ROLE OF AGRICULTURAL SECTOR IN ECONOMIC AND INDUSTRIAL GROWTH OF PAKISTAN

BY

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CHAPTER I

INTRODUCTION

During the last three decades, Pakistan has heavily depended on agriculture in its quest for economic development and industrialization. Agriculture has not only provided the food, fiber and raw material for the industry, but has also provided the economy much needed foreign exchange through exports. In 1990-91, almost 70 percent of Pakistan's exports were based on agriculture (Finance Division, Economic Survey 1991-92). At present, Pakistan's exports are dominated by cotton, and cotton products.

Since the late sixties, the linkage between the trade and economic development has been a hot topic. Researchers have shown that the empirical evidence that the trade has played a key role in the economic progress in past, and argue that trade policy is a very effective tool in economic development. Most of the previous work has examined the role of trade across the countries which prompted some to indicate the need for more emphasis on the level of individual countries. Such a study is very crucial for developing countries to evaluate their policies in the past, and to formulate the strategies in the future. Over the last three decades, the government has pursued the industrialization very aggressively which makes it even more important to evaluate the role of agriculture in the economic and industrial growth.

Objectives of the Study

The main objective of this study is to determine the role of agriculture in the economic growth. This study is divided into three phases. In the first phase the objective is to measure the impact of aggregate agricultural exports on the economic growth of the country. In this phase a system of simultaneous equations is used to determine the role of agricultural exports in the GDP growth. A key contribution to the existing literature is the inclusion of net factor income from abroad (NFI). NFI could be defined as the funds that were earned by Pakistani citizens in foreign countries and were sent to Pakistan in foreign currencies. Further more; this study analyzes the impact of trade on economic growth of an individual country by utilizing a system's approach. Previously this approach was used only on the cross-sectional studies (Esfahani 1990).

The specific objectives of the first phase are to:

1. determine the role of agricultural exports in the real GDP growth,
2. determine if the externality hypothesis has any support in case of the agricultural exports,
3. check for the validity of the hypothesis that the externalities increase with a shift in export structure toward one with more manufactured goods,
4. check for the existence of import shortages supposedly caused by a binding foreign exchange availability.

The objective in the second phase is to examine the interaction between the agricultural sector and the manufacturing sector. A key contribution is the use of simultaneous equations model (a system's approach) to avoid simultaneity bias. The third phase is aimed at finding the interaction between the cotton production and the industrial growth. The key contribution of this phase is to determine the role of cotton in industrial growth and role of cotton manufacturing in raising cotton production, while avoiding the simultaneity bias.

Overview of Pakistan's Economy

Right from the independence, agricultural sector has played a very important role in Pakistan's economic development. The economy went through a gradual transition in which it shifted from mostly agricultural to the one with dominant agricultural and manufacturing sectors. Despite the political instability in the region, the economy grew at a steady rate during the last three decades. From 1960 to 1990, the real growth in GDP averaged at 6.02 percent per year, while the real agricultural growth averaged at 4.29 percent per year. During the same period the manufacturing sector grew at an average annual rate of 7.89 percent (Figure 1). During the fiscal year 1990-91, the agricultural sector employed over half of the country's labor force, contributed slightly less than one fourth of the gross domestic product, accounted for more than one fourth of the total exports, and brought in about one sixth of the country's total foreign exchange earnings (Table I, Figure 2, Figure 3). According to Dorosh and Valdes (1990), the main reasons for growth in agriculture output were the public investment in irrigation and the introduction of high-yielding varieties of wheat,

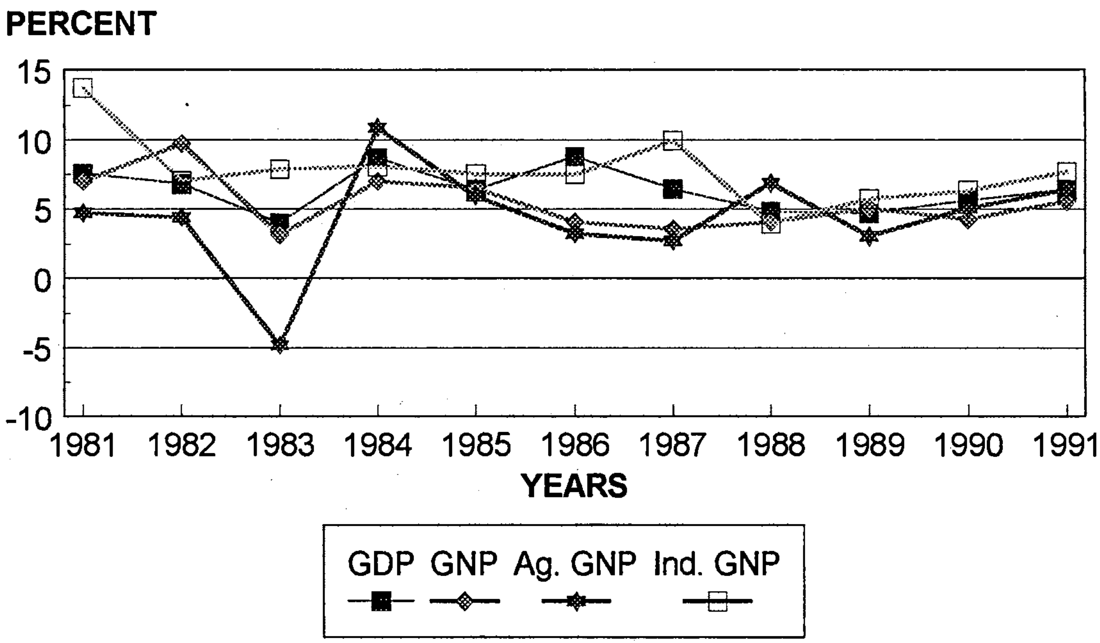

Figure 1: REAL ECONOMIC GROWTH, PAKISTAN, 1981-1991.
(SOURCE: FINANCE DIVISION, ECONOMIC SUVERY 1991-92)

Table I

AGRICULTURAL SECTOR'S SHARE OF LABOR FORCE, AND ITS CONTRIBUTION TOWARDS GROSS DOMESTIC PRODUCT, EXPORTS, AND FOREIGN EXCHANGE EARNINGS, PAKISTAN, SELECTED YEARS.

Year	Share of		Share of Ag Exports	
	GDP	Labor Force	Foreign Exchange Earnings	Total Value of Exports
	(percent)		(percent)	
1959-60	45.83	59.30	44.38	44.38
1971-72	36.02	57.32	39.53	39.53
1979-80	29.57	52.67	18.30	33.12
1990-91	25.00	51.50	16.69	28.89

(Source: Finance Division, Economic Survey 1991-92)

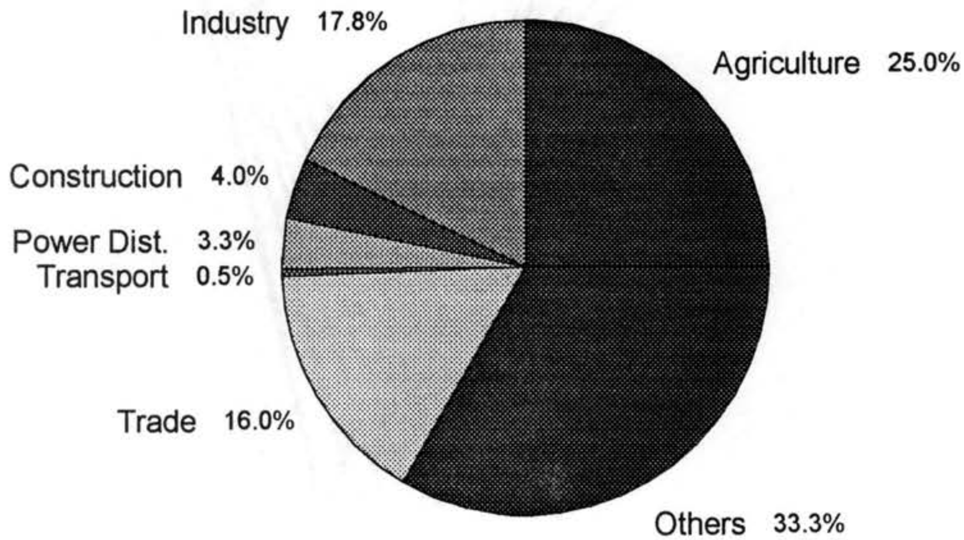

Figure 2: CONTRIBUTION OF SECTORS TOWARDS GDP, PAKISTAN, 1990-91. (SOURCE: FINANCE DIVISION, ECONOMIC SUVERY 1991-92)

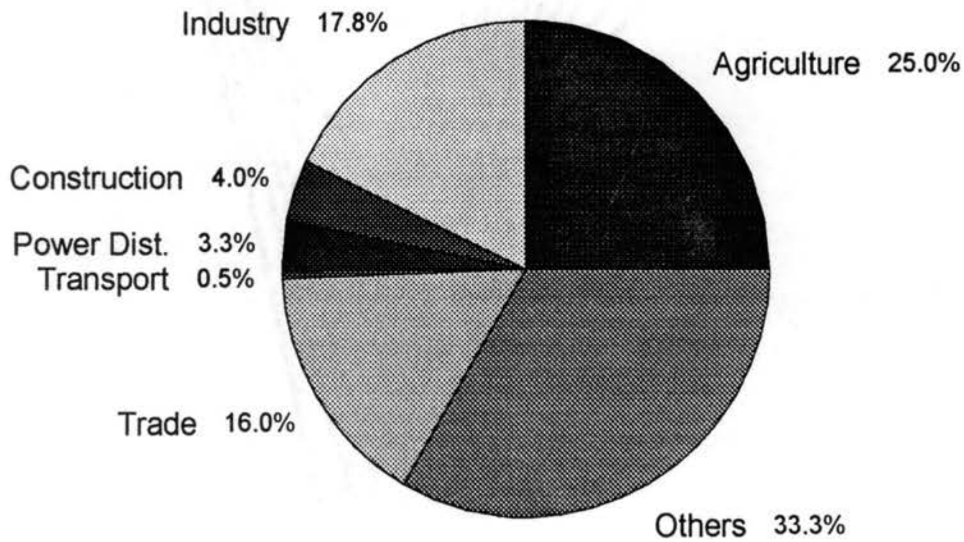

Figure 3: DIVISION OF LABOR AMONG ECONOMIC SECTORS, PAKISTAN, 1990-91. (SOURCE: FINANCE DIVISION, ECONOMIC SUVERY 1991-92)

rice, and cotton. Even though the share of agriculture fell from 46 percent in 1960 to 25 percent in 1990, the labor force did not follow the suit. The share of the labor employed by the agriculture is still more than 51 percent (Table I).

Overview of Agricultural Sector

The agricultural sector is very important in the sense that it not only provides the food and fiber for a population that is growing at an average rate of 3.1 percent per year (Figure 4), but also as it provides raw material for an industrial sector that has been growing at an average rate of 7.89 percent per year (Figure 1). Economic activities in different sectors of the economy are linked with agricultural sector. It has been noted that the efforts to increase the agricultural production have not only increased the production in the agricultural sector, but also have increased the output of the other sectors. Mahmood and Walters (1990) cite a recent study which shows that a one rupee increase in agricultural production ultimately results in a two rupee increase the overall economic activities.

Wheat, Cotton and Rice are the main crops in Pakistan. Wheat is the main staple of Pakistan, and is produced mainly for the domestic consumption. Pakistan achieved self sufficiency in the mid-eighties, but during the years with heavy floods, or other natural disasters; the country resorts to imports to meet the surplus demand. Rice is yet another staple and is produced for not only the domestic market, but also for the exports. In the world market, Pakistan has been among the top ten exporters of rice during the last decade. According to Dorosh and Valdes (1990), Pakistan has

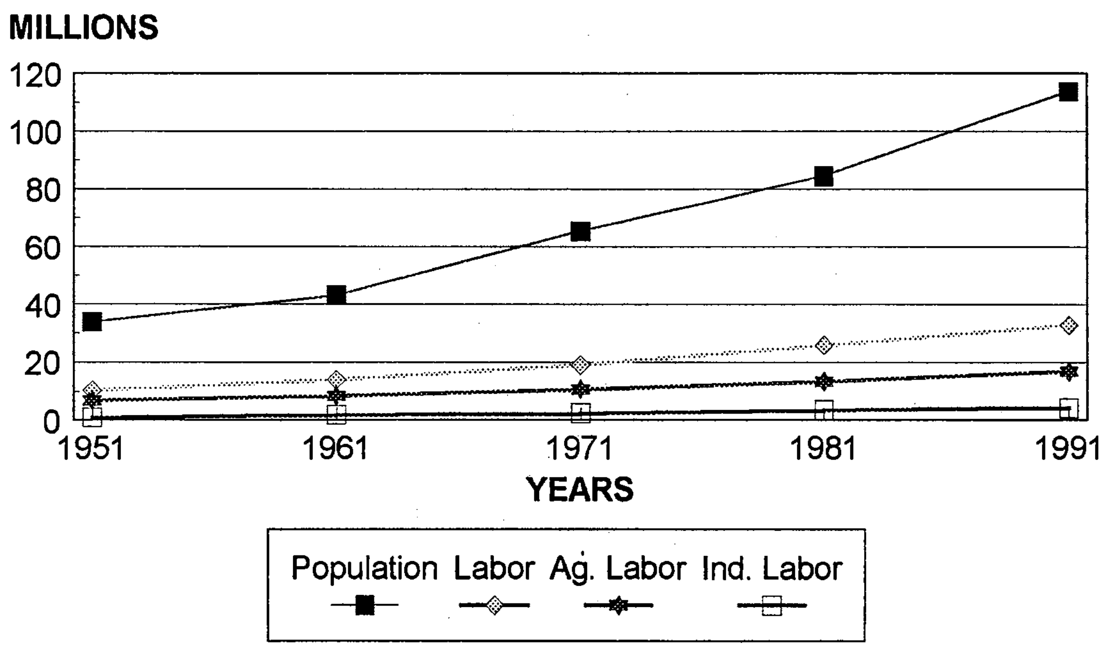

Figure 4: POPULATION AND LABOR FORCE, PAKISTAN, 1951-1991. (SOURCE: FINANCE DIVISION, ECONOMIC SUVERY 1991-92)

monopoly in the export of Basmati (a high-valued aromatic rice). In 1991, Basmati rice along with the other rice accounted for 6 percent of the total exports. Cotton is probably the most important cash crop of Pakistan. Increasing cotton production has allowed Pakistan not only to develop one of the largest textile sector in the world, but has also been a significant source of exports. Over the last decade, Pakistan has been among the top five exporters of Raw cotton. Cotton group which constitutes of raw cotton and cotton products has provided the country with almost 60 percent of its exports during the recent years (Table II, Table III, Figure 5).

Agricultural Base

Agricultural Land Pakistan's total area is 79.6 million hectares. During the year 1991, only 21.89 million hectares (27.5 percent) were cultivated. According to Zia (1992), the primary reason for the small share of land under crops is the lack of irrigation water. The cultivated area has risen form 11.6 million hectares in 1947 to 21.89 million hectares in 1991 that is an increase of nearly 90 percent over the last forty five years. This impressive growth slowed down in the eighties. The slow down is mainly caused by water logging, soil erosion, and salinity.

Irrigation Water Pakistan's northern part hosts such famous mountain ranges as Himalayas, Karakorum, Hindu-Kush. In contrast to the northern boundary, the southern boundary is at the sea level. This drastic difference in altitude between the

Table II
CROPPED AREA AND PRODUCTION OF WHEAT, RICE AND COTTON, PAKISTAN, 1970-1990.

Year	Wheat		Cotton		Rice	
	Area (000 hac)	Production (000 tons)	Area (000 hac)	Production (000 tons)	Area (000 hac)	Production (000 tons)
1970	5977	6476	1733	542	1622	542
1971	5797	6890	1957	707	1503	707
1972	5971	7442	2010	702	1456	702
1973	6113	7629	1845	659	1480	659
1974	5812	7673	2031	634	1512	634
1975	6111	8691	1852	514	1604	514
1976	6390	9144	1865	435	1710	435
1977	6360	8367	1843	575	1749	575
1978	6687	9950	1891	473	1899	473
1979	6924	10587	2081	728	2026	728
1980	6984	11475	2108	715	2035	715
1981	7223	11304	2214	748	1933	748
1982	7398	12414	2263	824	1976	824
1983	7343	10882	2221	495	1978	495
1984	7259	11703	2242	1008	1999	1008
1985	7403	13923	2364	1208	1999	1208
1986	7706	12016	2505	1309	1863	1309
1987	7308	12675	2568	1468	2066	1468
1988	7730	14419	2619	1426	1963	1426
1989	7845	14316	2599	1457	2042	1457
1990	7911	14565	2662	1639	2107	1639

(Source: Finance Division, Economic Survey 1991-92)

Table III:
BREAKDOWN OF EXPORTS IN MAJOR CATEGORIES, PAKISTAN, 1990-91.

