Welfare and Poverty Implications of Global Rice and Agricultural Trade Liberalisation for Pakistan

Siddiqui, Rizwana

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Rizwana Siddiqui

I. Introduction

Rice is one of the leading food crops in the world, and an important staple food and cash crop in Pakistan. Two varieties of rice are produced– *basmati* and *irri*. Being a net exporter of rice, Pakistan receives 15 percent of foreign exchange earnings from exporting rice. In the past, using guaranteed price support for agriculture in general and for rice in particular, the government had encouraged farmers to produce exportable surpluses, particularly of basmati, where Pakistan had comparative advantage and a virtual monopoly (Noshab, 2005). These policies promoted commercial farming at the expense of farm labour and small scale agriculture. Pakistan also undertook significant liberalization measures in its agriculture sector by reducing state intervention and bringing prices closer to world market levels. However, due to slow liberalization of agriculture and rice sector in developed countries, the country has not been able to realize its expected benefits.[1]

Global liberalization of rice and agriculture sector is expected to affect welfare and poverty in Pakistan through various channels, such as prices, production, employment, income and consumption. Recently a number of studies have analysed the impact of agriculture trade liberalization on poverty (e.g., Robilliard and Robinson, 2005; Hertel and Winters (2005); Cororaton *et al*, 2005; and Cororaton, 2004)[2]. However, such impact of agricultural and rice trade liberalization on poverty and welfare in Pakistan has not been explored yet. In this backdrop, an attempt is made in this chapter to find out whether Pakistan would gain from the global agriculture trade liberalization in general and rice trade in particular. The study uses both supply-side (domestic) and demand side reforms (global)[3]. It also examines whether the effects of global liberalisation in the rice sector are different from those of liberalisation in all agricultural commodities. The study conducts both short-run and long-run analysis of global

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[1] Favourable developments in the domestic supply is only beneficial if they can be absorbed by the importing countries. For instance price support measures applied in the United States and European community resulted in an increase of wheat production, which the world market has been unable to absorb.

[2] According to a recent World Bank study (Hertel and Winters, ed. 2005), as agriculture is much more distorted than any other sector, two-thirds of the gains from the goods' sector would come from the abolition of tariffs, subsidies, and domestic support programmes in the agricultural sector alone.

[3] In the international rice market there are countries such as China, India, Pakistan, Thailand, USA, and Vietnam which are the leading net exporter of rice. On the other hand, countries such as Bangladesh, Indonesia, the Philippines and Japan are the net rice importing countries. A large number of poor people, as consumers, producers and as both consumers and producers, in both the net rice-exporting and net rice-importing developing countries depend heavily on rice.

liberalization of rice trade on welfare and poverty.

To address the research questions, it is important to consider the policy changes in domestic as well as in world economy for which a computable general equilibrium (CGE) framework is to be most appropriate. Therefore, this chapter makes use of such a framework, which has been calibrated to the most recent Social Accounting Matrix (SAM) for Pakistan to conduct simulations of supply and demand side shocks. The long-run impacts of global full liberalization of rice trade on household incomes, welfare and poverty are being assessed by assuming capital and other factors' mobility across sectors.

The study is organised as follows. After this introduction in Section I, Section II presents an overview of the Pakistan economy with a focus on the rice sector; Section III discusses the structure of the CGE model and data base used. Section IV and V discuss simulation results of rice and agricultural trade liberalization, respectively. Section VI concludes.

II. Rice Sector and the Pakistan Economy

The agriculture sector in Pakistan has confronted an uneven growth coinciding with different policy regimes. The stagnation in the 1950s was followed by a rapid growth in the 1960s due to a large scale public investment in the irrigation sector, the green revolution, the introduction of high-yielding varieties in wheat and rice that helped increase agricultural productivity and profitability. The trend was reversed in the 1970s, mainly because of climatic factors and Pakistan's drive to promote the manufacturing sector. This period observed a reduction in the share of agriculture in GDP, from 45 percent in 1960 to 25.7 percent in 1987-88.. Currently, the share is about 22 percent. Despite the dwindling share, the sector's importance cannot be overemphasized as the majority of population living in rural areas are engaged in farm activities. Its importance can also be viewed from the fact that it makes the largest share of Pakistan's export earnings from the agricultural sector.

Rice is the second largest staple food crop in Pakistan. It accounts for 5.7 percent of the total value added in agriculture and 1.3 percent of GDP. The area of rice cultivation has increased by 23 percent; from 2035 thousand hectares in 1980 to 2503 thousand hectares in 2004-05 (Table 5.1). Consequently, production has increased from 3126 thousand tonnes to 4991 thousand tonnes. Its share in value added of major crop has increased from 13.5 percent to 15.4 percent during the past twenty years. Per capita daily calorie intake from rice is presently at around 8 percent. Figure 5.1 reveals various uses of rice production. It shows that despite rising production in recent years, its export has declined. This has resulted in the rise of domestic availability of rice. Despite the increased availability, the price of rice has increased during the last five years. Figure 5.2 shows the very sharp decline in prices during 1999 to 2001, but since then it recovered quite strongly. This might be due to reduction in government support measure. Another reason could be the increase in domestic demand which is reflected in somewhat a rising tendency in calorie intake from rice (Table 5.1).

Table 5.1: Area, Production, Yield, and Calorie intake of Rice

| Year	Area	Production	Value Added	Yield	Share in total	Per capita
	'000 Hectare	'000 Tonnes	Share in major Crop (percent)	Kg/Hectare	Exports	calorie in take from Rice (kilo

					calories)
1979-80	2035	3126	13.52	1581	17.85	165
1984-85	1999	3315	15.61	1659	8.79	199
1989-90	2042	3200	13.51	1825	4.83	103
1994-95	2125	3447	13.52	1622	5.58	177 (7.0)[**]
1999-00	2515	5156	16.45	2050	6.31	207
2004-05	2503	4991	15.4	1994	5.9	184. (7.8)[**]

Source: Pakistan (Various issues). [**] Figures in parentheses are shares of calories from rice in total calories in take from cereals (Khan and Qureshi, 2002).

