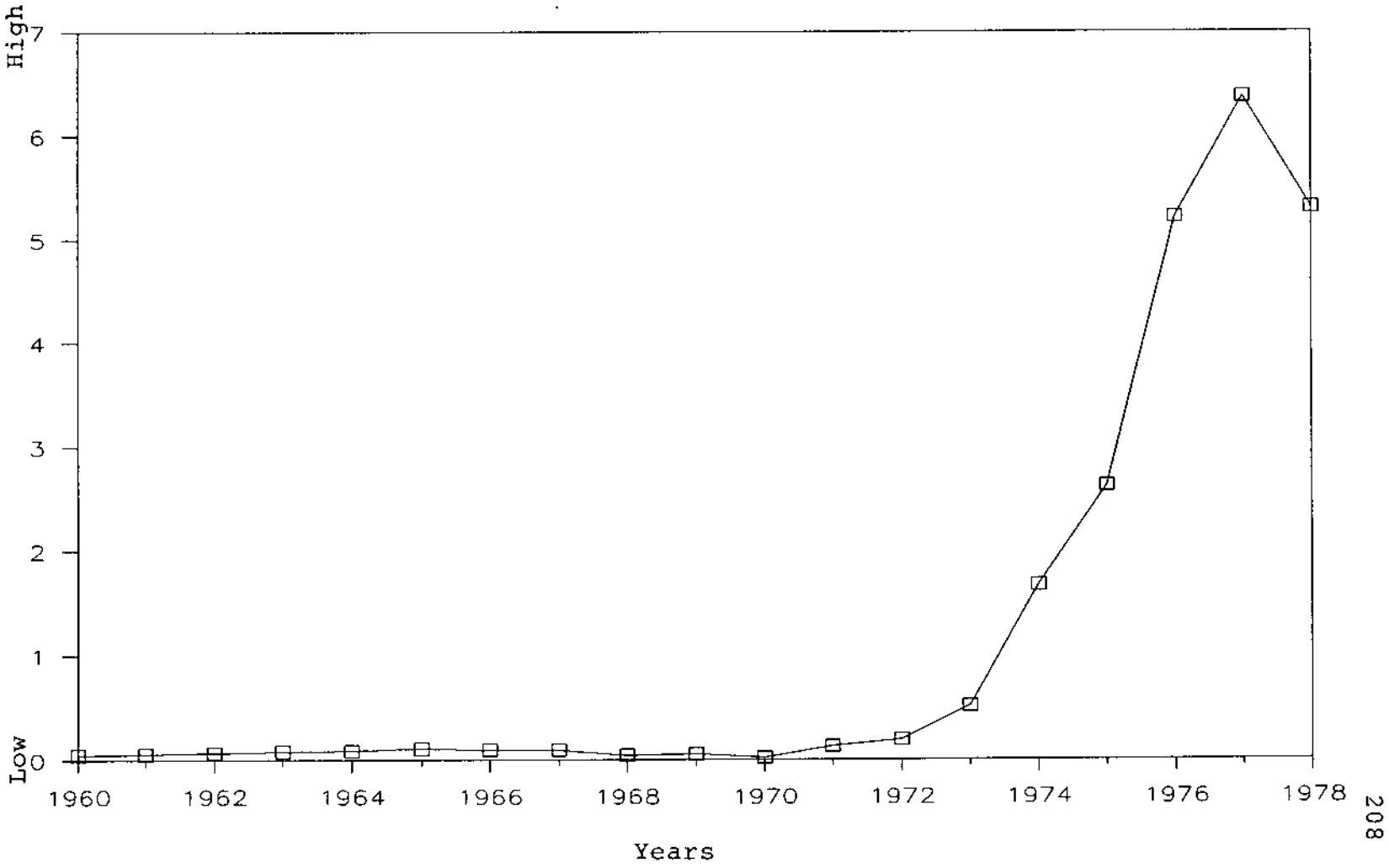


Figure 16

Saudi Total Arms Imports from the World
Billions US Dollars