	(Percent Share)	
	July - March	
	1991-92 (Provisional)	1990-91 (Actual)
Total Cotton Group	58.2	58.3
Rice	6.0	5.3
Leather	3.8	5.1
Leather Manufactures	4.7	4.8
Fish and Fish Preparations	1.7	2.0
Carpets and Carpeting	3.5	3.8
Petroleum Products	1.2	1.8
Synthetic Textiles	6.3	6.0
Fruits and Vegetables	0.7	1.0
Others	13.9	11.9
Total	100.0	100.0

(Source: Finance Division, Economic Survey 1991-92)

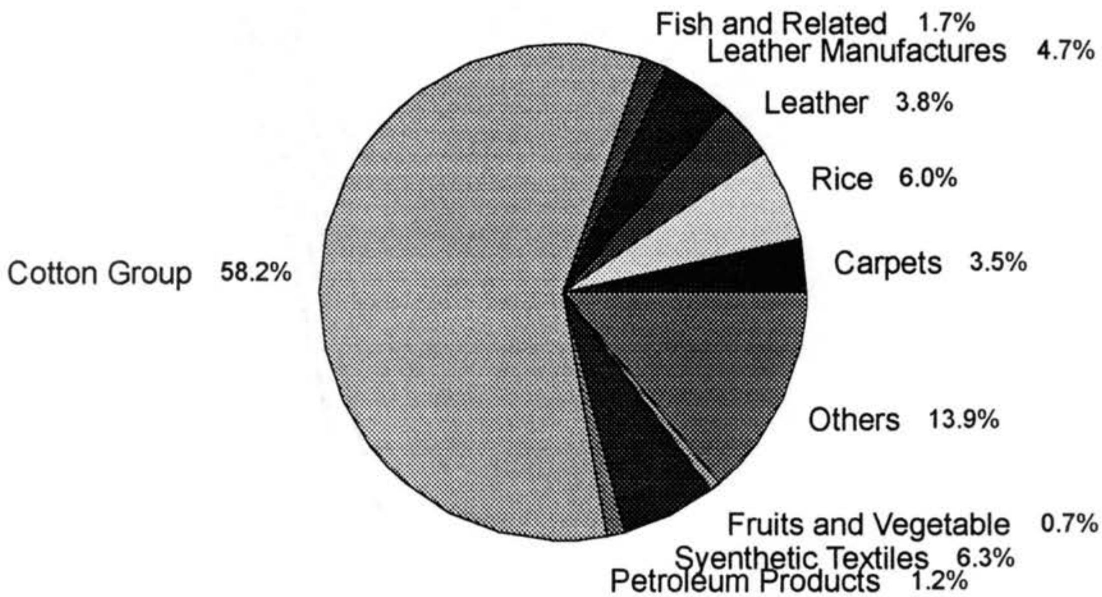

Figure 5: BREAKDOWN OF EXPORTS, PAKISTAN, 1991-92. (SOURCE: FINANCE DIVISION, ECONOMIC SUVERY 1991-92)

north and the south determines the direction of flow of river Indus and its tributaries. Along with this north to south slope exists a gentler slope from east to west. This east to west slope has allowed for the development of world's largest gravity-flow canal irrigation system. Mahmood and Walters (1990) report that this system consists of the river Indus and its 5 tributaries, 3 major storage reservoirs, 19 barrages, 12 link canals, and 43 primary canals and it serves roughly 90,000 villages. Zia (1992) reports that the total length of the canal system is about 40,000 miles, with watercourses and field ditches running another 1.0 million miles.

Due to lack of an effective drainage system, and not so effective repair mechanism the efficiency of the canal system is deteriorating over the time. Mahmood and Walters (1990) show that a substantial amount of water is lost between rivers and the farmgate. The seepage and excessive irrigation are resulting in water-logging and salinity. An effective solation to these water related problems is the use of tubewells. In the last two decades, the government has provided subsidies to encourage the use of this alternative source of irrigation water. Zia (1992) reports that the tubewell use has not only been helpful in the fight against the water related problems, but also in adding to the supply of irrigation water. In 1991, the canal system along with the alternative irrigation sources have supplied 112.2 million acre feet of water at the farmgate level.

Farm Labor According to the government, in 1991 the agricultural sector employed 16.76 million people, or in other words 51 percent of the labor force (Table I). While agricultural sector's share in GDP fell from 45.8 percent in 1959-60 to 25.0 percent in 1990-91, the share of labor force employed by the sector did not change as much. During 1990-91 the agricultural sector employed 51.5 percent of the labor force as compared to 59.3 percent during 1959-60. Both economic and social factors are to be blamed for this relatively smaller change in the size of agricultural labor force.

Overview of Manufacturing Sector

At the time of independence, Pakistan had virtually no industry what so ever. One of the top priorities of the government was the establishment of an industrial sector that would utilize country's resource base. In order to achieve this objective government used trade policy in conjunction with the subsidies and tax breaks. Due to these special considerations, the share of manufacturing sector in the GDP grew at an average annual rate of 7.9 percent during the last three decades.

The cotton manufacturing is the most important industrial sector of the country. This sector comprises the ginning (process of separating seed cotton into cotton lint and cotton seed), and the textile (process of transforming cotton lint into yarn, cloth clothing) industries. Before independence, all of the cotton industry was located in India. Trade policies were designed to push down the prices of the raw cotton, and to tax, or to ban the importation of the competing goods altogether. During the sixties, on one hand government used an overvalued exchange rate and export tax to keep the domestic price of the raw cotton down, and on other hand provided export subsidies that raised the prices of cotton yarn and fabrics. Dorosh and Valdes (1990) report that during this time the effective rates of protection for cotton yarn and fabric were 82 percent and 213 percent, respectively. During the mid seventies, the government taxed exports of both the raw cotton and the cotton yarn. Due to the export duties on the raw cotton and the cotton yarn, the spinning industry enjoyed heavy protection. During the early eighties, government adopted a new program with an aim to balance the prices, to modernize the industry, and to reduce the duties on the spinning machinery. According to Dorosh and Valdes (1990), this program proved to be very effective in making the industry more efficient, and more competitive in the global market. During the early eighties, the world market experienced a sharp increase in the prices of cotton yarn. The availability of cotton yarn at the prices lower than the ones in the global market, along with an increased efficiency in the production process made the spinning industry even more prosperous. Due to the successful use of the trade and exchange rate policies, the number of mills in the textile manufacturing has increased significantly (Figure 6). At present the government is taking steps toward another shift of policy to the one that would encourage increased production and export of fabrics and garments.

Overview of International Trade

Pakistan's trade policy had been designed to achieve three objectives. These objectives has been listed by Dorosh and Valdes (1990) as following:

1. to contain the trade deficit within manageable limits,
2. to ensure the adequate supply of the essential goods,

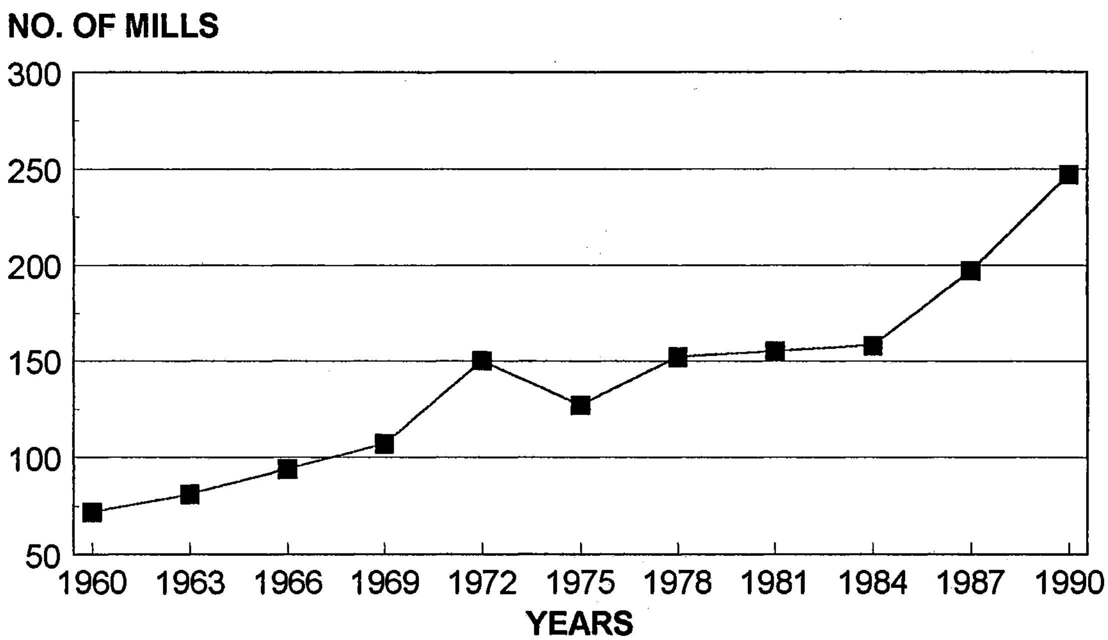

Figure 6: COTTON PROCESSING UNITS, PAKISTAN, 1960-90. (SOURCE: FINANCE DIVISION, ECONOMIC SUVERY 1991-92)

3. to direct the investment and production to the sectors in accordance with the national priorities.

In order to achieve the first objective, the government had been putting more emphasis on restricting the imports rather than export promotion. Over the last three decades these restrictions have been gradually decreased. Dorosh and Valdes (1990) cite results of different studies that have estimated effective rates of protection on manufactured goods. According to these results, the effective rate of protection on finished goods had decreased form 883 percent in 1963-64 to 26 percent in 1980-81, where as the effective rate of protection on the overall manufactured goods went down from 271 percent in 1963-64 to 66 percent in 1980-81. In a later study Dollar (1992), generated a trade policy orientation index that combined both effects, distortion and the variability of the exchange rate. On basis of this index Dollar ranked 95 developing countries in decreasing order of openness. According to Dollar's outward orientation ranking, Pakistan was the sixth most open economy in the group.

In order to ensure an adequate supply of the essential commodities the government allocated import licenses, lowered import duties, and restricted exports of these commodities. Dorosh and Valdes (1990) argue that the government failed to achieve its third objective of the trade policy. Dorosh and Valdes further argue that the structure of the protection resulting from trade policy discriminated against essential agricultural goods, and favored certain non-essential manufactured goods.

Exports

Over the last two decades, the economy has seen a significant change in country's export structure. During the last two decades the share of primary goods have gone down from 45 percent in 1971-72 to 16.8 percent in 1991-92, share of the semi-manufactured goods fell from 27 percent in 1971-72 to 21 percent in 1991-92, and the share of manufactured goods rose from 28 percent in 1971-72 to 62.2 percent in 1991-92 (Table IV, Figure 7). During the last ten years, the exports grew at an average of 9.2 percent per year to Rs. 138.3 billion or $6.1 billion (Table V, Figure 8). At present the exports are dominated by the so called cotton group which comprises of raw cotton, and its various manufactured products (Table VI, Figure 9). During 1990-91, the cotton group accounted for 58.2 percent, synthetic textiles were a distant second with 6.3 percent, and rice was the third most important contributor with 6.0 percent of total export earnings (Table III, Figure 5).

Imports

During the last two decades the import structure has not changed as much as the export structure, but never the less country is importing more raw materials for the consumer goods. During 1971-72, 23 percent of the imports were consumer goods, 24 percent were the raw materials to manufacture the consumer goods, 42 percent were capital goods, and 11 percent were the raw materials to manufacture the capital goods. In comparison during 1990-91, 14 percent of the imports were consumer goods, 38 percent were the raw materials to manufacture the consumer goods, 42 percent were

Table IV:
ECONOMIC CLASSIFICATION OF EXPORTS, PAKISTAN, 1971 AND 1991.

(Percent Share)

	July - March	
	1991-92 (Provisional)	1971-72
Primary Commodities	16.8	45.0
Semi Manufactured	21.0	27.0
Manufactured	62.2	28.0
Total	100.0	100.0

(Source: Finance Division, Economic Survey 1991-92)

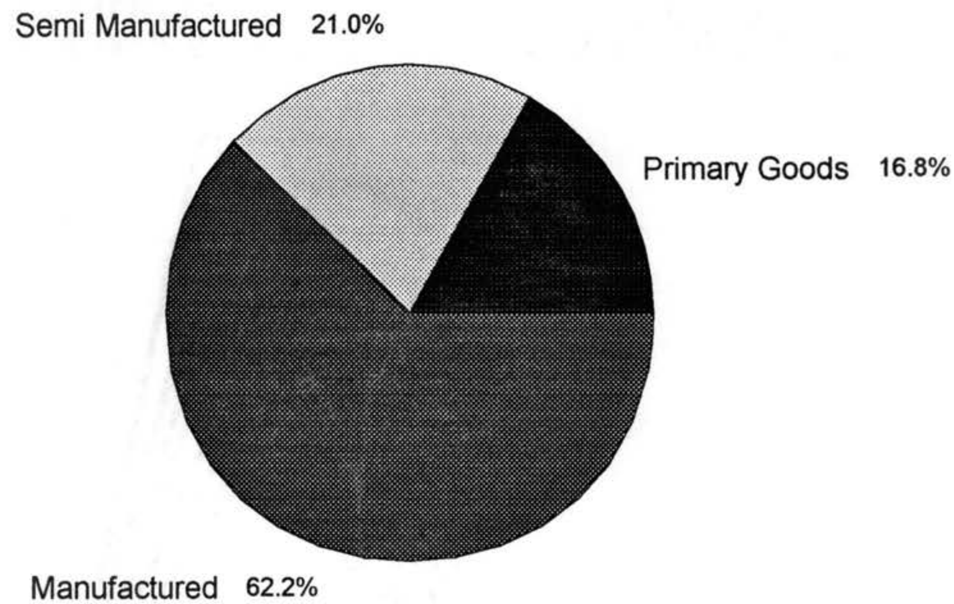

Figure 7: ECONOMIC CLASSIFICATION OF EXPORTS, PAKISTAN, 1991-92. (SOURCE: FINANCE DIVISION, ECONOMIC SUVERY 1991-92)

Table V

VALUE OF EXPORTS, IMPORTS, AND NET FACTOR INCOME FROM ABROAD (NFI) IN CURRENT AND CONSTANT PRICES, PAKISTAN, 1971-90.

Year	Current Prices			Constant Prices*		
	Exports	Imports	NFI	Exports	Imports	NFI
			(Rs. Million)			
1971	3371	4727	99	10867	15239	319
1972	8551	9598	463	25135	28213	1361
1973	10161	15202	617	22978	34378	1395
1974	10286	23016	1147	18354	41071	2047
1975	11253	23854	2992	17898	38124	4782
1976	11294	26741	5480	16148	38234	7835
1977	12980	32600	12139	17219	43248	16104
1978	16925	42529	14533	21054	52903	18078
1979	23410	54578	18284	26303	61324	20544
1980	29280	62129	22692	29280	62129	22692
1981	26270	68501	25349	23645	61657	22816
1982	34442	82018	39395	29617	70529	33877
1983	37339	92222	39595	29928	73920	31737
1984	37979	106729	38311	28809	80960	29061
1985	49592	103475	41359	36049	75216	30064
1986	63355	109273	36493	44453	76672	25606
1987	78445	131197	31096	51782	86604	20527
1988	90183	156641	28005	53928	93668	16746
1989	106469	173293	36900	60040	97724	20809
1990	138280	188681	30795	69216	94444	15414

* 1980-81 as the base year.