Figure 1: Distribution of Rice among Various uses
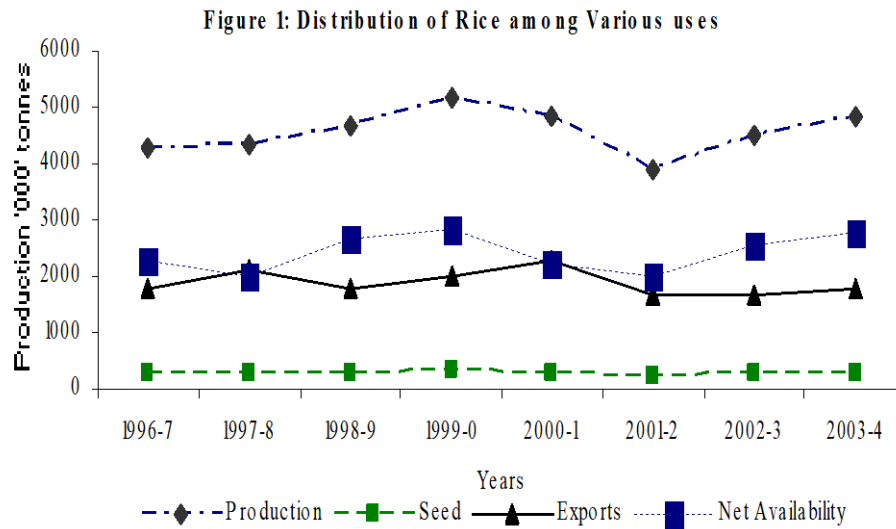
Figure 2: Percentage change in Retail Price of Rice
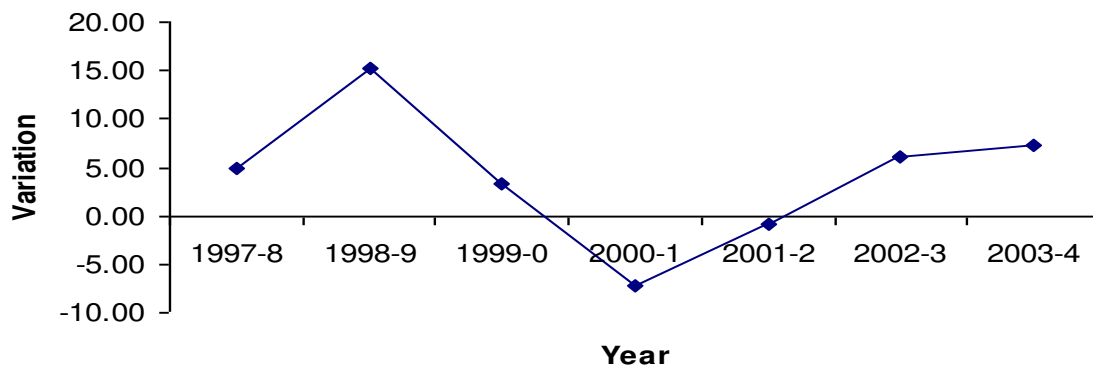
Since independence government policies have been swathe by direct and indirect government interventions comprising product-specific price supports provided to wheat, cotton, sugarcane,

and rice and input subsidies on fertiliser, electricity, seeds, pesticides and credit. These policies had generated a large disparity between world and domestic prices. Table 5.2 indicates that under pricing of agriculture commodities has remained a consistent policy. The nominal protection coefficient (NPC) indicates that domestic prices of major agriculture commodities, in most cases, have been less than fifty percent of those of international prices (Table 5.2). However, the ratios for rice have risen in late nineties.

Table 5.2: Nominal Protection Coefficient of Various Crops (percent)

Year	Cotton	Wheat	Rice (basmati)	Rice (Irri)	Sugarcane
1979-80	0.57	0.57	0.28	0.47	0.38
1984-85	0.52	0.39	0.25	0.56	1.29
1989-90	0.34	0.39	0.33	0.41	0.47
1994-95	0.40	0.60	0.66	1.01	0.59
1996-97	0.57	0.65	0.60	0.95	0.79

Source: Chaudhry and Chaudhry (1997) Nominal Protection Rate (NPC) is the ratio of procurement to the corresponding import and export parity prices.

Some agriculture sectors were highly protected till 1980s. Since then most of non-tariff barriers (NTBs) had been removed or replaced with tariffs under structural adjustment program (SAP). The tariffs on agriculture imports were also reduced from a maximum of 65 percent in 1995 to 25 percent in 2002-03, quantitative restrictions, export licensing scheme and exports subsidies have been almost eliminated, and the number of items on the negative list has been reduced. Overall, the domestic support measures to agricultural activities declined by 44 percent during 1995-6 to 1999-2000.[4]

On the other hand, tariff peaks and tariff escalation in the developed economies have been very high. For instance, in OECD countries they are the highest on the imports of fruits, vegetables, cotton and staple foods such as cereals (including rice). Sometimes, tariffs exceed 100 percent (Noshab, 2005). These barriers have made it difficult for Pakistan to increase its share of agriculture exports in those countries, as its non-subsidised exports remain uncompetitive with the subsidised products of importing countries.

The changes in production and prices have some implications for poverty especially for rural population (70 percent of the total population), who are heavily engaged in agricultural activities. Rice being the second important staple food has low share in total consumption. The share of rice in household budget is, however, found to be larger for rural households relative to urban households. Also, disaggregation of household by rich and poor shows that the rice share in food expenditure is larger for poor than rich households in the urban as well as in the rural areas. This implies that reforms in the area of rice may affect poor households more than the rich households.

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[4] The discussion in this section is based on (WTO, 2001, Pakistan, 2001, Pakistan 2004)

Table 5.3: Poverty Indicators for Pakistan (percent)

FGT Indices	Area	1986-87	1987-88	1990-91	1992-93	1993-94	1998-99	2001-02	2004-05
Head Count	Pakistan	28.6	29.2	29.4	35.9	35.7	32.6	33.5	35.7
	Urban	28.8	28.9	31.3	29.7	29.9	24.2	-	-
	Rural	28.1	30.1	29.1	39.1	37.3	35.9	-	-
Income Gap	Pakistan	20.6	21.1	26.3	28.9	27.9	7.0	-	-
	Urban	21.2	21.7	25.5	26.6	24.1	5.0	-	-
	Rural	20.2	20.1	26.1	28.3	27.5	7.9	-	-
Severity index	Pakistan	1.8	1.9	3.1	4.5	4.1	1.51	-	-
	Urban	1.9	2.0	3.2	3.4	2.8	2.51	-	-
	Rural	1.7	1.9	3.0	4.8	4.2	2.2	-	-
Growth in per capita income	Pakistan	1.6	1.6	0.6	-1.0	0.5	1.4	3.0	6.5

Source: MCHD (1999) and World Bank (2002).

Table 5.3 reveals that one third of the population fall below the poverty threshold level, compared with one-fourth of three decades ago i.e., the number of poor has increased from 28.6 percent in 1986-87 to 35.7 percent in 2004-05. The other two ratios, poverty gap and severity index, also show that poverty has increased during the 1990s (Table 5.3). In the 1980s and early-1990s growth in per capita has declined from 1.6 percent in 1986-87 to -1 percent in 1992-3. Since then the trend has however reversed. The rise in poverty despite the presence of high growth in per capita income leads conclude that income distribution has worsened.