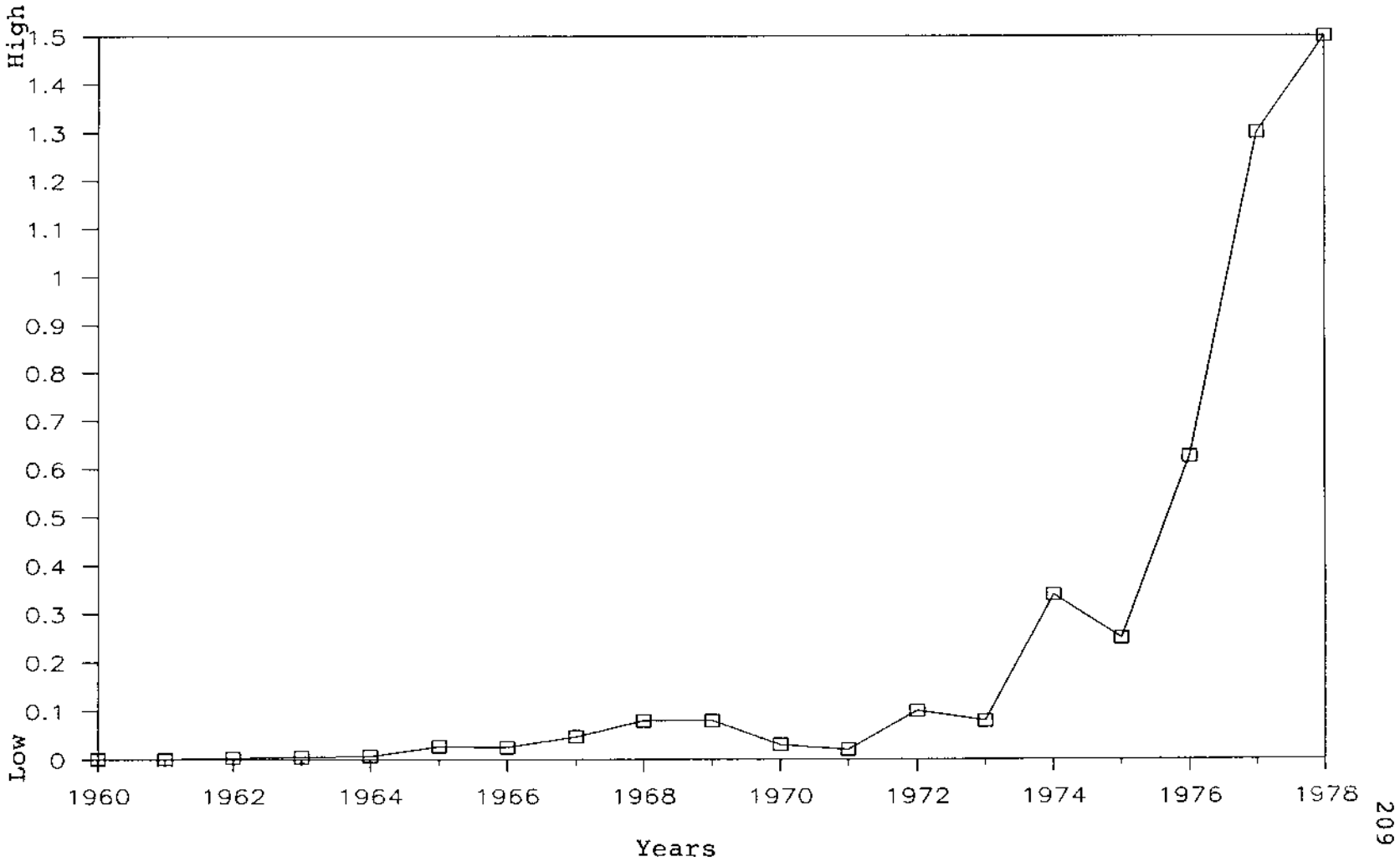


Figure 17

Saudi Total Arms Imports from US
Billions US Dollars