(Source: Finance Division, Economic Survey 1991-92)

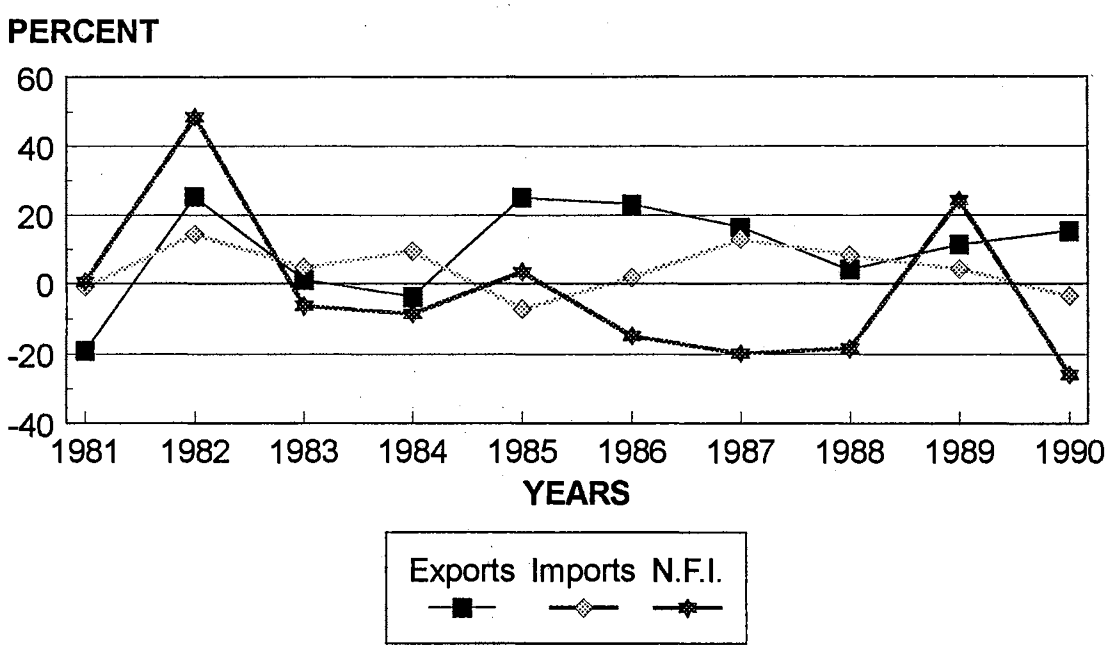

Figure 8: REAL GROWTH OF EXPORTS, IMPORTS, AND NET FACTOR INCOME FROM ABROAD (NFI), PAKISTAN, 1981-1990. (SOURCE: FINANCE DIVISION, ECONOMIC SUVERY 1991-92)

Table VI
BREAKDOWN OF EXPORTS BY THE COTTON GROUP, PAKISTAN, 1990-91.

(Percent Share)

	July - March	
	1991-92 (Provisional)	1990-91 (Actual)
Raw Cotton	8.6	6.0
Cotton Yarn	28.4	32.9
Cotton Fabrics	21.2	19.8
Readymade Garments	15.7	15.1
Tarpaulin and Canvas	1.4	1.9
Bed Wear	7.5	7.2
Hosiery	10.6	9.7
Towels	3.7	4.1
Others	2.9	3.3
Total	100.0	100.0

(Source: Finance Division, Economic Survey 1991-92)

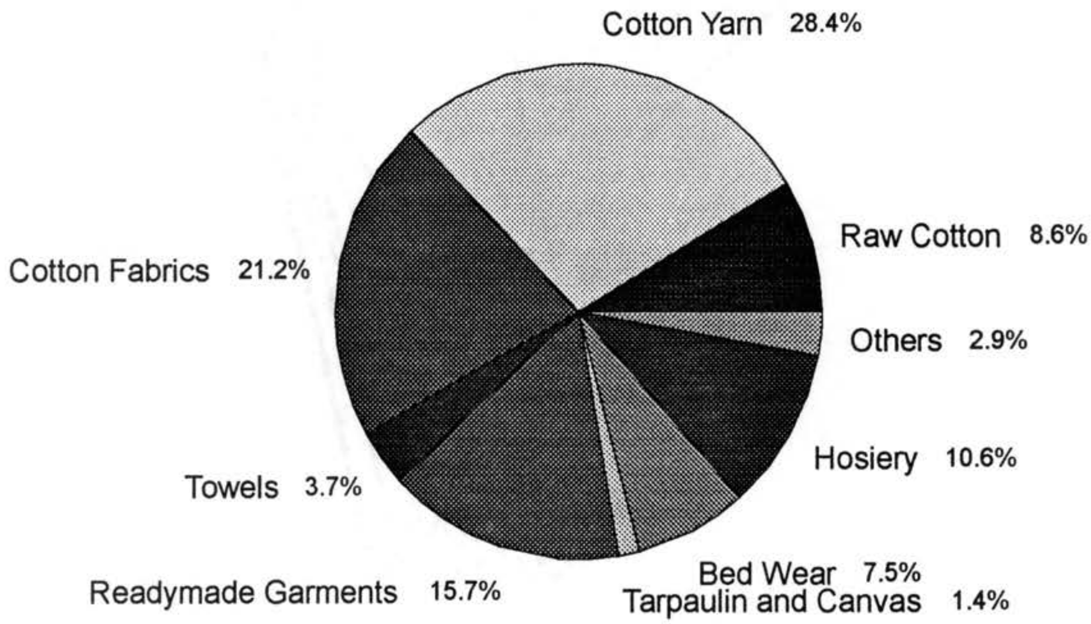

Figure 9: BREAKDOWN OF EXPORTS BY THE COTTON SECTOR, PAKISTAN, 1991-92. ((SOURCE: FINANCE DIVISION, ECONOMIC SUVERY 1991-92)

the capital goods, and 6 percent were the raw material to manufacture the capital goods (Table VII, Figure 10). During the last ten years imports increased at an average rate of 17.5 percent to Rs. 171 billion or $7.6 billion (Table V, Figure 8). During 1991-92, the imports were dominated by machinery which accounted for 27 percent, imports of chemicals accounted for 15.3 percent, and petroleum products for 8.8 percent of the total import value (Table VIII, Figure 11).

An Overview of the Pakistan's Net Factor Income From Abroad (NFI)

Since early seventies, Pakistan has been an extensive exporter of labor to the oil rich countries of middle east, and the developed world. Over the years, the net factor income from abroad (NFI) has played a duel role in Pakistan's economic growth. The NFI flows have not only helped to finance the country's trade deficit by providing much needed foreign exchange, but also have stimulated the economy through increases in domestic consumption and investment. Due to the political instability in the middle east, competition by labor from rest of the world, tougher immigration policies by the host country, and the overall situation of the world economy, the NFI has started to shrink during the recent years (Figure 8). During 1991-92, the Pakistanis working in Saudi-Arabia accounted for about 45 percent of the total NFI earnings. The workers' in United States of America accounted for 10.4 percent, while the workers' in United Kingdom accounted for 9.3 percent of the total workers' remittance (Table IX, Figure 12).

Table VII:
ECONOMIC CLASSIFICATION OF IMPORTS, PAKISTAN, 1971 AND 1991.

	(Percent Share)	
	July - March	
	1991-92 (Provisional)	1971-72 (Actual)
Consumer Goods	13.6	11.0
Raw Material for:		
i) Consumer Goods	37.7	26.0
ii) Capital Goods	6.2	11.0
Capital Goods	42.5	52.0
Total	100.0	100.0

(Source: Finance Division, Economic Survey 1991-92)

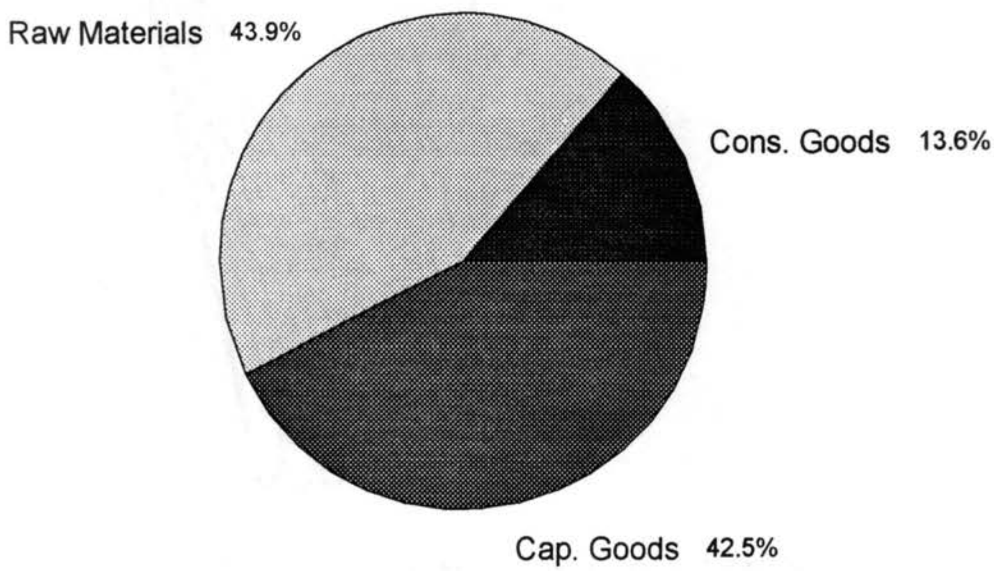

Figure 10: ECONOMIC CLASSIFICATION OF IMPORTS, PAKISTAN, 1991-92. (SOURCE: FINANCE DIVISION, ECONOMIC SUVERY 1991-92)

Table VIII
BREAKDOWN OF IMPORTS IN MAJOR CATEGORIES, PAKISTAN, 1990-91.

	(Percent Share)	
	July - March	
	1991-92 (Provisional)	1990-91 (Actual)
Machinery	26.99	19.59
Petroleum Crude	5.58	9.01
Petroleum Products	8.81	14.77
Sugar	0.42	2.11
Soybean Oil	0.75	2.52
Palm Oil	3.58	2.73
Chemicals	15.34	15.84
Transport Equipment	4.82	5.79
Wheat (Unmilled)	4.08	2.28
Iron and Steel	3.36	3.27
Tea	1.93	2.14
Others	24.34	22.06
Total	100.00	100.00

(Source: Finance Division, Economic Survey 1991-92)

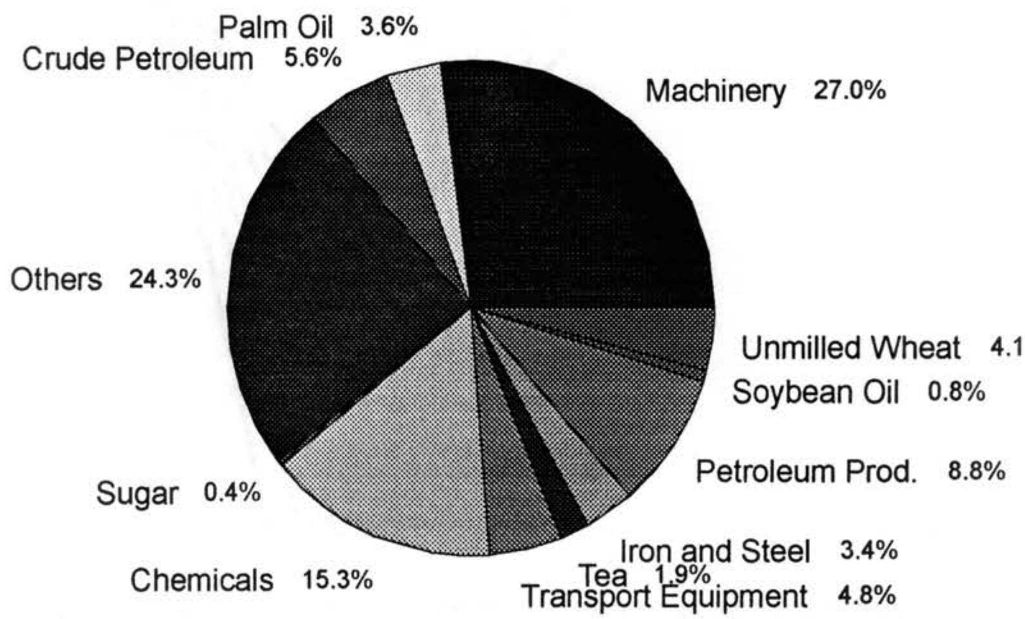

Figure 11: BREAKDOWN OF IMPORTS, PAKISTAN, 1991-92. (SOURCE: FINANCE DIVISION, ECONOMIC SUVERY 1991-92)

Table IX

AMOUNTS AND SHARES OF NET FACTOR INCOME FROM ABROAD (NFI) OR WORKER'S REMITTANCES BY THE MAJOR SOURCE COUNTRIES PAKISTAN, 1990-91 AND 1991-92.

		July - March			
		Amount (Mil. U.S. Dollars)		Percent Share	
Countries		91-92	90-91	91-92	90-91
A.	Oil Producers	752.62	978.29	66.7	67.6
	Saudi Arabia	489.77	633.98	45.0	43.8
	Abu-Dhabi	37.92	77.98	3.5	5.4
	Oman	57.25	75.21	5.3	5.2
B.	Others	362.05	469.72	33.3	32.4
	U.S.A.	113.64	147.33	10.4	10.2
	U.K.	101.10	141.82	9.3	9.8
Total	NFI	1087.67	1448.01	100.0	100.0

(Source: Finance Division, Economic Survey 1991-92)

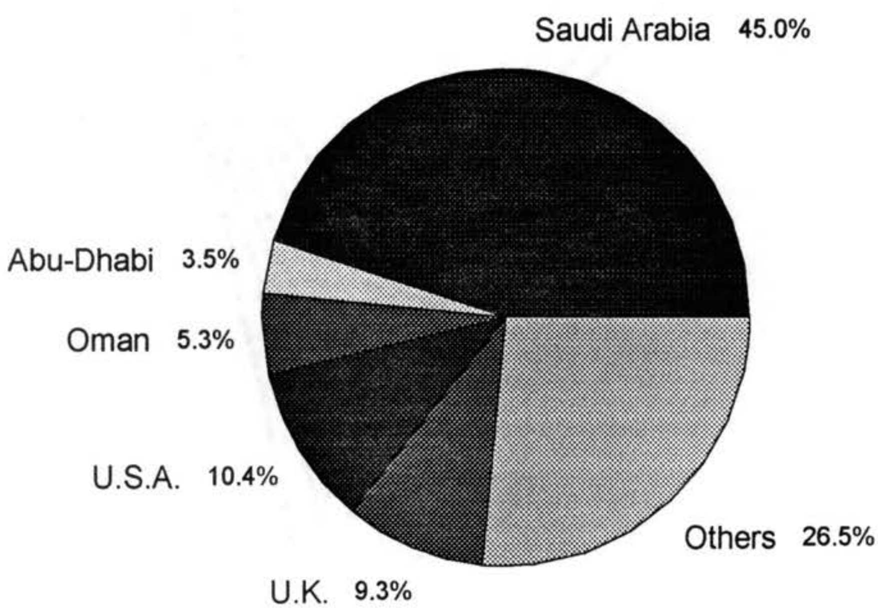

Figure 12: SOURCES OF NET FACTOR INCOME FROM ABROAD (NFI), PAKISTAN, 1991-92. (SOURCE: FINANCE DIVISION, ECONOMIC SUVERY 1991-92)

Organization of the Dissertation

The rest of the dissertation is divided into four chapters. Chapter II provides an overview of the work done on the previously discussed objectives. Chapter III specifies the models for all three phases of this study. It provides the underlying assumptions and hypotheses. This chapter also lists the data sources, and describes the techniques used for estimation. Chapter IV is divided into three sections as described earlier. Each of these sections present the results obtained in the different phases. Chapter V summarizes the results in chapter IV. This chapter is also aimed at providing some policy implications of this study.

CHAPTER II

LITERATURE REVIEW

Role of International Trade in Economic Growth

Since the late sixties, the export promotion policies have been regarded by the economists as a very effective development tool for the semi-industrialized countries (SICs). Their support for the export promotion policies stems mainly from the empirical evidence indicating the existence of a statistically significant and strong correlation between the growth rates of output and exports. Balassa (1978) was one of many economists whose work provided the evidence for the existence of this correlation. Balassa's work was a follow up on the work done by Michalopoulous and Jay (1973). Similar to Michalopoulous and Jay; Balassa used a production function type approach to quantify the impact of export promotion policies on the economic development. Balassa specified the output growth as a function of the two factors of production: namely, capital and labor, and of the exports. This study involved a cross-sectional data set, and was aimed at explaining the differences in the intercountry economic growth rates. In a later study Balassa (1985, pg. 32) defends the inclusion of the export growth rate:

> The introduction of an export variable in the production function-type framework aims at capturing the effects of exports on economic growth through improved resource allocation, capacity utilization, economies of scale, and

> technical change. Under the formulation utilized, intercountry differences in export growth rates, and in the share of exports to GDP, are considered to be manifestation of the trade policies followed.