III. The Model Structure and the Database

Structure of Computable General Equilibrium Model for Pakistan

The economy wide CGE model captures structural features of the Pakistan economy for the year 2002 – the year for which the information could be compiled. It is structured in the tradition of trade-focused CGE models of developing countries. Its major building blocks are production, factor markets, commodity markets, households, government, and the rest of the world. The details of factors, sectors, and actors are given in Table 5.4. Households are categorised into nineteen groups ─ two in urban and 17 in rural areas. Urban households are grouped into two, poor and non poor. Rural households are categorized by region, Sindh, Punjab and Other Pakistan [which includes two provinces NWFP and Balochistan]. In each region, farm households are classified by land holdings – large, medium and small, landless farmer and rural agriculture labourer. The rest of the households is grouped into two categories viz. non farm non poor and non farm poor. Production activities are aggregated into agriculture (seven activity types), and 13 non agriculture activities – with nine grouped for industry and four for services.

Table 5.4: Structure of the Social Accounting Matrix

Institutions	I. Households: Rural 1. Large farm Sindh(50 Acres), 2.Large farm Punjab(50 Acres), 3. Large farm Other , Pakistan(50 Acres), 4. Medium farm Sindh(12.5-50)Acres, 5. Medium farm Punjab(12.5-50)Acres, 6. Medium farm Other Pakistan(12.5-50)Acres, 7. Small farm Sindh(12.5) Acres, 8. Small farm Punjab (12.5) Acres, 9. Small farm Other Pakistan(12.5) Acres, 10. Landless farmer Sindh, 11. Landless farmer Punjab,12. Landless farmer Other Pakistan, 13. Rural agriculture Wage labourer Sindh, 14. Rural agriculture wage labourer Punjab, 15. Rural agriculture wage labourer Other Pakistan, 16. Rural non-farm non-poor, 17. Rural non-farm poor Urban: 18. Urban non-poor (Above poverty line), 19. Urban poor (Below poverty line) II. Enterprises, III. Government, IV. Rest of the World

Activities and Commodities		<u>Agriculture</u>: 1. Wheat, 2. Rice-Paddy, 3. Cotton, 4. Other Major Crop, 5. Horticulture, 6. Livestock and , poultry, 7. Forestry, <u>Industry</u>: 8. Mining, 9. Food, 10. Wheat, 11. RICE Manufactured, 12. Text 13. Leather, 14. Other Manufacturing, 15. Chemicals, 16. Energy, <u>Services</u>: 17. Construction, 18. Trade and Transport, 19. Housing, 20. Services
Factors of Productio		I. Labour: L1 : Labour (own) engaged in large farm , L2 : Labour (Own)Engaged in small farm, L3 : Labour wage worker, L4: Labour unskilled, L5: Labour Skilled, II. Capital: Farm Capital, Non Farm Capital III. Land and Water

Goods for domestic market and foreign markets are of different qualities and substitution between them is defined through the constant elasticity of transformation (CET). The allocation of outputs between domestic and foreign markets is determined by the relative prices received in domestic and foreign markets. Export demand is a function of the ratio of world export price to domestic export price (fob basis) and the base year export demand.

For domestic product markets, the demand side consists of households' consumption, government consumption, intermediate input demands and investment demand. The supplies comprise domestic production and imports. In each market, the ratio between demands for products from these two sources depends on relative prices, assuming that there are quality differences between imports and domestic output (Armington, 1969). The constant elasticity of substitution (CES) technology is assumed between imports and domestic goods and Pakistan is assumed to be a price-taker on the import side.

Factors of production can be categorized into three broad categories: labour, capital, and land. We have five types of labour in the model – three types of labour engaged in agriculture activities and two in non agriculture activities. Land appears as a factor of production only in the agricultural sectors. Farm capital is mobile while non agriculture capital is sector specific. In the factor markets, the demands are fulfilled with fixed supply quantities. In labour market, each type of labour moves freely and wage rate adjusts to bring equilibrium in the market. The land and capital markets are segmented by activity, *i.e.*, land and capital (non farm) cannot move from one activity to another. In each market, rent is flexible to assure that demand and supply are equal. Farm capital can move freely and returns to farm capital adjust to bring equilibrium. Avergae wage rate of agriculture labour and non agriculture labour is weighted average of three types of labour engaged in agriculture activities and two type of skilled and unskilled labour engaged in non agriculture activities, respectively.

The multilevel specification of the production process is shown graphically in Figure 5.1 in Appendix-I. The production activities produce goods and earn their income from sales of goods in domestic and foreign markets. The income is allocated to purchases of intermediate inputs and payments to production factors.

The incomes from factors of production are distributed among institutions in fixed shares. Households receive all labour income with the distribution among the households depending on the ownership of labour. They also receive a part of capital income from production, transfer payments from the government, remittances from the rest of the world and dividends from firms. Households allocate this income to pay taxes which are fixed shares of incomes, whereas,

household saving varies to bring equilibrium between saving and investment. Household demand is specified by linear expenditure system (LES)-maximizing the Stone-Geary utility function subject to household's budget constraint.

The government collects taxes from production, households, charges on land-water and used for consumption (of fixed commodity quantities), transfers to households (indexed to the domestic price level), and savings. Government savings is defined as the difference between government revenues and expenditures.

Enterprises income originates from capital and they allocate it to savings and transfers to households. Total demand for investment and government consumption in real terms are determined by deflating with their respective price deflators.

The three blocks, viz. savings-investment, government, and the rest of the world, are associated with the macro constraints of the model. (i) In the savings-investment block, the total purchase of investment goods is financed by savings from the domestic institutions and the rest of the world. However, savings are investment-driven and adjust through flexible saving rates for households. The rest of the world's income includes income from sales of imports and its outlay includes expenditure on exports and remittance income to households. The difference between the two measure is current account balance (CAB) or foreign capital inflow. To the extent that Pakistan's spending exceeds its earnings, foreign savings (the current account deficit) is positive. The Walras law holds for goods market; (ii) The fiscal balance, with government savings equal to the difference between government revenue and spending; and (iii) The external trade balance (in goods and non-factor services), which implicitly equates the supply and demand for foreign exchange. In tariff reduction exercise government income is also fixed with lost tariff revenue replaced through an increase in tax rate on production. The equations with variables definitions are given in the Appendix table 5.1.

Poverty and Welfare Analysis

The study investigates the impact of global agriculture sector liberalization in general and rice liberalization in particular on poverty using micro data of about 15 thousand households (Pakistan, 2002).[5]. The national poverty line of Rs.748 per capita per month is used to estimate poverty in the rural and the urban area[6] in the base year through the most used poverty indices, namely, the head count, poverty gap and severity indices[7](Foster *et al, 1984*). The basic principle underlying the analysis is to take the household sample as a reference population which remains the same in post simulation, but household income and prices vary. The change in income from simulation results is injected into household survey data (Pakistan, 2002) to get new vector of income. Prices are endogenously determined in the model. A new poverty line is determined by deflating it with

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[5] For details see (Siddiqui and Kemal, 2002; Siddiqui, 2005)

[6] As Dorosh *et al.* (2004) estimate poor households in urban and rural areas using the national poverty line of Rs. 748 per month per capita.