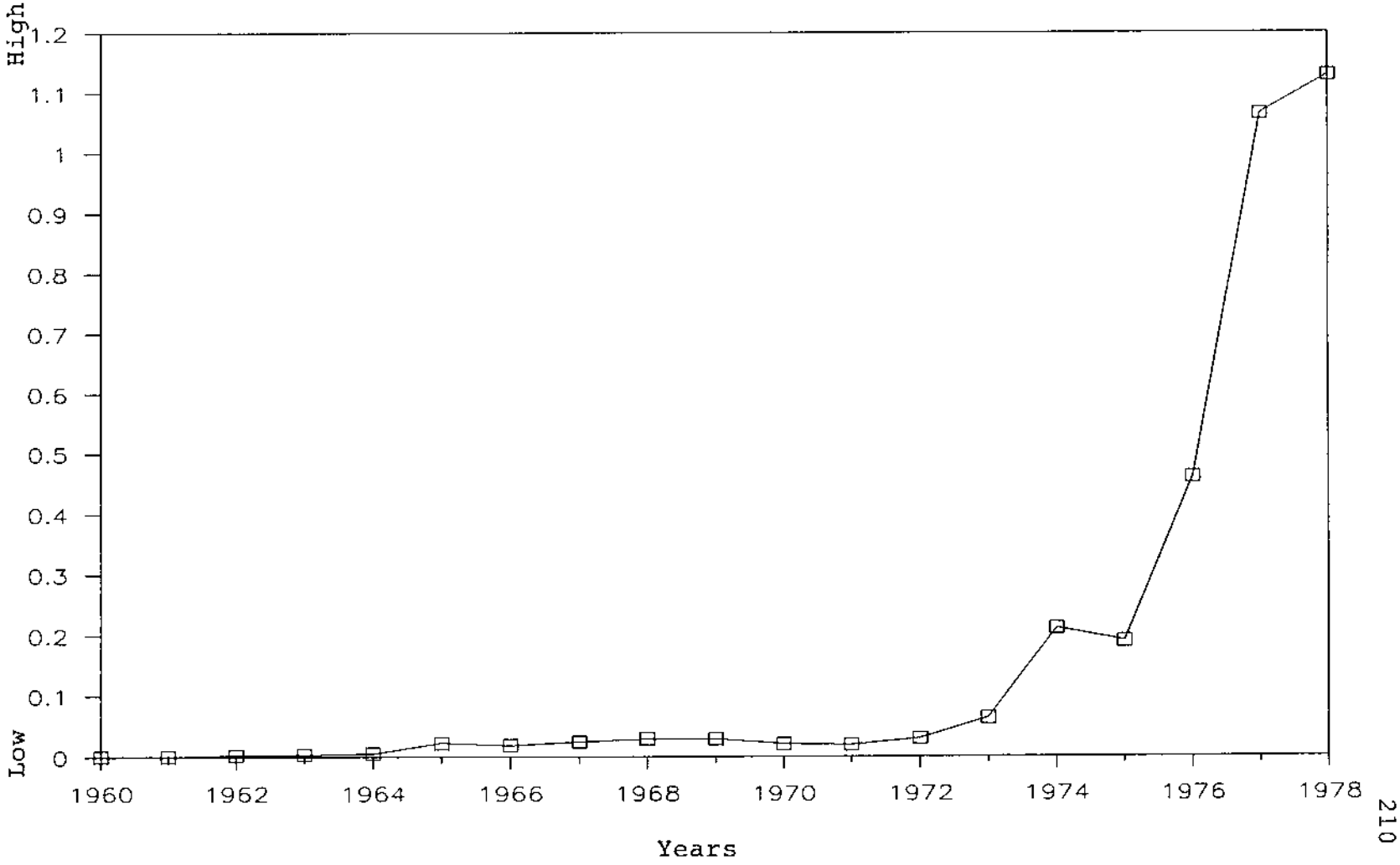
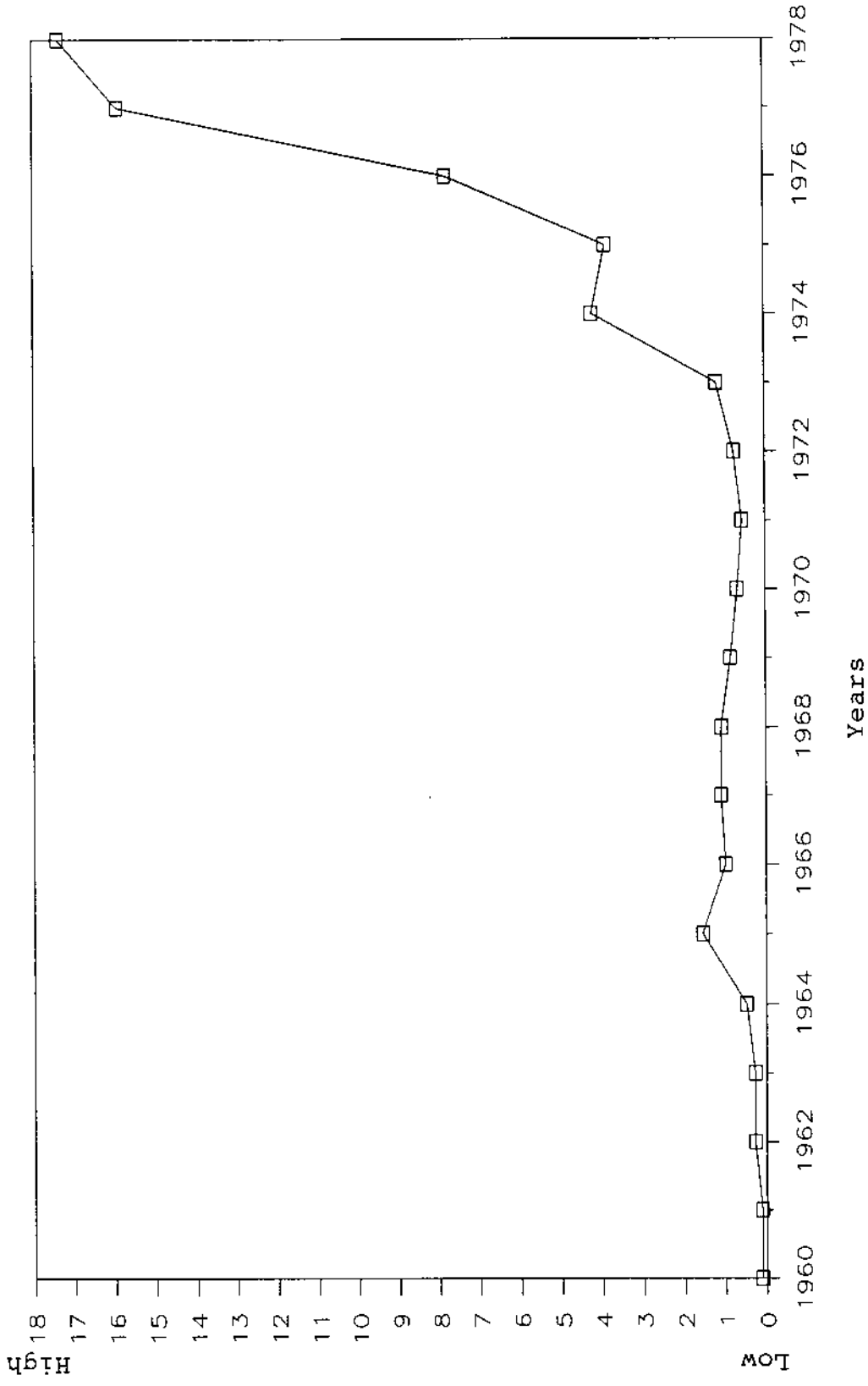


Figure 18

Ratio of US Total Arms Exports to SA/US Total Arms Exports



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