Later on Tyler (1981) in a follow up to Balassa's work used the same methodology on a larger group of countries. Tyler's study used data for middle income countries for the period of 1960-70. This study was aimed at checking the validity of the hypothesis that the contribution of the export sector in a country's economic development is above and beyond the mere obvious. According to this hypothesis, the export sector also results in positive externalities for the rest of the economy. The proponents argue that the rest of the economy benefits due to better resource allocation, capacity utilization or reduced X-inefficiency (when the sector or the instution is not fully utilizing its resources) , and by the introduction of technological breakthroughs to the other sectors [Balassa (1978), Keeling (1967, 1969), Krueger (1980), Tyler (1981), Michalopoulous and Jay (1973), and Bhagwati and Srinivasan (1978)]. The results of the studies carried out by Balassa (1978), and Tyler (1981) led to the conclusion that in an inter-country setup, the exports have a strong and significant positive impact on the economic growth. Balassa (1978), and Tyler (1981) also report that with the inclusion of export variable in the model, the explanatory power of the estimating equation increased significantly.

Feder (1983) approached the externality hypothesis with a different formulation. Another contribution of Feder's work was that he assumed that on the contrary to the neoclassical theory, the marginal productivities across different sectors in the developing economies are not the same and the marginal productivities should be higher in the exporting sector. Feder (1983) argues that the markets in the developing countries have too many distortions to allow for the free movement of factors of production like the capital stock and the labor force. Feder (1983) incorporated the externalities by the use of the following formulation:

$$N=F(K_N,L_N,X) \tag{1}$$

$$X=G(K_X,L_X) \tag{2}$$

Where,

N = output of non-exports sector,

X = output of exports sector,

K_N,K_X = respective sector capital stock

L_N,L_X = respective sector labor force.

Feder allowed for the possibility of differing marginal productivities across the different sectors in the developing economies by incorporating the following relationship:

$$\left(\frac{G_K}{F_K}\right)=\left(\frac{G_L}{F_L}\right)=1+\delta \tag{3}$$

where the subscripts denote partial derivatives. This relationship implies that the marginal rate of technical substitutions are equal to $1 + \delta$ instead of 1. If the marginal productivities are the same across the sectors then the δ would have a value of zero. Feder applied his model to both broad and narrow groups of SICs for the period of 1964-73. Feder's results did provide the evidence showing that the marginal factor productivities do differ across the sectors. For the given data set the marginal factor productivities were significantly higher for the exporting sector. Feder concludes that the difference is in part due to the positive externalities generated by the export sector. Feder further concludes that the developing countries can not only grow with the expansion of the factors of production namely; capital stock and the labor force, but also by the reallocation of the resource from the less productive (non-export) sector to the more efficient (export) sector.

Balassa (1985) tries to examine the relationship between the growth rates of exports and the economy during the traumatic period of 1973-1979. In this study, Balassa not only re-estimates his original equation, but also analyzes the effects of alternative policies on economic growth, and combines the applied procedure into one single equation. The data set for the study included 43 developing countries all of which were adversely affected by the external shocks that occurred during the time period. Balassa's results indicate that the differences in the economic growth rates of different countries were a result of the differences in the capital stock or investment growth rates, growth rates of the labor force, the trade policies, and the composition of the exports. Balassa concludes that the economies of the countries with an outward oriented trade policy grow faster than the ones with more inward oriented policies, and that the low-income countries can accelerate their economic growth rates with the application of modern technology in combination with an appropriate trade policy. Balassa also suggests that the developing countries should gradually shift from the trade dominated by the primary commodities to the one that is more dominant in manufactured goods.

Almost all of the above mentioned works utilized a similar methodology. The results were obtained by regressing the GDP growth on a measure of export growth along with measures of capital stock growth and of labor force growth. Another common feature was the use of cross sectional data. Findings of these studies indicated the presence of a statistically significant, and positive correlation between the GDP growth and the export growth. Most of these researchers concluded that the correlation was caused by the positive externalities generated by the export sector.

Some of the more recent work has questioned the validity of the hypothesis that the positive correlation was due to the external effects of the export sector. Ram (1987) and Rana (1988) used the models similar to the ones used by Feder (1983), and Balassa (1978, 1985). Separate findings made by Ram (1987) and Rana (1988) indicated that the external effects of the export sector declined between the periods 1960-73 and 1973-1981. However Ram (1987) found an increase in the coefficient of export variable for low-income countries in his estimating equation. Jung and Marshall (1985) have listed three factors which could be responsible for the positive correlation between the real export growth and the growth in the real GNP. These factors are as follows:

1. growth in the demand for a country's output would increase the country's exports, and the export growth would lead to growth in real GNP,
2. increased exports would lead to increased foreign exchange availability,

and this might enable the economy to increase imports of intermediate and capital goods that in turn would lead to growth in the GNP,

3. growth in export sector might result in positive externalities like increased efficiency in the non-export sector, and these externalities would lead to growth in the GNP.

Most of the previously discussed literature tends to address only last of the above three possibilities for the existence of correlation between the export and output growths. At present most of the developing countries are dependent on their exports for the foreign exchange. Although some of them have the access to foreign exchange in the form of foreign aid and private loans, but still the exports are the main supplier of the much needed foreign exchange. Foreign exchange is needed for the imports of intermediate and capital goods. According to the theory of "two gap" model this function of the exports is only important when the economy is facing an import shortage resulting from a foreign exchange constraint. Most of the previous work has implicitly assumed that the import shortage was not a problem with the countries included in the study.

Esfahani (1991) carried out a study aimed at testing whether the semi-industrialized countries (SIC) are facing import shortage due to a binding foreign exchange constraint or not. Another contribution of this study was to use a system of equations estimated simultaneously rather than the use of a single equation. This study utilizes the data from three distinct periods; 1960-1973, 1973-1981, and 1980-1986. For the model selection Esfahani used the J-test as proposed earlier by

Davidson and Mckinnon (1981). His model consisted of a system of the following three equations:

$$s_x X_{pc} = s_x g_{pc} + \nu_1 g_{pc} + \nu_2 (\log G_{PC}) + \nu_3 l + \nu_4 l (\log L) + dr_x + (p_g - p) s_x \tag{4}$$

$$g_{pc} = \alpha k + \gamma_0 s_x x_{pc} + \gamma_1 t_x s_x X_{pc} + \lambda_0 r_m s_m m_{pc} + \lambda_1 r_m s_m m_{pc} \tag{5}$$

$$s_m m_{pc} = s_m g_{pc} + \sigma_1 g_{PC} + \sigma_2 g_{PC} (\log G_{PC}) + \sigma_3 l + \sigma_4 l (\log L) + dr_m + (p_g - p_m) s_m \tag{6}$$

Where,

g_{pc} = per capita growth rate of GDP,

k = share of investment in GDP,

s_x = export share in total gross output or average export-GDP ratio,

s_m = import share in total gross output or average import-GDP ratio,

x_{pc} = per capita growth rate of exports,

m_{pc} = per capita growth rate of imports,

t_x = a changing parameter to accommodate changes in export structure (from primary to secondary, and form secondary to tertiary),

r_m = residual term that captures deviation of a country's import-GDP ratio from its expected value (to take into account the fact that the data is for more than one country),

dr_x = captures affect of export promotion policies,

G_{pc} = per capita GDP,

l = growth rate of labor force,

L = average size of population (a proxy for labor force),

p = price index of total output of the economy,

p_g = price index of real GDP of the economy,

p_m = price index of imports,

For the model selection, first of all Esfahani estimated equations (2) and (3) without the export variables. He used the predicted value of g_{pc} in place of import variable in equation (2), and estimated the (1)-(2) system. According to the J-test, if the coefficients of a new variable are statistically significant then the variable should be included in the model. In Esfahani's case the import variable was highly significant for all three time periods. In a reverse test, Esfahani replaced the export variable with the predicted value of g_{pc} in the simultaneous equation model. The results indicated that the export variable could be left out without any significant impact on the analysis. According to Esfahani (1991, pg. 111), "These findings imply that the positive impact of the exports on GDP observed in the past is likely to be due to the import-shortage reduction rather than the externality effect".

Results obtained by Esfahani (1991) also help in explaining the findings made by Ram (1987). Esfahani (1991, pg. 112) writes, "Our analysis suggests the reduced impact of export expansion on GDP growth rate in SICs during the seventies must have been due to a reduction in the shortage of foreign exchange for these countries in this period". Esfahani's results also provide support for the findings made by Bruno (1983). Bruno (1983) reports that during the mid-seventies the enormous supply of petro-dollars resulted in relatively generous private loans to the SICs. The foreign private loans helped the SICs in avoiding the import shortages, despite the external shocks. However, these loans were not available to the very low-income countries. Low-income countries' lack of access to the non-official sources of foreign exchange led to these countries' increased dependence on exports for foreign exchange.

Some researchers have also questioned the validity of the methodology used prior to Esfahani's work. Most of the studies relied upon international cross-sectional data sets. As Jung and Marshall (1985, pg. 1) report, "Almost all of them regress a growth variable on a contemporaneous export variable. None consider the direction of causal relation between exports and growth". Another argument made by Jung and Marshall is that in most of the earlier work the direction of causality was assumed and not determined. Jung and Marshall (1985, pg. 3) argue, "hypothesis of export promotion should be taken to be not only an assertion of correlation, but also an assertion of causation". Jung and Marshall further argue that while export growth might lead to economic growth, an equally plausible hypothesis is that the economic growth could lead to growth of exports. Jung and Marshall give example of a growing economy with a leading sector. This leading sector is the center of rapid learning and technical changes resulting from the factors other than the government's policies regarding trade and production enhancement. These changes might be brought about by the accumulation of human capital, accumulated production experience, technology transfer through licensing or direct investment, or accumulation of physical capital. This economy has an unbalanced growth in the sense that some of the industries are growing at a much faster pace than rest of the economy. This unbalance could lead to the case where the demand for the products of these rapidly changing industries is not growing as fast as their production is. This could lead the producers to market their products in some alternative markets e.g; foreign markets. Now in this case the output growth led to a growth in economy's exports, and direction of the causation is totally opposite to the one assumed in the export-promotion hypothesis. Another objection to the old methodology of the use of production type models is that they suffer from a simultaneity bias, since export function might be a function of output growth [Jung and Marshall (1985), Heller and Porter (1978), and Esfahani (1991)]. Another contribution of Jung and Marshall (1985) study was that they used the individual country data to test for the direction of causality. Jung and Marshall (1985, pg. 11) report, "The time series results for 37 countries provide evidence in favor of export promotion in only four instances, Indonesia, Egypt, Costa Rica, and Ecuador. This strongly suggests that the evidence in favor of export promotion is weaker than previous statistical studies have indicated".

Esfahani (1991) used a second equation not only to relate the export growth to output growth, but also to relate the shifts in the factors determining the export-GDP ratio. In order to show the presence of binding foreign exchange constraint, Esfahani added the imports to the right hand side of the regression of GDP growth rate on capital, labor, and export growth rates. Esfahani defines the import shortage as the difference between the 'actual' and the 'expected' import-GDP ratio of the country. Esfahani calculated the 'expected' import-GDP ratio by using an equation that was estimated by regressing the import-GDP ratio on logs of per capita GDP, population, area, and squares of these logs. The area variable that was left out from similar studies proved to be the most significant. According to Esfahani's findings the most important function of the exports is to relieve the import shortages that are faced by many SICs. Esfahani also found that once this effect is isolated not much is left unexplained. Esfahani's results show that increased share of manufactured goods in the total exports do not increase the externality effect. Esfahani reports that the lack of significant external effects could be due to the existence of numerous distortions in the factor and in the product markets of the SICs. Esfahani (1991, pg. 114) concludes;

> ...export promotion policies in these countries can be quite valuable in supplying foreign exchange , which relieves import shortages and permits output expansion. Although in this role exports may be temporarily replaced by foreign assistance, long term growth of any developing country ultimately depends on the steady and strong expansion of its export sector.

Relationship between Agricultural and Industrial growth

The role of agriculture in the economic development is very complex and very dynamic, because the exact role is the result of interactions between various economic and social factors. According to Hwa (1988), these factors include the initial factor endowment, institutional setup, cultural backgrounds, historical factors, policy choices, etc. These factors could be more or less significant depending on the individual countries. For example; it could be argued that even though outward oriented trade policies have been found to be more effective in economic growth, but a country the size of India might not have the same choices as a smaller country like Singapore has. Singapore has a very small domestic market, so it has adopted outward oriented policies in order to benefit from its surplus production. In contrast this probably is not such an obvious alternative for India because of a huge domestic market with excess demand rather than the excess supply. For the Indian policy makers and planners the more important market is the domestic one with the objective of ensuring a safe supply of the essential commodities to the masses. The domestic needs might be the deciding factor behind an inward oriented trade policy adopted by the Indian government.

Johnston and Mellor (1961), and later Johnston and Kilby (1975) have identified some of the roles that the agriculture sector plays during the transition form traditional to an industrialized economy. These roles are as following:

1. the agricultural sector acts as market for the industrial products;
2. provides the raw material for the industry;
3. provides price stability by providing adequate food supply;
4. acts as a source of factors of production for the industry;
5. agricultural exports provide valuable foreign exchange for the importation of capital goods, raw material, and technology;
6. provides the rest of the economy with the enterpreneural and marketing capabilities necessary for an efficient industrial sector.

The relationship between the agriculture and the industry is of a unique nature. It is of both interdependence and complementary nature. The industry relies on agriculture for supply of inputs, labor and capital, and the agriculture benefits as the industry helps to modernize the traditional production techniques by providing it with modern inputs, technology, and improved managerial skills. The end result is that both of the sectors end up benefiting from each other. Chenery and Taylor (1968) and later Chenery and Syrquin (1975) in their studies on the development patterns present models to test such a relationships. Hwa (1988) uses such a non-linear model to test the significance of such relationship. Hwa's model relates the industrial growth to the per capita income and the agricultural growth. The model has the following functional form:

$$I=f[A,\ln YN,(\ln YN)^2]+\mu \qquad (7)$$

where;

I = industrial growth,

A = agricultural growth,

YN = per capita income,

μ = the error term.

Hwa used the cross-sectional data for 87 countries for two distinct time periods; 1960-70 and 1970-79. Haw's results indicate that the agricultural growth had a significant impact on the industrial growth for both time periods. Hwa's results also show that the inclusion of the agricultural growth variable raised the explanatory power of the model. For the first time period the R^2 jumped to 0.18 from 0.12, and to 0.28 from 0.13 for the second period. Hwa's results confirm the hypothesis that the countries with above normal growth in the industrial sector are the ones with the above normal growth in the agricultural sector. Hwa writes, "This result seems to suggest that the development of agriculture precedes that of industry".

CHAPTER III

METHODOLOGY

This chapter is divided into three sections. The first section deals with the role of agricultural exports in economic growth of Pakistan. The second section is aimed at determining the interaction between the growth in agriculture and the industrial growth. The third section looks at the impact of cotton on the industrial growth. Later in the chapter, the data sources and the estimation techniques are also discussed.

Role of Agricultural Exports in Economic Growth

The model used for the determination of the role of agricultural exports in economic growth is some what similar to the one used by Esfahani (1990). This model was chosen since it recognizes the presence of simultaneity bias in the earlier work, and also because it checks for the possibility of import shortages due to binding availability of foreign exchange. Some modifications were necessary to adopt the model for a time-series framework. Modifications were also needed to take into account the special characteristics of Pakistani economy e.g; inclusion of NFI. The model assumes that the economic growth is simultaneously determined along with agricultural exports, and the imports. Like Esfahani's (1990) model, this model also has a system of three simultaneous equations determining GDP, exports, and imports.

In contrast with Esfahani's model which was derived, this model is ad-hoc. As proposed by Davidson and McKinnon (1981) and by Esfahani (1991), the J test would be used during the process of model selection. According to the J test, if the coefficient of a variable is statistically significant then the variable should be included in the model.