[7] The poverty gap measures distance between the average poor household income per capita and the poverty line. The severity index measures, which is the squared of poverty gap, gives a measure of the distribution of income among the poor households (Robiallard and Robinson, 2005).

new CPIs for each type of households. Poverty indices are estimated with the new vectors of income and new poverty line using the DAD software (Duclos *et al*, 2001). Welfare is measured by the equivalent variations (EV) using base year price and consumption for each type of household.

The Database

The model is built around an aggregate version of the 2002 SAM for Pakistan (Dorosh *et al*, 2004). The production sector is aggregated into 20 sectors that buy primary inputs from households, and using them in the production process generates value added. In exchange of supplying factor services, households receive income as wages, and returns to land and capital.

Table 5.5: Structure of Employment in Pakistan by Sectors (percent)

Sectors	Labour					Land	Capital	Land/ Labour	Capital/ Labour	Skill/ Unskilled	Value Added
	Large Farm	Small Farm	Agriculture	Unskilled	Skilled						
All Agriculture	*100.0*	*100.0*	*100.0*	*-*	*-*	*100.0*	*23.7*	*1.4*	*2.9*	*-*	*23.21*
- Wheat	22.9	20.7	6.8	-	-	10.9	1.1	1.0	0.9	-	1.9
- Rice-Paddy	2.9	2.8	0.9	-	-	7.8	0.3	5.6	1.5	-	0.7
- Cotton	16.7	13.1	4.6	-	-	10.7	0.5	1.5	0.6	-	1.4
- Other major crops	41.0	32.3	11.3	-	-	33.3	1.1	1.9	0.5	-	3.8
- Horticulture	14.2	30.0	7.2	-	-	34.0	1.4	3.0	1.1	-	3.6
- Livestock and poultry	-	-	68.7	-	-	-	19.3	-	8.1	-	11.6
- Forestry	2.3	1.1	0.5	-	-	3.2	-	4.0	0.0	-	0.3
All Industry	-	-	-	6.6	19.5	-	29.1	-	3.4	2.7	20.15
- Rice-Milled	-	-	-	0.3	0.5	-	1.0	-	3.7	1.3	0.7
- Textile	-	-	-	1.4	6.2	-	6.9	-	2.8	4.1	5.0
- Leather	-	-	-	-	0.1	-	0.1	-	2.9	1.5	0.1
All Services	-	-	-	93.4	80.5	-	47.2	-	0.8	0.8	56.6
All Sectors	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*0.2*	*1.3*	*0.9*	*100*

Note: Rice Paddy and rice milled are from agriculture and manufacturing sectors, respectively. Source: Authors calculation from SAM-2002 (Dorosh *et al,* 2004)

Table 5.5 reveals that around 40 percent of large farm and 37 percent of small farm labour are engaged in the production of three major crops (wheat, rice and cotton). Table 5.5 also indicates that large farm and small farms are largely engaged in production activities, whereas agriculture wage labour is largely engaged in livestock activities. The land-labour ratio is the highest for the paddy sector while the rice-milled sector is relatively more capital intensive amongst the non-agricultural sectors.

Table 5.6: Structure of the Cost of Production (percent)

	Large Farm	*Small Farm*	*Wage Worker*	*Un-skilled*	*Skilled*	*Land*	*Capital*	*Total*	*Value Added (% of total)*	*Total Intermediate (% of total)*	*Output (% of total)*
Wheat	12.9	15.1	6.5	-	-	54.7	10.7	100.0	1.9	1.8	1.9
Rice -Paddy	4.4	5.6	2.3	-	-	81.9	5.8	100.0	0.7	0.5	0.6
Cotton	13.2	13.3	6.2	-	-	58.7	8.6	100.0	1.4	0.9	1.1
Other Major Crop	11.7	11.9	5.5	-	-	60.8	10.1	100.0	3.8	1.8	2.8
Horticulture	4.3	11.7	3.7	-	-	69.1	11.2	100.0	3.6	2.0	2.8
Livestock and poultry	0.0	0.0	11.0	-	-	-	89.0	100.0	11.6	10.1	10.8
Forestry	10.1	6.1	3.8	-	-	80.0	-	100.0	0.3	0.1	0.2
Agriculture	4.7	6.0	8.0	-	-	32.0	49.4	100.0	23.2	17.1	20.1
Mining	-	-	-	4.5	25.5	-	70.0	100.0	0.6	0.2	0.4
Food	-	-	-	6.7	12.9	-	80.4	100.0	3.4	8.5	6.0
Wheat-Milled	-	-	-	6.5	12.0	-	81.6	100.0	1.2	4.4	2.8
Rice-Milled	-	-	-	9.2	12.1	-	78.7	100.0	0.7	1.7	1.2
Textile	-	-	-	5.1	21.1	-	73.9	100.0	5.0	17.7	11.4

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Leather	-	-	-	10.3	15.6	-	74.1	100.0	0.1	1.0	0.5
Other manufacturing	-	-	-	7.6	16.2	-	76.2	100.0	4.6	9.7	7.2
Chemicals	-	-	-	9.3	11.4	-	79.3	100.0	0.5	1.2	0.9
Energy	-	-	-	4.5	16.3	-	79.2	100.0	4.0	4.5	4.3
Industry	-	-	-	6.1	16.7	-	77.2	100.0	20.1	48.9	34.6
Construction	--	-	-	35.0	35.0	-	30.0	100.0	3.2	4.4	3.8
trade and transport	-	-	-	45.5	11.4	-	43.1	100.0	27.1	13.0	20.0
Housing	-	-	-	0.0	0.0	-	100.0	100.0	4.9	1.1	3.0
Services	-	-	-	19.2	44.8	-	36.0	100.0	21.5	15.5	18.5
Total Services	-	-	-	31.0	24.4	-	44.5	100.0	56.6	34.0	45.3
Total	1.1	1.4	1.8	18.8	17.2	7.4	52.2	100.0	100.0	100.0	100.0

Source: Authors' calculations.

Table 5.6 reveals that crop sector accounts for 7.8 percent of total value added, where land alone accounts for most of the total value added. The largest share in paddy production is of land, about 82 percent. The remainder of value added is accounted mainly for labour and farm capital. Agricultural non-crop sectors contribute 66 percent to agriculture output and 23 percent to total output (Table 5.6).

In the rice-milled sector, the contribution of capital to the gross value added of rice is 78.7 percent, whereas the rest is accounted for by both types of labour- skilled and unskilled (Table 5.6). Among other sectors, labour wage contribution (skilled and unskilled) to gross value added in agro-based and the export-oriented sectors such as textile and leather is relatively large compared to such import competing sectors as other manufacturing, chemicals, and energy (Table 5.6).

Exports and imports are very high for the industrial sector, 78.6 percent and 91.6 percent, respectively. Exports and imports from agriculture sector are less than 4 percent. However, the majority of exports from manufacturing sectors are agro-based such as milled-rice, textile, leather, etc. Rice export accounts for 34 percent of total production of rice, which constitutes 4.1 percent of total exports (Table 5.7).