One of the most commonly used functional form for describing GDP growth, export growth and import growth is the Cobb-Douglas function [Arize and Afifi (1987), Esfahani (1991)]. The preliminary plots of the economic, the exports, and the import growths also supported the choice of this functional form. A notable feature of this functional form is that the elasticity of the dependent variable with respect to the explanatory variable is constant and is equal to the regression coefficient. The Cobb-Douglas functional form is later transformed into a double log function for the purpose of estimation.

Agricultural Exports Equation

In contrast to Esfahani's export growth equation, this equation does not include agricultural labor force as an explanatory variable. The decision to drop the labor force was based on the fact that the Pakistan's agricultural sector has been considered as a labor surplus sector, so an increase in agricultural labor force might not result in a significant change in the size of agricultural exports.

One of the underlying assumption is that Pakistan is a small country in the world market. This assumption implies that the country's exports do not have any significant impact on the world market. This assumption allows to explain the exports by looking only at the variables that affect the supply of exports. This assumption is a reasonable one, since apart from raw cotton and rice all of the Pakistan's agricultural exports do not have any significant impact on the world market and these two commodities account for less than 20 percent of the total exports.

The following agricultural export function was chosen for this study.

$$X_{ac}=f(GDP_c,NFI_c,INV_c) \tag{8}$$

Above function takes the following Cobb-Douglas form.

$$X_{ac}=\beta_0(GDP_c)^{\beta_{GDP}}(NFI_c)^{\beta_{NFI}}(INV_c)^{\beta_{INV}} \tag{9}$$

Transformation of the equation (9) into a doublelog function leads to the following equation.

$$\log X_{ac}=\beta_0+\beta_{GDP}\log(GDP_c)+\beta_{NFI}\log(NFI_c)+\beta_{INV}\log(INV_c)+e \tag{10}$$

Where,

X_{ac} = real value of per capita agricultural exports in Rupees,

GDP_c = per capita real GDP in Rupees,

NFI_c = per capita real net factor income from abroad,

INV_c = per capita real investment,

β_0 = intercept or constant term,

$\beta_{var.}$ = the parameters characterizing the independent variables,

e = disturbance term.

The per capita GDP is expected to have a positive coefficient not only due to the fact that the growth in exports is also the growth in GDP, but also because of the externality hypothesis. The coefficient of the NFI is expected to be positive, since NFI could ultimately result in increased importation of technology and modern inputs like pesticides and fertilizers which in turn could result in increased agricultural production and exports. Another reason for positive relation between growth in agricultural exports and NFI is that it is spent in the domestic market. This added expenditure increases the demand for agricultural goods which provides an incentive to the producers to increase the supply of these goods and this could ultimately lead to increased exports. The coefficient associated with the per capita investment term is also expected to be positive, since increased investment in the agricultural sector is likely to expand the production base, and that in turn would result in increased exports. However, a negative coefficient for per capita investment would tend to support the view of net transfer of funds from agriculture to other sectors (Dorosh and Valdes 1990).

Imports' Equation

By considering the special features of Pakistani economy and the models that were previously used in the similar studies the following function was found to be most appropriate.

$$M_c = g(GDP_c, NFI_c, INV_c) \quad \textbf{(11)}$$

The above function takes the following Cobb-Douglas form.

$$M_c=\beta_0(GDP_c)^{\beta_{GDP}}(NFI_c)^{\beta_{NFI}}(INV_c)^{\beta_{INV}} \quad (12)$$

Transformation of the equation (12) into a doublelog function leads to the following equation.

$$\log M_c=\beta_0+\beta_{GDP}\log(GDP_c)+\beta_{NFI}\log(NFI_c)+\beta_{INV}\log(INV_c)+e \quad (13)$$

where,

M_c = Real value of per capita imports in Rupees,

GDP_c = per capita real GDP in Rupees,

NFI_c = per capita real net factor income from abroad,

INV_c = per capita real investment,

β_0 = intercept or constant term,

$\beta_{var.}$ = the parameters characterizing the independent variables,

e = disturbance term.

Due to the data limitations, total imports which do include the consumer goods. This proxy was used since the data for very recent years (1990-91) indicate that the share of consumer goods in the total imports was relatively small (less than 17 percent). The coefficient of the per capita GDP is expected to be positive, since an increase in the per capita income would mean increased buying power for the economy as a whole. A positive coefficient for the per capita NFI would provide support to the widespread belief that Pakistan has been using the funds to finance the trade deficit. Per capita investment is also expected to have a positive relation with the import growth, since the increased investment is likely to be spent on importing capital goods and technical know how from abroad.

The GDP Equation

GDP function is a modified form of the one used by Esfahani as it also includes the net factor income from abroad (NFI) variable.

$$GDP_c = h(X_{ac}, T_x, M_c, NFI_c, INV_c) \tag{14}$$

Above function takes the following Cobb-Douglas form.

$$GDP_c = \beta_0 (X_{ac})^{\beta_{Xa}} (T_x)^{\beta_{Tx}} (M_c)^{\beta_M} (NFI_c)^{\beta_{NFI}} (INV_c)^{\beta_{INV}} \tag{15}$$

Transformation of the equation (15) into a doublelog function leads to the following equation.

$$\log GDP_c = \beta_0 + \beta_{Xac}\log(X_{ac}) + \beta_{Tx}\log(T_x) + \beta_M\log(M_c) + \beta_{NFI}\log(NFI_c) + \beta_{INV}\log(INV_c) + e \tag{16}$$

Where,

GDP_c = per capita real GDP in Rupees,

X_{ac} = real value of per capita agricultural exports in Rupees,

T_x = Share of manufactured exports in total exports,

M_c = Real value of per capita imports in Rupees,

NFI_c = per capita real net factor income from abroad,

INV_c = per capita real investment,

β_0 = intercept or constant term,

$\beta_{var.}$ = the parameters characterizing the independent variables,

e = disturbance term.

A positive coefficient for the agricultural export variable would suggest the validity of the externality hypothesis. This function includes share of manufactured exports in the total exports (T_x) instead of manufactured exports, since this study is more concerned with the impact on GDP of a change in export structure. The coefficient of T_x variable is expected to have a positive sign. The share of exports of manufactured goods in total exports was included to check for the validity of the hypothesis that the externalities increase with a shift of export structure toward more manufactured goods. A significant positive coefficient would provide support to this hypothesis. The coefficient of import variable is expected to have a positive sign, since the increased imports of capital goods and raw materials would increase the overall production. Parameter associated with NFI is also expected to be positive, since the NFI not only allows the country to import more than otherwise, but also stimulates the economy through increased expenditure and investment. Investment is also expected to be positively related to the growth in GDP.

Interaction between Agriculture and Industry

Hwa (1988) uses a single equation model to determine the interaction between the agricultural sector and the industry. Hwa assumes that the industrial growth is a function of per capita income and the agricultural growth. This model acknowledges that the industry benefits from the agriculture, but does not take into account that the agriculture also benefits from the industry. It could be argued that while the industrial output in part is determined by the agriculture, at the same time the agricultural output is affected by the industry. This leads to the possibility of the simultaneity bias. The model used in this study not only recognizes that the interaction is two ways, but by estimating the equations with systems approach also deals with the simultaneity bias. The model consists of two equations. First equation determines the growth in the agricultural sector, where as the second one is to determine the economic growth in the industrial sector. Following Chennery and Syrquin (1975) and Hwa (1988), Cobb-Douglas type functions were used in this phase of study.

It is assumed that the growth of agricultural GDP is a function of the credit disbursed in the agricultural sector, of the agricultural labor force, of the total public investment, of the total private investment, of the growth in the industrial sector, and of the growth in the transportation sector. Equation determining the size of agricultural GDP could be written as follows:

$$G_A = f(C, L_A, I_B, I_T, G_I, G_T) \qquad \textbf{(17)}$$

ABove function takes the following Cobb-Douglas form.

$$GDP_A = \beta_0 (C)^{\beta_C} (L_A)^{\beta_L} (I_B)^{\beta_B} (I_T)^{\beta_T} (G_I)^{\beta_I} (G_T)^{\beta_T} \qquad \textbf{(18)}$$

Transformation of the equation (18) into a doublelog function leads to the following equation.

$$\log G_A = \beta_0 + \beta_C \log(C) + \beta_L \log(L_A) + \beta_B \log(I_B) + \beta_T \log(I_T) + \beta_I \log(G_I) + \beta_T \log(G_T) + e \tag{19}$$

where,

G_A= size of agricultural sector's GDP,

C= credit disbursed in the agricultural sector,

L_A= size of agricultural labor force,

I_B= total public investment,

I_T= total private investment,

G_I= size of industrial sector's GDP,

G_T= size of the transport sector's GDP,

β_0= intercept or constant term,

$\beta_{var.}$= the parameters characterizing the independent variables,

e= disturbance term.

Similarly it is assumed that the size of industrial GDP is a function of public and private investment, size of industrial labor force, size of agricultural GDP, and size of the GDP in the transport sector. There are two variables that represent the investment; public investment and private investment. The reason for splitting the investment into the two categories is to examine which of these played a bigger role in the agricultural and the industrial growths. Following function represents the industrial GDP:

$$G_I = g(L_I, I_B, I_T, G_A, G_T) \tag{20}$$

Above function takes the following Cobb-Douglas form.

$$G_I = \beta_O (L_I)^{\beta_{LI}} (I_B)^{\beta_{IB}} (I_T)^{\beta_{IT}} (G_A)^{\beta_{Ga}} (G_T)^{\beta_{Gt}} \tag{21}$$

Transformation of the equation (21) into a doublelog function leads to the following equation.

$$\log G_I = \beta_0 + \beta_{LI} \log(L_I) + \beta_{IB} \log(I_B) + \beta_{IT} \log(I_T) + \beta_{GA} \log(G_A) + \beta_{GT} \log(G_T) + e \tag{22}$$

where,

G_I = size of industrial sector's GDP,

L_I = size of industrial labor force,

I_B = total public investment,

I_T = total private investment,

G_A = size of agricultural sector's GDP,

G_T = size of transport sector's GDP,

β_0 = intercept or constant term,

$\beta_{var.}$ = the parameters characterizing the independent variables,

e = disturbance term.

In equation (19), the coefficient for the credit disbursed in the agricultural sector is expected to have a positive sign. The growth in real GDP is expected to be positively related to the size of the agricultural labor force unless the sector has surplus labor. In case of surplus labor the coefficient might not be significant, and in the extreme case could also be negative. Due to the data limitations, the investment variables represent the total investment in the economy rather than the investment in the individual sectors. The public investment could either have positive relation, or have negative relation with the growth in the agricultural sector. The coefficient will have a positive sign if significant share of the investment is being made in the agriculture, and sign would be negative if the sector is being ignored. The sign on the coefficient of private investment is expected to be positive, but it may be smaller than the coefficient of private investment in the equation that determines the growth in the industrial sector. The reason for a smaller coefficient might be what Dorosh and Valdes (1990) phrase as net outflow of capital from agriculture. The coefficient for the growth in the industrial sector represents the benefit that agriculture gets from industry. This coefficient in equation (19) is expected to be positive, and smaller than the coefficient of the agricultural growth in the equation (22). The reason for this could be the fact that, since independence the industry has depended upon agriculture for raw materials, but it was not till early eighties that the industry started supplying the agriculture with modern technology. The sign on the coefficient of growth in the transport sector is expected to be positive in case of both equations, but it should have bigger impact on agriculture since to farmers improvements in transport sector means better access to the market. Most of the industry is already accessible, so the expansion in the transport sector may not have as big impact as in agriculture.

In equation (22), the coefficient of industrial labor in the second equation is expected to have a positive sign. The sign on the coefficient for the public investment is expected to be positive in the case when a significant portion of the spending is done to encourage establishment of the industry. The sign on the size of the agricultural GDP is expected to be positive, since most of the industry is based on the agriculture. The sign on the coefficient for size of the transport sector is also expected to be positive.

Cotton and Industrialization

Cotton has played an important role in the industrial growth of the country. Majority of the country's private industry is based on the cotton manufacturing. Due to the fact that the cotton production and the industry grew at the same time and due to the fact that the most of country's private industry is based on cotton processing could and does lead to the argument that the cotton has compelled the industry to grow. On the other hand, one can argue that it was the growth in the industry that resulted in the increases in the cotton production. Both of these point of views carry weight, and this probably means that the value of cotton production and size of the industrial GDP are determined simultaneously. This study recognizes the possibility of this process being two ways, and uses a system of simultaneous equations to estimate a model explaining the role of cotton in industrialization and role of industry in expanding the production of cotton.

The factors that might have significant impact on the cotton production are price of cotton, availability of credit to farmers, size of agricultural labor force, and number of cotton manufacturing units in the country. The function could be written as follows:

$$COT = f(PR, ACRD, AL, MILLS) \tag{23}$$

Above function takes the following Cobb-Douglas form.

$$COT = \beta_0 (PR)^{\beta_{PR}} (ACRD)^{\beta_{ACRD}} (AL)^{\beta_{AL}} (MILLS)^{\beta_{MILLS}} \tag{24}$$

Transformation of the equation (24) into a doublelog function leads to the following equation.

$$\log COT = \beta_0 + \beta_{PR} \log(PR) + \beta_{ACRD} \log(ACRD) + \beta_{AL} \log(AL) + \beta_{MILLS} \log(MILLS) + e \tag{25}$$

where,

COT	= the real value of total production,
PR	= whole sale price index for cotton
ACRD	= the amount of credit disbursed among farmers,
AL	= size of agricultural labor force,
MILLS	= number of cotton processing factories,
β_0	= intercept or constant term,
$\beta_{var.}$	= the parameters characterizing the independent variables,
e	= disturbance term.

The coefficient of the cotton price is expected to have a positive sign. The reason for a positive relation between the cotton production and its price would imply that the farmers do respond to the price changes by adjusting their production in the direction of the change. The coefficient of the agricultural credit is expected to be positive, if the credit is being used to produce cotton or to improve the technologies used in its production. Size of agricultural labor should have a positive impact on the total value of cotton, unless the agricultural sector has excess supply of labor. A positive coefficient for number of cotton manufacturing units would indicate that the cotton production is responding to the increased demand.

The function determining the industrial growth is a modification of the one described in the previous section. It is assumed that the size of the industrial GDP is a function of industrial labor, total investment, value of cotton production, and imports. The function could be written as:

$$IGDP=g(IL,COT,INV,M) \tag{26}$$

Above function takes the following Cobb-Douglas form.

$$IGDP=\beta_0(IL)^{\beta_{IL}}(COT)^{\beta_{COT}}(INV)^{\beta_{INV}}(M)^{\beta_M} \tag{27}$$

Transformation of the equation (27) into a doublelog function leads to the following equation.

$$\log IGDP=\beta_0+\beta_{IL}\log(IL)+\beta_{COT}\log(COT)+\beta_{INV}\log(INV)+\beta_M\log(M)+e \tag{28}$$

where,

IGDP = size of industrial sector's GDP,

IL = size of industrial labor force,

COT = value of total cotton production,

INV = total investment,

M = value of the total imports,

β_0 = intercept or constant term,

$\beta_{var.}$ = the parameters characterizing the independent variables, *e* = disturbance term.

Industrial sector's GDP is expected to be positively related to the size of the industrial labor. The coefficient of the value of cotton production is expected to be positive which would indicate that cotton production has been a factor in country's industrial growth. The total investment is also expected to be positively related to the industrial growth, unless the bulk of investment is made in other sectors of the economy. The parameter of total imports is also expected to have a positive sign, since most of the country's imports consist of capital goods, and raw materials that are used in agricultural production..

Data Sources

Finance department's Economic Survey of Pakistan 1991-92 (1992) was the primary source of data in this study. The monetary data was deflated with the GDP deflator to 1980-81 levels. World Bank Development Reports (1989, 1991) were used to supplement and complement in the data.

Estimation Techniques

One of the assumptions of the classical linear regression model is that in the repeated samples the observed values of the independent variables are considered fixed. In case of a system of a simultaneous equations this assumption is violated. In such a system of equations; all the endogenous variables are random variables and are determined simultaneously. With a change in any of the disturbance terms changes all the endogenous variables. According to Kennedy (1990), a system of simultaneous equations can be estimated by the following two methods;

1. single equation models,
2. systems methods.

1. Single Equation Models

These techniques estimate a system of simultaneous equations by estimating each equation separately. These techniques are also called the 'limited information' methods, because they only utilize the information provided from the equation being estimated. Some of these single equation models are as follows;

a. ordinary least squares (OLS),
b. indirect least squares (ILS),
c. instrumental variables (IV),
d. two-stage least squares (2SLS),
e. limited information, maximum likelihood (LI/ML).

OLS and 2SLS are two of the most popular single equation methods of estimating the simultaneous equation models. Brief discussion of the two follows.

a. Ordinary Least Squares (OLS) For a data set of values of the parameters describing a relationship, estimated values of the dependent variable can be calculated by using the values of independent variables in the data set. The estimated values of the dependent variables are subtracted from the actual values to produce the errors or the residual terms. A good estimator is the one that would minimize these residuals. The estimator that generates the set of values that minimize the sum of squared residuals is called the ordinary least squares (OLS) estimator. In case of simultaneous system of equations, OLS estimate suffer from asymptotic bias.

Kennedy (1990) argues even though the OLS estimates suffer from the asymptotic bias, OLS should be used due to the following reasons;

i. in very small samples, the estimates from the alternative models are also biased and also because the OLS estimator has the minimum variance among these alternative methods,

ii. according to the Monte Carlo studies, as compare to the alternatives in the small samples the OLS estimator is less sensitive to the presence of estimation problems like multicolinearity, errors in variables or mis-specifications,

iii. predictions from simultaneous equations models estimated by OLS compare quite favorably to the ones estimated by the alternative techniques,

iv. OLS is very useful as a preliminary or exploratory estimator.

b. Two-Stage Least Squares (2SLS) As the name suggests the 2SLS estimator is carried out in two stages. In the first stage, each of the endogenous variables is regressed as a regressor on all the exogenous variables in the simultaneous equations model, and then the estimated values of these endogenous variables. In the second stage, the estimated values of the endogenous variables and the exogenous variables are used as regressors in an OLS regression.

2SLS is an instrumental variable estimator which ensures that the estimators are consistent. Monte Carlo studies have shown that the small-sample properties of the 2SLS on most criteria are superior to all other estimators. These studies have also shown that 2SLS is quite robust which implies that its desirable properties are insensitive to the estimation problems like multicolinearity and mis-specification errors. These reasons combined with its low computational cost has made the 2SLS estimator the most popular of all simultaneous equations estimators (Kennedy 1990).

2. Systems Methods

Systems estimating procedures estimate all the equations in model together as a set, instead of estimating these equations one at a time. These systems methods are also referred to as full information methods, because they utilize all the information of zero restrictions in the entire system during the estimation of structural parameters. The major advantage of these methods is that, since they incorporate all of the available into their estimates, they have a smaller asymptotic variance-covariance matrix than single-equation estimators. Due to the same reason, if the system is mis-specified the estimates of all structural parameters are affected. 3SLS is one such method, and is briefly discussed below.

Three Stage Least Squares (3SLS) As the name says, this method can be divided into three stages. In the first stage, the 2SLS estimates are calculated for the equations in the system. In the next stage, the 2SLS estimates are used to estimate the residuals of the structural equations, and then these residuals are used to estimate the contemporaneous variance-covariance matrix of the structural equations' residuals. In the third and final stage, the generalized least squares technique is used to the large equation that represents all the equations in the system.

The 3SLS estimator is not only consistent, but is also asymptotically more efficient than the 2SLS estimator. If the error terms in the structural equations in the system are not correlated, or in other words the contemporaneous variance-covariance matrix of the disturbances of the structural equations is diagonal; the 3SLS reduces to the 2SLS.

While estimating a system of simultaneous equations, 3SLS is superior to the OLS and the 2SLS because it not only takes into account all the information regarding the structural parameters in the system, but also because it is asymptotically more efficient than the 2SLS (Kennedy 1990). Due to the fact that the 3SLS takes into account all the information regarding the equations, and since it is asymptotically more efficient than the OLS and the 2SLS, the 3SLS is used for the estimation purposes in all three phases of the study.

CHAPTER IV

ESTIMATION RESULTS

This chapter is also divided into three sections. First section presents and elaborates the results obtained from the analysis done on the role of agricultural exports in economic growth. In the second section the results from the section on interaction between agriculture and the industry are presented. Third section explains the results obtained from the analysis done on determination of cotton's role in the industrialization of the economy.

Role of Agricultural Exports in Economic Growth

The results of the estimation using three stage least squares (3SLS) of simultaneous equations (10), (13) and (16) with data for years 1970 through 1990 are reported in table X. Table X also reports results obtained from using three modifications of the previously described model. These models are presented in columns (1)-(4). The results from the complete model are reported in column (1). The second model reported in the table, is a modification of the original model, and its results are presented in the column (2). In this model, the share of manufactured goods in the total exports have been dropped in the equation (16). In the third model the equation (13) that deals with the imports has been dropped along with the per

Table X:

THREE STAGE LEAST SQUARES (3SLS) AND ORDINARY LEAST SQUARES (OLS) ESTIMATION RESULTS FOR EQUATIONS (10,13,16), PAKISTAN,1971-90

Variable	Complete Model Estimated With 3SLS (1)	Exports & Imports Included Estimated With 3SLS (2)	Exports Included Estimated With 3SLS (3)	Single Equation Models Estimated With OLS (4)
GDP equation				
LOG (Xac)	0.3646***	0.2225***	0.2818***	0.3395***
	(3.7736)	(3.3932)	(4.1430)	(2.818)
LOG (Tx)	0.5358**		0.2347*	0.6880**
	(2.1394)		(1.5760)	(2.1820)
LOG (Mc)	-0.1752	0.1186		-0.2935
	(1.1038)	(1.1993)		(1.458)
LOG (NFIc)	-0.0106**	-0.0152**	-0.0133**	-0.0048
	(2.0227)	(2.6453)	(2.5986)	(0.7462)
LOG (INVc)	0.5682***	0.6869***	0.6226***	0.5731***
	(3.8610)	(4.5549)	(3.9712)	(3.1320)
Constant	1.9342***	0.8934***	1.3608***	2.3435***
	(3.619)	(3.0470)	(3.1170)	(3.5010)
Agricultural Exports equation				
LOG (GDPc)	1.8396***	1.9871***	1.9213***	1.1792**
	(3.3884)	(3.7820)	(3.5858)	(1.8710)
LOG (NFIc)	0.0533***	0.0532***	0.0532***	0.0533***
	(4.3710)	(4.3696)	(4.3702)	(3.9380)
LOG (INVc)	-1.5566***	-1.6772***	-1.6234***	-1.0163*
	(3.0143)	(3.3269)	(3.1744)	(1.7140)
Constant	-0.3236	-0.5123	-0.4281	0.5216
	(0.3248)	(0.5224)	(0.4324)	(0.4610)
Imports equation				
LOG (GDPc)	0.6901*	0.7454**		0.4423
	(1.7606)	(1.9183)		(1.0030)
LOG (NFIc)	0.0287***	0.0286***		0.0287***
	(3.3606)	(3.3598)		(3.0270)
LOG (INVc)	0.6384*	0.5931*		0.8410**
	(1.7260)	(1.6141)		(2.0270)
Constant	-1.4348**	-1.5056**		-1.1178*
	(2.0270)	(2.1360)		(1.4120)

Numbers in parentheses are t-statistics.
*** Significant at $\alpha = 0.01$,** at $\alpha = 0.05$,* at $\alpha = 0.10$.

capita import variable in the GDP growth equation. The results from this model are reported in the column (3). The fourth and the final model consist of only the GDP growth equation, and is estimated by using the OLS approach. The estimation results from this model are provided in the column (4). The data is in real terms, and is deflated by GDP deflator with 1980-81 as the base year.

All four models yield positive coefficients for the per capita agricultural exports which are statistically significant at a significance level of 1 percent. This provides an implicit support for the externality hypothesis. According to these models, an increase of one percent in the per capita agricultural exports would ultimately result in an increase of 0.22 to 0.36 percent in GDP. The growth in the GDP could be the result of one, or both of the following:

1. an increase in exports is also an increase in GDP, since GDP also includes the exports,
2. the exports generate positive externalities that lead to growth in rest of the economy.

As expected model (1), (3), and (4) yield positive coefficients for T_x. The coefficients of T_x in model (1) and (4) are statistically significant at a significance level of 5 percent. The coefficient is also statistically significant in model (3), but a lower level of significance;namely, at 10 percent. This tends to imply that the GDP grows faster when the share of manufactured goods in the total exports increases. The positive relation seems to suggest that the externalities generated by the export sector increase, when the share of the manufactured goods in the total exports increases.

The coefficient of the real per capita imports is negatively related in the model (1) and model (4) and is positively related in the model (3), but none of these is statistically significant at a significance level of 10 percent. Reasons for the insignificance might be the absence of a tight enough foreign exchange constraint and also since most of the expenditure on imports (42 percent) is also included in the investment. Absence of a binding foreign exchange availability could be a result of the considerable flow of NFI, foreign loans, foreign aid, and direct foreign investment. Reasons for the negative coefficient might include the fact that the expenditure on imports of capital goods which accounts for over 40 percent of the total expenditure on imports is also included in investment.

As expected, in all four models the coefficient associated with the per capita investment is statistically significant at a significance level of 1 percent and is positive. In most of the equations this coefficient is larger in the magnitude than any other coefficients in the equation, which would imply that an increase in investment would lead to more growth in the per capita GDP than any of the other factors.

The sign of the coefficient associated with the NFI in models (1), (2) and (3) is statistically significant at a significance level of 5 percent, and is not statistically significant at 10 percent level of significance in the fourth model. The coefficient is negative in all four models. In all four cases the coefficients are very small, and an increase of 1 percent in NFI would decrease the GDP by 1 percent at most. The reason for the sign other than the one expected might be due to the complicated and very indirect role of the NFI in determining GDP.

The signs of the coefficients in the equation determining the agricultural exports in column (1), (2), and (3) are all positive and are significant at significance levels of 1 percent except the one associated with the per capita investment. In all three models the coefficient of the per capita GDP is much larger than the coefficient of the per capita agricultural exports in the equation determining the GDP. This implies that an increase in per capita GDP has resulted in a much larger increase in the agricultural exports. This does not give any clue about the direction of causality, but it does hint about the presence of simultaneity bias when a single equation model is used.

In the equation determining the growth in agricultural exports, ss expected the NFI variable has a positive coefficient in all three models. This positive coefficients tends to support the hypothesis that the net factor income plays an indirect role in determining Pakistan's agricultural exports. While the NFI allows the country to import pesticides, fertilizers and other inputs for agriculture, it also results in increased demand for the agricultural products and in increased investment in the sector. The increased demand provides the incentive for the producers to increase their production and the increased supply increases the agricultural exports.

The per capita investment has a negative coefficient that is significant at a significance level of 1 percent. The reasons for the negative impact of an increase in the investment could be due to the following;

1. investment is decreasing in the agricultural sector,
2. most of the industry thrives on agriculture for inputs and increased

investment in the industrial sector would result in increase demand for the agricultural commodities which in turn would decrease the agricultural exports,

3. data limitations.

As expected all of the coefficients in the import growth equation (13) are positive. As expected the coefficient of NFI is significant at a significance level of 1 percent in columns (1) and (2). This implies that over the period of study, the NFI has played a significant role in the determination of the imports by providing the foreign exchange.

The coefficients of per capita investment in the first and the second are positive and are statistically significant at a significance level of 10 percent. The positive sign of the investment coefficient implies that a major part of investment is spent on importing the capital goods from abroad.

The coefficient of per capita GDP is positive in both models (1) and (2). The coefficient is statistically significant at a significance level of 10 percent in the first model and at a significance level of 5 percent in the second model. The positive sign implies that in the past the growth in per capita GDP has allowed the country to increase its imports.

Interaction Between Agricultural and Industrial Sector

The results of three stage least squares (3SLS) estimation of equations (19) and (22) with data for years 1963 through 1990 are reported in column (1) of table XI. Column (2) reports the results of OLS estimation of equation (19), and column (3)

Table XI

THREE STAGE LEAST SQUARES (3SLS) AND ORDINARY LEAST SQUARES (OLS) ESTIMATION RESULTS FOR EQUATIONS (19,22), PAKISTAN,1963-90

Variable	Complete Model Estimated With 3SLS (1)	Agricultural Growth Model Estimated With OLS (2)	Industrial Growth Model Estimated With OLS (3)
Agricultural GDP Equation			
LOG (C)	0.0376	0.0411	
	(1.4164)	(1.492)	
LOG (L_A)	0.3346	0.3579	
	(1.0235)	(1.056)	
LOG (I_B)	-0.1376	-0.1576*	
	(1.5953)	(1.767)	
LOG (I_T)	0.0622	0.0728	
	(1.1537)	(1.321)	
LOG (G_I)	0.0855	-0.0315	
	(0.4745)	(0.1683)	
LOG (G_T)	0.2879*	0.3758**	
	(1.7952)	(2.264)	
CONSTANT	3.0906***	3.2588***	
	(6.3620)	(6.471)	
Industrial GDP Equation			
LOG (L_I)	0.1690		0.1889
	(0.5776)		(0.6426)
LOG (I_B)	-0.1002		-0.1132
	(1.2366)		(1.4020)
LOG (I_T)	0.0120		0.0242
	(0.1204)		(0.2451)
LOG (G_A)	0.5013**		0.4422
	(2.2343)		(1.0940)
LOG (G_T)	0.1690		0.6357***
	(0.5776)		(2.8420)
CONSTANT	-0.6998		0.0316
	(0.6688)		(0.0302)

Numbers in parentheses are t-statistics.

*** Significant at $\alpha = 0.01$,

** Significant at $\alpha = 0.05$,

* Significant at $\alpha = 0.10$.

reports the results of OLS estimation of equation (22). The results for the agricultural growth equation (19) in the column (1) show that all the parameters have the expected signs for the public investment. Models in column (1) and column (2) suggest that the amount of credit disbursed in agriculture has played a positive, but this role was not significant at a significance level of 10 percent. This insignificance could be due to the following reasons;

1. majority of the farming community consists of the small scale farmers who do not have access to the credit,
2. the agricultural loan mechanism lacks effective mechanism to ensure that the loans are used to for enhancing the agricultural production and not on non-productive activities like marriage ceremonies and political campaigns.

In column (1) and (2), the parameters of the agricultural labor force is positive, but not significant at a significance level of 10 percent. This provides the support for the wide spread belief that there is surplus labor in agriculture, and the growth in this sector has been the result of improved production techniques and increased productivity of the existing labor force rather than due to labor growth.

The coefficients for the public investment in the first column is not statistically significant at 10 percent and has a negative sign. The coefficient of public investment in the second model is negative, and is significant at a significance level of 10 percent. which could be due to the following reasons;

1. net capital transfer out of agriculture to other sectors of the economy;
2. the data set does not distinguish between the investment in agricultural

sector and other sectors and a better data set might yield different results. During 1990-92, the public investment in the agriculture has declined (Finance Division, Economic Survey 1991-92).

The coefficients for the private investment are positive in the models reported in the columns (1) and (2). The coefficients in both of these models are not significant at a significance level of 10 percent. The insignificance could also be due to the lack of a more precise measurement of the investment in agriculture. The positive sign implies that in the past the private investment has helped the agriculture grow.

In column (1), the coefficient for the industrial growth is positive, but is not statistically significant at a 10 percent level of significance. This tends to indicate that the agriculture is not significantly benefiting form the manufacturing sector, which might be due to the fact that the industry did not start to provide agriculture with modern inputs until recently. It was not until mid eighties that the industry started supplying the agricultural sector with the modern inputs in sufficient quantities. Another reason could be the relatively small number of manufacturing units providing for the agricultural sector's needs. In the column (2), the coefficient of the industrial growth is also statistically insignificant at a significance level of 10 percent, but is negative. The reverse sign could be the result of simultaneity bias.

The coefficient of the growth in the transport sector in column (1) and (2) are both positive. The coefficient in the column (1) is statistically significant at a significance level of 10 percent. The coefficient in the column (2) is statistically significant at a significance level of 5 percent. This implies that the growth in the transport sector has benefited the agricultural. The growth in transport sector would have benefited the agricultural sector by providing the farmers with a better access to the markets. Better access to the markets mean that farmer has incentive to produce more, and also that more of the produce is accounted for while calculating the total output.

All of the coefficients of the industrial growth equation in column (1) and column (3) have the expected signs for the ones associated with public investment. In both columns, the coefficient associated with the industrial labor force has positive sign, but is not significant at a significance level of 10 percent. This could be due to the fact that in the industrial sector the quality of the labor is more important than its size. It could be said that the growth in the industrial output has been the result of a increased skill of the labor force and of a more advanced technology.