Table 5.7: Trade Structure of Pakistan, 2001-02 (percent)

Sectors	Exports Share in		Imports Share in		Import Tariff
	Total Exports	Sector Output	Total Imports	Composite Good Supply	
All Agriculture	*3.9*	*1.9*	*3.1*	*2.4*	*11.8*
- Wheat	0.6	3.4	0.3	2.4	0.0
- Rice-Paddy	0.0	0.0	0.0	0.0	0.0
- Cotton-(non-traded)	0.0	0.0	0.0	0.0	0.0
- Other Major Crop	0.5	1.9	0.6	3.2	0.0
- Horticulture	1.1	3.8	1.3	6.9	27.0
- Livestock and poultry	1.2	1.1	0.7	1.0	2.1
- Forestry	0.5	31.4	0.2	25.2	0.0
All Industry	*78.6*	*22.7*	*91.6*	*28.7*	*4.7*
- Wheat (Milled)	0.5	1.8	0.8	4.3	0.0
- Rice-milled	4.1	34.2	0.0	0.0	0.0
- Textile	40.9	36.0	2.3	4.6	9.5
- Leather	2.3	42.8	0.1	5.2	4.2
- Other Manufactures	30.8	16.54	88.4	46.26	4.6
All Services	*17.5*	*3.9*	*5.2*	*1.7*	*0.0*
Total	100.0	10.0	100.0	13.2	4.7

Source: Author's Calculations

On average, tariff rate has been very low on industry and high on agriculture; 4.7 percent and 11.8 percent, respectively, in 2001-02. However, Table 5.7 reveals that tariff is non-existent on

all crop sectors including rice manufacturing and mainly two agricultural sectors are protected through tariffs - horticulture and livestock.

Table 5.8 provides disaggregated information on income distribution across socio-economic households group by source. Agricultural factor incomes account for only 23 percent of total factor incomes in Pakistan. In rural areas, 50 percent of land income goes to large land holders comprising about 4 percent of the population. Small land holders, with 22 percent of population, receive 42 percent of land income. Urban non-poor households – twenty percent of all households – receive 50.7 percent of the total income. Rural households receive larger share of factoral incomes of capital and land whereas urban households receive larger share of non factor incomes (such as, dividends, government transfers, and remittances). All agriculture labour income accrues to rural households. Urban households receive 54 percent and 100 percent wage income of unskilled and skilled labour, respectively.

Table 5.8: Sources of Households Receipts, Rice Consumption and Poverty(percent)

Households	Income Share	Population Share	Large Farm	Small Farm	Wage	Unskilled	Skilled	Land	Capital	Dividends	Government Transfers	Row	Share of Rice in Food Expenditure	Head Count	Poverty Gap	Severity
Large farm in Sindh	0.52	0.12	6.89	0.00	0.02	0.01	0.00	4.35	0.58	0.00	0.00	0.55	6.53	39.07	15.93	9.34
Large farm in Punjab	1.78	0.25	15.05	0.00	0.00	0.05	0.00	12.39	2.70	0.00	0.15	1.84	1.71	33.32	10.14	3.63
Large farm in Other Pakistan	0.30	0.05	2.87	0.00	0.00	0.00	0.00	1.59	0.55	0.00	0.04	0.31	2.03	54.30	19.52	9.99
Medium farm in Sindh	1.20	1.00	17.65	0.00	0.37	0.18	0.00	7.63	1.72	0.00	0.06	1.28	6.53	41.31	12.30	4.92
Medium farm in Punjab	4.01	2.06	43.06	0.00	0.09	0.99	0.00	18.15	7.43	0.00	0.50	4.19	1.70	16.03	0.99	0.06
Medium farm in Other Pakistan	0.96	0.71	14.49	0.00	0.55	0.11	0.00	6.25	1.32	0.00	0.28	1.02	2.03	60.15	20.55	9.49
Small farm in Sindh	1.62	2.65	0.00	8.35	4.01	0.42	0.00	5.39	3.25	0.00	1.05	1.65	10.50	40.46	12.86	6.21
Small farm in Punjab	8.90	12.06	0.00	53.06	21.68	5.03	0.00	29.60	16.07	0.00	5.94	9.15	1.97	39.97	8.80	1.94
Small farm in Other Pakistan	3.52	7.19	0.00	15.91	6.81	1.62	0.00	7.15	7.74	0.00	4.05	3.58	1.93	60.49	26.80	16.01
Landless farmers in Sindh	1.19	3.89	0.00	10.73	10.28	0.28	0.00	3.11	2.06	0.00	0.54	1.25	9.18	46.11	16.92	7.47
Landless farmers in Punjab	1.27	2.95	0.00	8.74	4.52	1.04	0.00	3.39	2.18	0.00	0.71	1.32	1.97	64.63	22.69	11.29
Landless farmers in Other Pakistan	0.41	1.25	0.00	3.20	0.56	0.29	0.00	1.01	0.80	0.00	0.18	0.43	1.72	34.06	34.06	34.06
Rural agri. labourer in Sindh	0.60	2.22	0.00	0.00	11.99	0.49	0.00	0.00	0.87	0.00	0.63	0.60	5.07	79.94	22.45	9.36
Rural agri. labourer in Punjab	1.98	3.90	0.00	0.00	36.74	1.69	0.00	0.00	3.00	0.00	0.46	1.96	2.30	74.46	39.80	26.23
Rural agri. labourer in Other Pakistan	0.28	0.45	0.00	0.00	2.38	0.05	0.00	0.00	0.70	0.00	0.02	0.27	1.26	72.33	39.47	28.22
Rural non-farm non-poor	11.64	13.86	0.00	0.00	0.00	27.10	0.00	0.00	19.46	0.00	25.40	11.50	2.90	0.00	0.00	0.00
Rural non-farm poor	3.90	16.80	0.00	0.00	0.00	6.28	0.00	0.00	8.30	0.00	7.17	3.86	4.10	100.00	35.42	18.62
Rural (Total)	**44.08**	**71.42**	**100**	**100**	**100.**	**45.62**	**0.00**	**100.00**	**78.75**	**0.00**	**47.18**	**44.76**	**3.18**	**52.70**	**19.47**	**10.33**
Urban non-poor	50.65	20.44	0.00	0.00	0.00	32.63	100.00	0.00	18.06	100.00	49.93	50.04	2.74	0.00	0.00	0.00
Urban poor	5.27	8.14	0.00	0.00	0.00	21.75	0.00	0.00	3.19	0.00	2.89	5.20	3.72	100	33.52	6.0
Urban Total	**55.92**	**28.58**	**0.00**	**0.00**	**0.00**	**54.38**	**100**	**0.00**	**21.25**	**100**	**52.82**	**55.24**	**2.9**	**26.2**	**8.8**	**5.1**
Pakistan	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**3.03**	**44.78**	**16.27**	**8.76**

Source: All are author's calculations except income and population shares, which have been taken from Dorosh *et al* (2004)

Unequal resource allocation between rural and urban areas is evident from their consumption pattern, which has increased over time. 71 percent of the Pakistan population live in rural areas and 30 percent in urban areas. Their consumption account for 49 percent and 51 percent of total households demand, respectively, in 2002. Households and intermediate consumption together account for over 79.9 percent of total aggregate demand, of which household consumption accounts for 37.7 percent (Table 5.9). Rural households consume more of agriculture goods, whereas urban households consume relatively more services. Rice share in household budget is generally larger for the rural households than the urban households. However, compared to other

South Asian countries, the dependence on rice is very low as wheat is the main staple food in Pakistan.