In both columns the signs of the coefficients of the public investment are negative. These coefficients are not significant at significance level of 10 percent. The signs other than expected and the insignificance of the coefficients could be the result of the same reasons as described earlier while discussing the role of public investment in agricultural sector.

In both columns the private investment has a positive coefficient which are not significant at a significance level of 10 percent. The positive sign implies that the industry benefited from growth in the overall positive investment. One of the reasons for the insignificant coefficients could be the nationalization of the industry in the early seventies. Due to this policy, the investors turned to other sectors for investment opportunities. Another reason might be the fact that the investment data is aggregate and does not provide any information on its distribution among the different sectors.

The coefficients associated with the agricultural GDP are positive for the models in columns (1) and (3). The coefficient in the first column is significant at a significance level of 5 percent and the one in column (3) is not significant at a significance level of 10 percent. The reason for the positive signs is the fact that most of the industry relies upon agricultural sector for the inputs. The reason that the coefficient of agricultural GDP in the column (3) is not very significant could be attributed to the presence of simultaneity bias. The coefficient of the growth in agricultural sector is larger than the coefficient of the industrial growth in the agricultural growth equation, which suggests that the industry has benefited more form the relationship than the agriculture.

The coefficients of the growth in the transport sector in columns (1) and (3) are positive in both columns, but the coefficient in the column (1) is much smaller than the one in column (3) . The coefficient in the first column is not significant at a significance level of 10 percent, but the coefficient in the third column is significant at a significance level of 5 percent. According to the model in column (1), the growth in the transport sector has a bigger impact on the agricultural sector than on the industrial sector. On the other hand the coefficient in the column (3) is not only larger, but also more significant. This suggest that the results in column (3) might suffer form simultaneity bias.

Role of Cotton in the Industrial Growth

The results of three stage least squares of equations (25) and (28) are reported in column (1) of table XII. The signs of the parameters in the equation (25) are according to the expectations, with the exception of the one associated with agricultural credit. The sign of the coefficient associated with the agricultural credit is negative, and is significant at a significance level of 5 percent. The results seem to suggest that an increase in the amount of credit disbursed among the farmers, resulted in a decrease in the cotton production. One possibility could be that since cotton is produced on less than 15 percent of the cultivated land, and probably the bulk of the loans are spent on other crops. Another reason behind the negative sign might be the possibility that most of the money is being spent on the non-productive activities.

According to these results the agricultural labor has a positive impact on the cotton output. The coefficient is not significant at a significance level of 10 percent. The insignificance of the coefficient tends to support the view that the agricultural sector and the cotton production sector in particular has surplus labor.

The positive sign on the coefficient of the variables dealing with the number of cotton manufacturing plants provides an indication that the cotton output is demand driven. The coefficient is statistically significant at a significance level of 5 percent. This positive coefficient tends to indicate that the increases in the number of cotton processing units meant increased demand for the cotton producers, and it ultimately led to increased production. The size of this coefficient tends to indicate that a 100 percent increase in the number of mills led to an increase of 114 percent in the cotton

Table XII

THREE STAGE LEAST SQUARES (3SLS) AND ORDINARY LEAST SQUARES (OLS) ESTIMATION RESULTS FOR EQUATIONS (25,28), PAKISTAN,1963-90

Variable	Complete Model Estimated With 3SLS (1)	Single Equation Model Estimated With OLS (2)
Cotton Value Equation		
CRD	-0.2503**	
	(2.3076)	
AL	0.4806	
	(0.3689)	
MILLS	1.1475**	
	(2.2821)	
PR	0.1969	
	(0.4576)	
CONSTANT	-3.3829**	
	(2.4130)	
Industrial Value Equation		
IL	0.9292***	1.0778***
	(3.0619)	(3.348)
INV	-0.0159	-0.0354
	(0.0892)	(0.192)
COT	0.4998***	0.4159***
	(7.7808)	(6.172)
M	0.0989**	0.1157**
	(2.1082)	(2.355)
CONSTANT	2.0073***	2.3052***
	(3.7220)	(4.098)

Numbers in parentheses are t-statistics.

*** Significant at $\alpha = 0.01$,

** Significant at $\alpha = 0.05$,

* Significant at $\alpha = 0.10$.

production.

As expected the coefficient associated with the whole sale price of cotton is positive, but it is not statistically significant at a significance level of 10 percent. This tends to indicate that in the past the price increases have led to increased production of cotton. The statistical insignificance of the cotton prices might be due to the considerable presence of non market price fixing mechanisms.

With the exception of the investment parameter, all of the parameters in equation (28) have the signs as expected. The coefficients of the growth in the industrial labor force in the models given in the column (1) and (2) are positive and are statistically significant at a significance level of 1 percent. The results suggest that during the span of this study any increases in the size of the industrial labor force have resulted in an almost equal growth of the industrial sector.

In the models described in the columns (1) and (2), the coefficient associated with the imports is positive and are statistically significant at a significance level of 5 percent. The results also suggest that the imports had a positive impact on the industry, but the size of the impact is smaller than expected which could be due to the fact that the import data is not narrow enough to reflect the true consumption of the industry.

The parameters associated with the value of cotton production are positive and statistically significant at a significance level of 1 percent in both of the models. The results suggest that the cotton production had a significant impact on the industrial growth. According to the model in the column (1), an increase in the value of cotton production resulted in an increase of almost 50 percent in the value of total industrial output.

The results obtained by the model in column (2) confirm the findings reported by the model in column (1). The most obvious difference seems to be that the impact of cotton production is more significant when the model was estimated with the systems method. This might be an indication of the existence of simultaneity bias in the estimations with the single equation model.

Results obtained from Alternative Models

All of the above models were also estimated using; time trend variables, lagged independent variables and lagged dependent variables. These alternative models were either inconsistent with the economic theory, or had serious statistical problems. The results from alternative models addressing first phase of the study are reported in appendixes A through D. The results from the alternative models addressing the second phase are in the appendixes E through G, and the ones addressing the third phase are in reported in the appendixes H through J.

CHAPTER V

SUMMARY AND CONCLUSIONS

This study is aimed at examining the role of agricultural sector in Pakistan's overall economic growth and the industrial growth in particular. The study is divided into three phases. First phase of the study is aimed at determining the role of agricultural exports in the economic growth. The second phase is aimed at exploring the interaction between the agricultural and the industrial sector. The third phase is a modification of the second phase. This phase is intended to explore the role of an individual commodity namely; cotton, on the industrial development of Pakistan.

Role of Agricultural Exports in Economic Growth

First phase has demonstrated the role of agricultural exports in the overall economic growth. The results have shown a positive correlation between agricultural exports and the GDP growth. This positive correlation could imply that the agricultural exports do give rise to externalities and that these externalities impact the economy in a positive way. The positive correlation between the economic growth and the share of the manufactured goods in the total exports tends to support the view that the externality effect of the exports increases when the export structure shifts to the one with more manufactured goods.

The results did not show a significant relation between the economic growth and the imports. The reason for the insignificance could be the result of the fact that about 40 percent of the imports are capital goods, and any expenditure on the capital goods would also be covered in the investment. This prompts for a better data set which would provide information about how much of the investment money is spent on imports of capital goods. Moreover, contrary to Esfahani's findings there was not any strong evidence of the existence of an import shortage as a result of binding foreign exchange availability which might be due to the presence of significant size of NFI, and other sources of foreign exchange.

The study has shown that the NFI has played an important role in Pakistan's economic growth by not only allowing the economy to import more than what it exports, but also by stimulating the economy through increased consumption and investment. The study has demonstrated the need for further studies to explore the complex role of NFI in economic growth.

The results in this phase of the study have also shown that the investment has been another important factor in the economic growth in the past two decades. According to the three stage least squares estimation of the model including equations (10), (13) and (16), a 1 percent increase in the investment has led to an increase of 0.57 percent in the GDP.

Interaction Between Agricultural and Industrial Sectors

Second phase dealt with the interaction between the agricultural and industrial sectors. The results show that the agricultural labor has not played a very significant role in the expansion of the agricultural sector. This insignificant role tends to support the view that the agricultural has a surplus supply of labor which suggests the need for the retraining and reallocation of the excess labor. This study has also demonstrated the need for studies to evaluate the hypothesis stating that the growth in the agriculture has been result of increases in the productivity of the existing labor force.

The results show that the increases in the size of industrial labor force had even a smaller impact on the industrial growth than the impact of increases in the labor force employed by the agriculture on the growth in agricultural sector. This insignificant role tend to indicate that in Pakistan the quality of the labor force might have played a bigger role than its size, and further studies involving the industrial labor force should also include some measure of productivity.

The study has also shown that the agricultural credit has not played a very important role in the growth of agricultural sector. This finding demonstrates the need for further studies on whether the credit is accessible to the needy or not, and also whether it is being used for enhancing the productivity in agriculture or not.

The results have shown that both the public and the private investments variables were statistically insignificant. This insignificance might be due to the fact that the investment variable includes the investment made in all sectors of the economy, rather than in the two sectors included. During the past few years a significant amount of the public investment was made in the transport sector, and the insignificance might be due to the fact that the investment and the growth in the transport sector are correlated.

The results tend to indicate that the growth in the transport sector had a positive impact on industrial and agricultural growth. The coefficient for the variable representing the growth in transport sector in the agricultural GDP equation (19) is larger in size than the one in industrial GDP equation (22). This difference in size tends to support the hypothesis that the agricultural sector benefited more from the improvement of the infrastructure than the industrial sector.

The positive coefficients associated with the interaction terms in the two equations indicate that both sectors benefited from the relationship. The differences in the sizes and the statistical significance of the interaction parameter demonstrated that while both of the sectors benefited, the industrial sector gained more. This tends to confirm the conclusions made by Hwa (1988) and Adelman (1983) that the agricultural growth and the rural development should be given top priority, since it helps the industrial sector grow even faster.

The results show that when the agricultural GDP equation was estimated individually by using the ordinary least squares the coefficient was negative, but when the full model was estimated by using three stage least squares method this interaction was positive. This finding combined with the fact that both of the sectors benefited form the relationship seems to suggest that Hwa's model might have suffered from simultaneity bias.

Role of Cotton Production in Industrial Growth

The third phase demonstrated the role of an individual commodity namely; cotton in the industrial growth of the country. The results show that the whole sale price of cotton has played a positive, but not an important role in the expansion of cotton production. This tends to indicate a considerable presence of non-market pricing mechanism. This statistical insignificance could also be the result of the fact that the available price data was at the whole sale level and not at the farm level.

The coefficient associated with the agricultural credit was negative. The negative coefficient tends to indicate that either the majority of loans were spent on non-productive activities or were spent on increasing the production of crops competing with cotton for resources. The results have indicated the need for better control mechanism on the part of the loan advancing agencies to ensure that the loans are being properly used.

The findings about the agricultural labor conform to the ones made in the previous phase of the study. The findings in this section also suggest that the labor force in the agricultural sector is immobile and measures like retraining are needed to decrease the obstacles that are preventing the free mobility of the labor force.

The results show that the expansion in the textile sector had a statistically significant and positive impact on the cotton production. This finding tends to indicate that the cotton producers responded to the increased demand by increasing the cotton production. This finding combined with the previous finding that the cotton price at the whole sale level did not play an important level in the expansion of cotton production tends to indicate that the producers were basing their production decisions on the quantity demanded rather than the prevailing price. This further indicates that perhaps at the sowing time the producers were not confident about the price of cotton at the time of harvest.

The results show that the coefficient associated with the import variable in the equation determining the growth in the industrial growth is positive. This finding conforms with the fact that more than 80 percent of the imports are aimed at enhancing the GDP growth.

The results show that the coefficient associated with the variable representing the cotton production in the equation determining the growth in the industrial sector is positive. This tends to indicate that the expansion in the cotton production was one of the main driving forces behind the industrial growth. This finding combined with the fact that the size of the textile sector had a positive impact on the cotton production indicates that the growth in cotton production and in the industrial sector might be determined simultaneously.

Implications

This study dealt with the impact of agricultural growth on the growth of overall economy, and of industrial sector in particular. This study has demonstrated that while the agricultural sector's share in the GDP is declining, it should not be excessively exploited in order to promote the non-agricultural activities and should be given due importance in the long term development. This study has shown that the agricultural sector plays a complimentary role with the industrial sector, and excessive exploitation of the agricultural sector for resources could ultimately hurt the industrial sector.

This study has shown that one way that to make the agricultural sector more productive is to retrain the labor force and to reallocate the excess labor to other sectors of the economy. Another way to increase the growth in the agricultural sector is to setup more industry for the agricultural needs. This study has also demonstrated that an investment in the infrastructure would also help the agriculture grow.

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APPENDIXES

APPENDIX: A
3SLS AND OLS ESTIMATION RESULTS FOR EQUATIONS (10,13,16) WITH TIME TREND VARIABLE, PAKISTAN, 1971-1990.

Variable	Complete Model Estimated With 3SLS (1)	Exports & Imports Included Estimated With 3SLS (2)	Exports Included Estimated With 3SLS (3)	Single Equation Models Estimated With OLS (4)
GDP equation				
LOG (Xac)	0.0779*	0.0533**	0.0428	0.0585
	(1.8725)	(2.3237)	(1.5091)	(1.105)
LOG (Tx)	0.0749		-0.0161	0.0878
	(0.7261)		(0.2705)	(0.6669)
LOG (Mc)	-0.0938	-0.0576		-0.0745
	(1.5383)	(1.6981)		(0.9589)
LOG (NFIc)	-0.0059**	-0.0063**	-0.0075***	-0.0054*
	(3.1345)	(2.6453)	(4.1355)	(2.283)
LOG (INVc)	-0.0871	-0.0906	-0.1289	-0.1301
	(1.0905)	(1.1209)	(1.6113)	(1.319)
TIME	0.0152***	0.0156***	0.0153***	0.0153***
	(12.070)	(13.692)	(12.232)	(9.790)
Constant	2.6934***	2.5928***	2.5758***	2.7900***
	(13.470)	(17.300)	(14.790)	(11.09)
Agricultural Exports equation				
LOG (GDPc)	3.5967*	3.6402*	3.7516**	1.9709
	(1.9360)	(1.9620)	(2.0249)	(0.9068)
LOG (NFIc)	0.0666***	0.0668***	0.0674***	0.0579***
	(4.1720)	(4.1886)	(4.2279)	(3.144)
LOG (INVc)	-0.4821	-0.4738	-0.4528	-0.7893
	(0.6521)	(0.0641)	(0.6129)	(0.9276)
TIME	-0.0399	-0.0407	-0.4246	-0.1392
	(1.2794)	(1.3033)	(1.3623)	(0.3816)
Constant	-6.2943	-6.4150	-6.7236	1.7877
	(1.1940)	(1.218)	(1.2780)	(0.2901)
Imports equation				
LOG (GDPc)	-1.5183	-1.5367		-0.8320
	(1.1760)	(1.1908)		(0.5581)
LOG (NFIc)	0.0176	0.0175		0.0212
	(1.5989)	(1.5908)		(1.6800)
LOG (INVc)	0.3459	0.3424		0.4756
	(0.6802)	(0.6734)		(0.8149)
TIME	0.0334	0.0337		0.0224
	(1.5403)	(1.5545)		(0.8954)
Constant	4.5015	4.5525		2.5991
	(1.229)	(1.2440)		(0.6149)

Numbers in parentheses are t-statistics. *** Significant at α=0.01,** at α=0.05,* at α=0.10

APPENDIX B
3SLS AND OLS ESTIMATION RESULTS FOR EQUATIONS (10,13,16) WITH LAGGED INDEPENDENT VARIABLES, PAKISTAN, 1971-1990.