Table 5.9: Composition of Demand by Sectors at market prices (percent)

Sectors	Rural	Urban	Total Household Consumption	Intermediate goods	Govt.	Rest of the world	Investment	Composite Demand
Agriculture	28.7	26.6	27.6	15.8	0.0	3.9	0.0	20.2
Rice-milled	1.5	1.2	1.4	0.4	0.0	4.1	0.0	1.1
Industry	35.7	34.5	35.1	49.4	0.0	78.6	47.8	41.5
Services	17.4	16.9	17.1	9.8	97.9	0.0	9.3	16.5
Total Services	35.6	38.9	37.3	34.8	100.0	17.5	52.2	38.3
Grand Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Share in total demand	18.1	19.6	37.7	42.2	5.1	8.4	6.6	100.0

Source: Authors' calculations

The Pakistan Integrated Household Survey (PIHS) 2001-02 (Pakistan, 2002) is used to estimate the poverty indices in the base year. The headcount, gap, and severity indices are presented in Table 5.8. It is found that, other than poor non-farm households, the highest incidence of poverty is among agricultural labourer Sindh households, who spend relatively large on rice consumption. Poverty incidence is the lowest in Punjab, but high in all the three categories defined by the size of cultivated land in other parts of Pakistan (NWFP and Balochistan). The same pattern is found for gap and severity indices. The landless farmer households are poorer in Punjab than in Sindh and other parts of Pakistan. Rural agriculture wage labourers in Sindh are poorer compared to those of in Punjab and other Pakistan. A comparison across the households shows that other than poor households, the incidence of poverty is the highest among the rural agriculture wage labourer in Sindh, where about 80 percent of the population is found to live below the poverty threshold level.

IV. Results

The changes in the world economy affect demand and supply sides factors of global trade. Reduction in control over agricultural trade in the world market increases world export market potential to absorb exports. Elimination of supply-side restrictions influences country's economy through shifting resources from inefficient sectors to efficient sectors. Both have strong implications for poverty and distribution issues. Therefore, a link between Pakistan's economy and the rest of the world has been developed here. Five experiments using the Global Trade Analysis Project (GTAP) model have been conducted to capture the impact of rice and agriculture trade liberalization in the world economy, which are:

> Simulation 1: 100 percent removal of tariff and domestic support measures on rice in all countries (*full_rice*).
> Simulation 2: 100 percent removal of tariff and domestic support measures on rice only in developed countries (*full_rice_dev*).
> Simulation 3: 50 percent removal of tariff and domestic support measures on rice in all countries (*part_rice*).
> Simulation 4: 100 percent removal of tariff and domestic support measures on all agricultural commodities in all countries (*full_ag*).

Simulation 5: 50 percent removal of tariff and domestic support measures on all agricultural commodities in all countries (*part_ag*).

These simulations bring about changes in world import prices, world export prices and export demand facing Pakistan (Appendix Table 5.2). These changes are then fed into the Pakistani economy through a CGE model along with country specific changes in tariff and domestic support measure (if any). In the first three simulations, there is no change in domestic policies as rice faces no restrictions in the base year. However, in the last two simulations, along with the changes in world export price, world import price and export demand, tariff-cuts are introduced on all agricultural imports with tax adjustment to compensate loss in government revenue. Lastly, simulation 1 is re-run to explore the impact of global full liberalization of rice trade on welfare and poverty in the long-run. The analysis is carried out by assuming that capital and land are also mobile factors of production.

In the first three simulations, though changes in world import price, world export price and export demand quantitatively differ but direction of change remains the same. When the impact of these shocks are fed into Pakistani economy, through world import and export prices and export demand, a little variation in the impact is found. Therefore, the results of the first simulation (*full_rice*) are discussed in a greater detail, while the results of simulations 2 and 3 (*full_rice_dev* and *part_rice*) are discussed briefly with reference to the impacts obtained under simulation 1. Similarly, the results of simulation 4 (*full_ag*) are discussed in detail in 4.2 and used as reference for simulation 5 (*part_ag*).

4.1 Rice Trade Liberalization

Simulation 1: Full Liberalization of Rice Trade in all Countries [full_rice]

The reduction in tariff and domestic support measures on rice in all countries bring changes in relative terms of trade and export demand facing Pakistan. The world export prices rise more than world import prices in all agriculture and services sectors (Appendix 5.2), which are relatively less open compared to industry. With the exception of rice-milled, the change in world export price and world import price is less than one percent in all sectors. World import price of rice increases by 7.9 percent, world export demand for rice by 74 percent and world export price of rice by 1.3 percent (Appendix 5.2). Pakistan being a net exporter of rice is expected to be benefited with the increase demand for rice and its export price in the world economy.

Macro Effects

The changes in the world economy affect terms of trade in the country. On average, import and export price indices in Pakistan increases by 0.01 percent and 2.7 percent respectively (Table 5.10). Imports increase by 1.47 and export decline by 0.8 percent. The changes in export and import prices along with the demand and supply of imports and export travel through the economy and bring changes in domestic prices. With the increase in domestic price and import price, CPI increases by 2.9 percent. However, imports are relatively cheaper now. Consumers shifts from local goods to imported good. With the increase in the demand for imported goods, locally produced goods decline by 0.02 percent. Resultantly, output decline by 0.09 percent.

Though output decline but demand for composite goods increases by 0.21 percent fulfilled by import (Table 5.10).

The results reveal that global liberalization of rice trade generate favorable aggregate results. The changes in structure of trade and structure of production lead to change in demand for factors of production. These changes translate into the change in price of immobile factors of production. Mobile factors (farm capital and labor) reallocate and return to farm capital and wage rate adjusts to bring equilibrium in their respective markets. On average real wage rate of labour employed in the agriculture sectors of economy increase more than wage rate of labour employed in the non agriculture sectors of economy, 2.6 percent and 0.4 percent respectively. On the other hand returns to agriculture land increases significantly, whereas returns to capital in non agriculture sectors of the economy decline but marginally (Table 5.10).

Table 5.10: Macroeconomic Effects of Trade Liberalization (percentage variation from the base year)

Household Real Consumption	Simulation 1	Simulation 2	Simulation 3	Simulation 4	Simulation 5	Simulation 6
		Short Run			Long-run	
Rural	1.08	1.09	0.43	1.28	0.41	2.65
Urban	0.33	0.33	0.12	2.18	0.77	3.35
All Pakistan	0.69	0.70	0.27	1.74	0.60	3.02
Total Absorption	0.53	0.53	0.20	1.33	0.46	2.30
Household Income Real						
- Rural	1.04	1.04	0.41	1.51	0.52	2.89
- Urban	0.12	0.12	0.04	0.77	0.38	3.99
- Pakistan (Total)	0.53	0.53	0.20	1.10	0.44	3.50
Demand and Supply Effects						
- Imports	1.47	1.49	0.58	2.06	0.87	1.56
- Composite Demand	0.21	0.21	0.08	0.69	0.23	1.66
- Domestic Sale	-0.02	-0.02	-0.01	0.44	0.11	1.68
- Exports	-0.78	-0.79	-0.27	-0.47	-0.13	0.37
- Out Put	-0.09	-0.09	-0.03	0.36	0.09	2.01
- Domestic Price	3.39	3.42	1.33	2.9	1.44	0.72
- Price of Exports	2.70	2.72	1.09	3.50	1.66	1.76
- Price of Imports	0.01	0.01	0.01	-0.90	0.04	0.01
Returns to Factor of Production						
- Real Wage Rate	0.59	0.59	0.23	2.49	0.90	2.78
- Agriculture	2.65	2.65	1.10	4.83	1.27	7.71
- Agriculture large Farm	2.92	2.93	1.22	5.11	1.46	8.92
- Agriculture Small Farm)	2.90	2.92	1.20	5.39	1.20	8.64
- Agriculture (Wage)	1.50	1.51	0.59	2.95	1.09	3.31
- Non Agriculture	0.38	0.39	0.14	2.28	0.87	2.34
Unskilled	0.54	0.55	0.21	2.50	0.96	2.73
Skilled	0.20	0.39	0.07	2.04	0.76	1.91
Returns to Non Agriculture Capital –Index	-0.01	-0.04	-0.03	1.17	-0.17	0.19
Returns to composite agriculture capital Index [Land and Farm Capital]	3.5	3.2	1.26	5.77	1.35	0.61
GDP Deflator	3.98	4.01	1.56	3.46	1.70	0.64
CPI	2.86	2.88	1.12	2.40	1.22	0.61
Agriculture	4.94	4.98	1.94	5.26	2.12	3.10
Industry	1.67	1.68	0.66	2.09	1.00	1.16
Service	3.09	3.12	1.21	1.46	1.02	-1.08

These changes in factorial income result in larger gains to rural households than the urban households. Because rural households receive all income from land and labour engaged in agriculture activities, where returns increases with higher percentage relative to labour and capital employed in non agriculture activities. Aggregate consumption of rural households increases four times the increase in consumption of urban households; 1.1 percent and 0.3 percent, respectively (Table 5.10). The increase consumption has led to an increase in domestic absorption by 0.5 percent with investment and public consumption fixed at the base level. Income of rural households increases more than the income of urban households (Table 5.10).

Over all results indicate that global full liberalization of rice trade benefit more to the rural households than the urban households in Pakistan.

Prices rise in all sectors of the economy due to increase in world export and world import prices facing Pakistan, which have lead to change in the structure of trade as well as structure of production. At the sector level, export price indices of agriculture, industry and services increase but the largest increase is in the industrial sector which includes liberalized sector, rice-milled. With an increase in world export demand of rice-milled by 74 percent, world export price increase by 1.3 percent. Producers find it more beneficial to produce exportable surplus. They increase production of rice-paddy and rice-milled by 6.2 and 8.3 percent. Demand for labour and capital increase in this sector. Labour demand in rice-paddy and rice-milled increase by 37.1 percent and 43.9 percent, respectively (Table 5.11). Wages increase leading to higher value added price. Domestic export price of rice milled increases by 36.3 percent. Increased production of rice-milled is directed to world market and exports of rice-milled increase by 23.9 percent. When the increased production of rice-paddy, a non-traded sector, is absorbed in the domestic economy, domestic sales of it increase by 6.2 percent.

Table 5.11: Simulation 1. Effects on Prices and Quantities (Percentage Variation over Base Values)

Sectors	Imports	Composite Demand	Domestic sale	Exports	Output	Labour Demand	Value Added Price	Producer Price	Import Price	Consumer Price	Export Price
All Agriculture	4.92	0.16	0.03	-2.92	-0.03	0.00	6.01	5.01	-0.02	4.94	1.65
- Wheat	5.35	-0.03	-0.16	-2.48	-0.24	-0.36	5.80	4.15	0.00	4.11	2.20
- Rice -Paddy	0.00	6.17	6.17	0.00	6.17	37.13	45.86	29.06	0.00	29.06	0.00
- Cotton	0.00	-0.84	-0.84	0.00	-0.84	-1.81	4.65	3.49	0.00	3.49	0.00
- Other Major Crop	6.21	-0.04	-0.24	-4.34	-0.31	-0.60	5.60	4.79	-0.45	4.71	-0.47
- Horticulture	4.76	0.08	-0.36	-3.34	-0.47	-1.18	4.99	4.27	0.08	3.97	2.25
- Livestock and poultry	5.12	0.04	-0.01	-2.76	-0.04	-0.38	4.32	4.31	0.08	4.29	1.94
- Forestry	1.37	-0.13	-0.62	-1.42	-0.87	-4.28	1.41	1.53	0.03	1.28	1.16
All Industry	1.20	0.18	-0.38	-0.40	-0.37	-1.25	2.33	2.72	0.01	1.67	2.99
- Mining	-0.04	-0.23	-1.00	-0.89	-0.98	-3.22	0.27	0.83	0.00	0.16	0.90
- Food	3.36	0.32	-0.14	-2.17	-0.55	-2.77	1.04	2.65	0.11	2.64	1.16
- Wheat-Milled	4.58	0.25	0.06	-3.24	0.00	-0.02	3.58	3.72	0.02	3.61	0.92
- Rice-Milled	0.00	-0.61	-0.61	23.87	8.27	43.91	31.32	21.87	0.00	13.48	36.34
- Textile	2.45	-0.31	-0.46	-1.79	-0.94	-3.53	0.59	1.95	0.06	2.18	1.32
- Leather	4.09	-0.05	-0.29	-2.41	-1.19	-4.50	-0.72	3.03	0.11	3.55	2.05
- Other manufacturing	0.98	0.33	-0.67	-1.18	-0.79	-3.26	0.74	1.24	0.00	0.54	0.75
- Chemicals	1.57	1.01	-0.36	-1.34	-0.52	-2.48	1.74	1.52	0.01	0.47	0.96
- Energy	1.79	0.23	-0.32	0.00	-0.32	-1.55	2.45	1.78	0.01	1.31	0.00
All Services	4.12	0.25	0.18	-2.00	0.10	0.18	3.73	3.09	0.00	3.09	1.63
- Construction	0.00	-0.43	-0.43	0.00	-0.43	-0.62	3.48	1.82	0.00	1.82	0.00
- Trade and transport	4.17	0.28	0.27	-2.00	0.08	0.14	3.67	3.07	-0.02	3.20	1.63
- Housing	0.00	0.04	0.04	0.00	0.04	0.00	4.54	4.09	0.00	4.09	0.00
- Services	4.12	0.38	0.23	-1.81	0.23	0.36	3.65	3.22	0.00	3.09	1.47
ALL Sectors	1.47	0.21	-0.02	-0.78	-0.09	0.00	3.98	3.35	0.01	2.86	2.70