Variable	Complete Model Estimated With 3SLS (1)	Exports & Imports Included Estimated With 3SLS (2)	Exports Included Estimated With 3SLS (3)	Single Equation Models Estimated With OLS (4)
GDP equation				
LOG (Xac)#	0.2777***	0.1854***	0.3423***	0.2906**
	(3.5889)	(3.5126)	(5.2464)	(2.817)
LOG (Tx)#	0.4049		0.5627***	0.6339
	(1.8062)		(3.3238)	(2.096)
LOG (Mc)#	0.2502	0.4690***		-0.0326
	(1.7530)	(4.2448)		(0.1526)
LOG (NFIc)#	-0.0202***	-0.0209***	-0.0128**	-0.0150*
	(3.5548)	(3.3441)	(2.4897)	(2.036)
LOG (INVc)#	0.3185**	0.3754**	0.4360***	0.0368**
	(2.5709)	(2.9809)	(3.4582)	(2.307)
Constant	1.5856***	0.8801***	1.8623***	2.0979***
	(3.7240)	(3.5960)	(5.3660)	(3.6750)
Agricultural Exports equation				
LOG (GDPc)#	1.6787***	1.7523***	1.7361***	1.2378*
	(3.1569)	(3.3772)	(3.2560)	(2.018)
LOG (NFIc)#	0.0115	0.0114	0.0114	0.0117
	(0.9860)	(0.9826)	(0.9833)	(0.9001)
LOG (INVc)#	-1.3040**	-1.3621**	-1.3493***	-0.9557
	(2.6358)	(2.8021)	(3.7221)	(1.689)
Constant	-0.3535	-0.4532	-0.4312	0.2436
	(0.3502)	(0.4546)	(0.4266)	(0.2124)
Imports equation				
LOG (GDPc)#	0.8719***	0.9101***		0.6429**
	(3.5099)	(3.7773)		(2.228)
LOG (NFIc)#	0.0458***	0.0458***		0.0459***
	(8.3740)	(8.3704)		(7.510)
LOG (INVc)#	0.1771	0.1469		0.3580
	(0.7649)	(0.6485)		(1.3450)
Constant	-0.8899*	-0.9417*		-0.5797
	(1.8810)	(2.0200)		(1.0740)

Numbers in parentheses are t-statistics.

*** Significant at $\alpha = 0.01$,** at $\alpha = 0.05$,* at $\alpha = 0.10$.

Variable is lagged by one year.

APPENDIX C
3SLS AND OLS ESTIMATION RESULTS FOR EQUATIONS (10,13,16) WITH LAGGED DEPENDENT VARIABLES, PAKISTAN, 1971-1990.

Variable	Complete Model Estimated With 3SLS (1)	Exports & Imports Included Estimated With 3SLS (2)	Exports Included Estimated With 3SLS (3)	Single Equation Models Estimated With OLS (4)
GDP equation				
LOG (GDP)#	1.0345***	1.0175***	1.0435***	1.0422***
	(18.130)	(21.960)	(18.620)	(14.690)
LOG (Xac)	-0.0048	0.0054	-0.0049	-0.0027
	(0.1790)	(0.3356)	(0.2648)	(0.0804)
LOG (Tx)	-0.0379		-0.0410	-0.0400
	(0.5050)		(0.7543)	(0.4269)
LOG (Mc)	0.0102	-0.0039		-0.0019
	(0.2387)	(0.1250)		(0.0355)
LOG (NFIc)	0.0241**	0.0224 **	0.0264***	0.0267**
	(2.8750)	(2.8410)	(3.2750)	(2.5620)
LOG (INVc)	-0.0981*	-0.9057*	-0.0983*	-0.0969
	(1.8690)	(1.7960)	(1.9340)	(1.4860)
Constant	0.0773	0.1510*	0.6849	0.0699
	(0.4733)	(2.0140)	(0.5144)	(0.3432)
Agricultural Exports equation				
LOG (Xac)#	0.1917	0.1939	0.2861*	0.2822
	(1.355)	(1.371)	(1.9650)	(1.679)
LOG (GDPc)	0.9224	0.9177***	0.8791	0.8917
	(1.7140)	(3.3772)	(1.6330)	(1.4350)
LOG (NFIc)	-0.0333	-0.0335	-0.0383	-0.0378
	(0.5145)	(0.5179)	(0.5919)	(0.5056)
LOG (INVc)	-0.5433	-0.5399	-0.5523	-0.5628
	(0.8610)	(0.8557)	(0.8752)	(0.7717)
Constant	-0.0701	-0.0664	-0.0684	-0.0789
	(0.0663)	(0.0629)	(0.0647)	(0.0647)
Imports equation				
LOG (Mc)#	0.3225	0.3229		0.2862
	(1.756)	(1.7590)		(1.307)
LOG (GDPc)	0.5444	0.5451		0.5435
	(1.7570)	(1.7590)		(1.5140)
LOG (NFIc)	0.1453 ***	0.1453***		0.1486***
	(3.6020)	(3.6020)		(3.1650)
LOG (INVc)	-0.1823	-0.1835		-0.1346
	(0.4903)	(0.4934)		(0.3120)
Constant	0.1387	0.1385		0.1024
	(0.2148)	(0.2146)		(0.1365)

T-ratio in parentheses. *** Significant at α=0.01,** at α=0.05,* at α=0.10, # Lagged.

APPENDIX D
3SLS AND OLS ESTIMATION RESULTS FOR EQUATIONS (10,13,16) WITH IMPORT SHARE INSTEAD OF IMPORT VARIABLE, PAKISTAN, 1971-90.

Variable	Complete Model Estimated With 3SLS (1)	Exports & Imports Included Estimated With 3SLS (2)	Exports Included Estimated With 3SLS (3)	Single Equation Models Estimated With OLS (4)
GDP equation				
LOG (Xac)	0.2755***	0.2490***	0.2818***	0.1992**
	(3.8990)	(3.5430)	(4.1430)	(2.2430)
LOG (Tx)	0.2461		0.2347	0.3214*
	(1.6180)		(1.5760)	(1.6680)
LOG (Tm)	-0.1368	0.0267		-0.1958
	(0.2984)	(0.0556)		(0.3342)
LOG (NFIc)	-0.0139**	-0.0130**	-0.0133**	-0.0097
	(2.5430)	(2.2510)	(2.5990)	(1.4530)
LOG (INVc)	0.6372***	0.8260***	0.6266***	0.5767**
	(3.8600)	(6.5300)	(3.9710)	(2.7980)
Constant	1.3280**	0.7891**	1.3608***	1.6592**
	(2.9320)	(2.2310)	(3.1170)	(2.9230)
Agricultural Exports equation				
LOG (GDPc)	1.9170***	2.0142***	1.9213***	1.1792*
	(3.5750)	(3.8440)	(3.5860)	(1.8710)
LOG (NFIc)	0.0532***	0.0532***	0.0532***	0.0533***
	(4.3700)	(4.3690)	(4.3700)	(3.9380)
LOG (INVc)	-1.6199***	-1.6994***	-1.6234***	-1.0163*
	(3.1660)	(3.3780)	(3.1740)	(1.7140)
Constant	-0.4227	-0.5471	-0.4281	0.5216
	(0.4268)	(0.5585)	(0.4324)	(0.4610)
Imports equation				
LOG (GDPc)	-0.1092	-0.1148		-0.0672
	(1.2370)	(1.3030)		(0.6796)
LOG (NFIc)	-0.0069)***	-0.0070***		-0.0070***
	(3.6360)	(3.6360)		(3.2740)
LOG (INVc)	0.2726***	0.2771***		0.2382**
	(3.2750)	(3.3360)		(2.561)
Constant	-0.4245**	-0.4174**		-0.4783**
	(2.6670)	(2.6260)		(2.6940)

Numbers in parentheses are t-statistics.
*** Significant at $\alpha = 0.01$,** at $\alpha = 0.05$,* at $\alpha = 0.10$.

APPENDIX E
3SLS AND OLS ESTIMATION RESULTS FOR EQUATIONS (19,22) WITH TIME TREND VARIABLE, PAKISTAN, 1963-90.

Variable	Complete Model Estimated With 3SLS (1)	Agricultural Growth Model Estimated With OLS (2)	Industrial Growth Model Estimated With OLS (3)
Agricultural GDP Equation			
LOG (C)	0.0418	0.0433	
	(1.4840)	(1.501)	
LOG (L_A)	0.1966	0.2095	
	(0.3972)	(0.4125)	
LOG (I_B)	-0.1650	-0.1816	
	(1.5440)	(1.6590)	
LOG (I_T)	0.0757	0.0823	
	(1.258)	(1.3400)	
LOG (G_I)	-0.4385	-0.0807	
	(0.0197)	(0.3538)	
LOG (G_T)	0.3182*	-0.3540*	
	(1.811)	(1.9750)	
TIME	0.0026	0.0036	
	(0.3068)	(0.4022)	
CONSTANT	-1.6665	3.2291	
	(0.1056)	(0.2001)	
Industrial GDP Equation			
LOG (L_I)	0.2556		0.2700
	(0.8818)		(0.9400)
LOG (I_B)	-0.2065*		-0.2220*
	(1.9390)		(2.1111)
LOG (I_T)	0.0106		0.0181
	(0.1105)		(0.1909)
LOG (G_A)	0.4872		0.3157
	(1.2150)		(0.7955)
LOG (G_T)	0.2760		0.3326
	(0.9308)		(1.1390)
TIME	0.0132		0.0144
	(1.389)		(1.5320)
CONSTANT	-24.429		0.0316
	(1.4100)		(0.0302)

Numbers in parentheses are t-statistics.

*** Significant at $\alpha = 0.01$,

** Significant at $\alpha = 0.05$,

* Significant at $\alpha = 0.10$.

APPENDIX F
3SLS AND OLS ESTIMATION RESULTS FOR EQUATIONS (19,22) WITH LAGGED INDEPENDENT VARIABLES, PAKISTAN, 1963-90.

Variable	Complete Model Estimated With 3SLS (1)	Agricultural Growth Model Estimated With OLS (2)	Industrial Growth Model Estimated With OLS (3)
Agricultural GDP Equation			
LOG (C)#	0.0418	0.1223***	
	(1.4840)	(8.444)	
LOG (L_A)#	0.1966	0.9623*	
	(0.3972)	(1.783)	
LOG (I_B)#	-0.1650	-0.3856***	
	(1.5440)	(7.507)	
LOG (I_T)#	0.0757	0.2082**	
	(1.258)	(2.7650)	
LOG (G_I)#	-0.4385	-0.3912**	
	(0.0197)	(2.287)	
LOG (G_T)#	0.3182*	0.3000	
	(1.811)	(1.270)	
CONSTANT	-1.6665	4.7344***	
	(0.1056)	(248.20)	
Industrial GDP Equation			
LOG (L_I)#	0.2556		0.2622
	(0.8818)		(0.6309)
LOG (I_B)#	-0.2065*		-0.1637
	(1.9390)		(1.4420)
LOG (I_T)#	0.0106		0.1999
	(0.1105)		(1.4760)
LOG (G_A)#	0.4872		-1.1972***
	(1.2150)		(7.9390)
LOG (G_T)#	0.2760		1.3627***
	(0.9308)		(8.0250)
CONSTANT	-24.429		0.6309***
	(1.4100)		(147.40)

Numbers in parentheses are t-statistics.

*** Significant at $\alpha = 0.01$,

** Significant at $\alpha = 0.05$,

* Significant at $\alpha = 0.10$.

Lagged by one year.

APPENDIX G
3SLS AND OLS ESTIMATION RESULTS FOR EQUATIONS (19,22) WITH LAGGED DEPENDENT VARIABLES, PAKISTAN, 1971-90.

Variable	Complete Model Estimated With 3SLS (1)	Agricultural Growth Model Estimated With OLS (2)	Industrial Growth Model Estimated With OLS (3)
Agricultural GDP Equation			
LOG $(G_A)^{\#}$	-0.0021	-0.0018	
	(0.5167)	(0.4340)	
LOG (C)	0.0369	0.0397	
	(1.338)	(1.3950)	
LOG (L_A)	0.4442	0.4763	
	1.0380	(1.0760)	
LOG (I_B)	-0.1365	-0.1549	
	(1.533)	(1.6850)	
LOG (I_T)	0.0446	0.0555	
	(0.6606)	(0.8013)	
LOG (G_I)	0.1001	-0.0053	
	(0.5141)	(0.0263)	
LOG (G_T)	0.2681	0.3432	
	(1.4850)	(1.841)	
CONSTANT	3.0692***	3.2215***	
	(6.050)	(6.1370)	
Industrial GDP Equation			
LOG $(G_I)^{\#}$	0.0050		0.0054
	(0.8419)		(0.9148)
LOG (L_I)	0.2147		0.2410
	(0.7134)		(0.8009)
LOG (I_B)	-0.1188		-0.1327
	(1.407)		(1.5810)
LOG (I_T)	0.0353		0.4662
	(0.3416)		(0.4568)
LOG (G_A)	0.6699		0.4319
	(1.642)		(1..0630)
LOG (G_T)	0.4895*		0.6065**
	(2.141)		(2.6710)
CONSTANT	-0.5116		0.1461
	(0.4811)		(0.1378)

Numbers in parentheses are t-statistics.

*** Significant at $\alpha = 0.01$,

** Significant at $\alpha = 0.05$,

* Significant at $\alpha = 0.10$.

Lagged by one year.

APPENDIX H
3SLS AND OLS ESTIMATION RESULTS FOR EQUATIONS (15,28) WITH TIME TREND VARIABELE, PAKISTAN, 1963-1990.

Variable	Complete Model Estimated With 3SLS (1)	Single Equation Model Estimated With OLS (2)
Cotton Value Equation		
CRD	-0.1637	
	(1.3598)	
AL	2.2651	
	(1.2606)	
MILLS	1.9951**	
	(2.2444)	
PRICE	0.6281	
	(1.0773)	
TIME	-0.0481	
	(1.3513)	
CONSTANT	-7.3684**	
	(2.0430)	
Industrial Value Equation		
IL	0.1205	0.0994
	(0.5295)	(0.4337)
INV	-0.0319	-0.0397
	(0.3057)	(0.3788)
COT	0.1368**	0.1089*
	(2.3810)	(1.881)
M	-0.0783**	-0.0800**
	(2.0034)	(2.035)
TIME	0.0298***	0.0309***
	(6.8534)	(7.0480)
CONSTANT	2.4037***	2.4584***
	(7.5630)	(7.698)

Numbers in parentheses are t-statistics.

*** Significant at $\alpha = 0.01$,

** Significant at $\alpha = 0.05$,

* Significant at $\alpha = 0.10$.

APPENDIX I
3SLS AND OLS ESTIMATION RESULTS FOR EQUATIONS (25,28) WITH LAGGED INDEPENDENT VARIABLES, PAKISTAN, 1963-90.

Variable	Complete Model Estimated With 3SLS (1)	Single Equation Model Estimated With OLS (2)
Cotton Value Equation		
CRD#	-0.1585	
	(1.2202)	
AL#	1.0308	
	(0.6091)	
MILLS#	0.8242	
	(1.3166)	
PRICE#	0.0403	
	(0.0793)	
CONSTANT	-2.2043	
	(1.3340)	
Industrial Value Equation		
IL#	1.1737***	1.1816***
	(3.7691)	(3.790)
INV#	0.0002	-0.0091
	(0.0012)	(0.0501)
COT#	0.3886***	0.3950***
	(5.8173)	(5.907)
M#	0.1019**	0.0969*
	(2.1294)	(2.022)
CONSTANT	2.2800***	2.2469**
	(4.1070)	(4.044)

Numbers in parentheses are t-statistics.

*** Significant at $\alpha = 0.01$,

** Significant at $\alpha = 0.05$,

* Significant at $\alpha = 0.10$.

Lagged by one year.

APPENDIX J
3SLS AND OLS ESTIMATION RESULTS FOR EQUATIONS (25,28) WITH LAGGED DEPENDENT VARIABLES, PAKISTAN, 1963-90.

Variable	Complete Model Estimated With 3SLS (1)	Single Equation Model Estimated With OLS (2)
Cotton Value Equation		
CRD	-0.2031*	
	(1.9615)	
AL	-0.2140	
	(0.1556)	
MILLS	1.1898**	
	(2.2475)	
PRICE	-0.2042	
	(0.4563)	
COT#	0.4675**	
	(2.4483)	
CONSTANT	-3.4769**	
	(2.3280)	
Industrial Value Equation		
IL	0.5105***	0.9236**
	(3.3756)	(2.632)
INV	-0.7809	-0.0135
	(0.9737)	(0.0713)
COT	0.0699	0.4056***
	(1.5313)	(5.981)
M	-0.0030	0.1153**
	(0.1251)	(2.356)
IGDP#	0.0105	0.0118*
	(0.9782)	(1.810)
CONSTANT	0.6674**	2.1354***
	(2.3480)	(3.669)

Numbers in parentheses are t-statistics.

*** Significant at $\alpha = 0.01$,

** Significant at $\alpha = 0.05$,

* Significant at $\alpha = 0.10$.

Lagged by one year.

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VITA

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