Except milled-rice, exports from all sectors of economy decline. Resultantly, exports from agriculture and services decline significantly, by 2.9 percent and 2 percent, respectively. Exports from industry decline marginally, 0.4 percent, due to significant increase in exports of rice-milled. On the other hand, relative import price of all commodities show negligible change, positive or negative leading to an increase in import price index by 0.01 percent with the changes in import price indices of agriculture and industry by (-0.02 and 0.01 percent, respectively) and no change in import price of services. Consumers shift their demand from domestically produced goods to imported goods. Imports of all commodities increase, which lead to significant increase in imports of agriculture and services by 5 and 4 percent, respectively and moderate increase in imports of industry of 1.2 percent. With a very large share of imports of industry, total imports

record an increase of 1.5 percent. From the results, it can also be concluded that global full liberalization of rice trade makes inward looking sectors agriculture and services more open (Table 5.11).

In response to structural changes in the economy, factors of production reallocate. On average, labor move towards rice-milled and rice-paddy sectors from all other sectors of the economy (Table 5.11). The demand for labor in rice-paddy and rice-milled sectors increase more than decline in labor demand in other agriculture sectors and non agriculture sectors. Wage rate for all type of labour and returns to land increases significantly (Table 5.10). Whereas, in agriculture sector of the economy, wage rate and returns to capital in crease by less than one percent. Rice milled being a domestic sector with no final consumption is totally absorbed by intermediate demand. Domestic consumption of rice-milled decline with the increase in price but production increases and surplus is directed to foreign market to fulfill their export demand.

Welfare and Poverty Effects

The major concerns in the study are measuring the effect of shocks on welfare and poverty. These effects can be tackled through change in factor remuneration and change in consumer prices. Table 5.12 indicates that nominal income as well as consumer price index of all households rise in the rural and the urban area. However, some variation can be observed across households group indicating differences in their sources of income and consumption pattern. Rural household nominal income rises more than income of the urban household, 4.4 percent and 3.4 percent, respectively (Table 5.12). Among rural households, the largest increase is in income of the large farm households Sindh, who receive relatively larger share from large farm labour compared to other sources, i.e., 6.9 percent of large farm income. The smallest increase is in the income of non farm poor households, 3.4 percent (Table 5.12). Table 5.6 indicates that rice is land intensive sector, land contribute 82 percent of value added of rice-paddy, which is largest across the crops. The returns to land increases by 3.5 percent in real term (Table 5.10), which also benefit to land owners. In the urban area, income of poor households who receive relatively larger share of unskilled labour compared to other sources increases more than the income of rich households. The wage rate of unskilled labour rises more than the wage rate of skilled labour, 0.5 percent and 0.2 percent, respectively, which benefit more to urban poor. Although results suggest that every household gain in terms of income but income distribution has worsened in the rural area and improves in the urban area.

Table 5.12: Income, CPI and Welfare: Variation over Base Year (Percentage Variation over base year Value)

Households	Simulation 1			Simulation 2			Simulation 3			Simulation 4			Simulation 5		
	Household Income	Equivalent Variation	Consumer Price	Household Income	Equivalent Variation	Consumer Price	Household Income	Equivalent Variation	Consumer Price	Household Income	Equivalent Variation	Consumer Price	Household Income	Equivalent Variation	Consumer Price
Large farm Sindh	6.26	2.93	3.41	6.3	2.95	3.44	2.46	1.18	1.33	6.64	3.35	3.35	2.39	0.85	1.59
Large farm Punjab	5.73	2.79	3.04	5.78	2.8	3.07	2.25	1.12	1.19	5.82	2.99	2.92	2.2	0.83	1.42
Large farm Other Pakistan	5.25	2.4	2.95	5.29	2.41	2.98	2.06	0.96	1.16	5.14	2.62	2.65	2.05	0.78	1.32
Medium farm Sindh	5.66	2.26	3.41	5.7	2.28	3.44	2.22	0.91	1.33	5.87	2.56	3.35	2.22	0.66	1.59
Medium farm Punjab	5.02	2.01	3.04	5.06	2.02	3.07	1.97	0.8	1.19	4.94	2.08	2.92	2.01	0.62	1.42
Medium farm Other Pakistan	5.73	2.78	2.95	5.77	2.8	2.98	2.25	1.12	1.15	5.97	3.38	2.65	2.25	0.95	1.32
Small farm Sindh	4.61	0.94	3.74	4.65	0.94	3.77	1.81	0.37	1.46	4.4	0.9	3.58	1.88	0.23	1.68
Small farm Punjab	4.65	1.39	3.3	4.69	1.4	3.32	1.82	0.56	1.29	4.6	1.36	3.3	1.93	0.39	1.57
Small farm Other Pakistan	4.18	0.94	3.29	4.21	0.95	3.32	1.63	0.37	1.29	3.84	0.75	3.18	1.76	0.26	1.53
Landless farmer Sindh	4.62	0.85	3.83	4.66	0.86	3.86	1.81	0.34	1.5	4.65	1.13	3.6	1.95	0.28	1.69
Landless farmer Punjab	4.5	1.27	3.27	4.54	1.28	3.3	1.76	0.51	1.28	4.55	1.43	3.18	1.93	0.43	1.53
Landless farmer Other Pakistan	4.4	1.25	3.2	4.44	1.26	3.23	1.72	0.5	1.25	4.32	1.31	3.08	1.86	0.41	1.48
Rural agriculture laborer Sindh	3.8	0.27	3.61	3.83	0.27	3.64	1.48	0.1	1.41	3.86	0.4	3.56	1.87	0.21	1.69
Rural agriculture laborer Punjab	3.77	0.4	3.44	3.8	0.4	3.47	1.47	0.15	1.34	3.79	0.46	3.42	1.85	0.25	1.62
Rural agriculture laborer Other Pakistan	3.5	0.3	3.27	3.53	0.31	3.3	1.36	0.11	1.28	2.81	-0.29	3.22	1.56	0.04	1.55
Rural non-farm non-poor	3.43	0.36	3.22	3.46	0.37	3.25	1.33	0.14	1.26	3.47	0.78	2.85	1.75	0.41	1.41
Rural non-farm poor	3.38	0.05	3.42	3.42	0.05	3.45	1.32	0.01	1.34	3.08	-0.14	3.33	1.64	0.08	1.59
Total Rural	*4.38*	*1.26*	*3.20*	*4.41*	*1.27*	*3.23*	*1.71*	*0.50*	*1.25*	*4.30*	*1.44*	*2.98*	*1.90*	*0.49*	*1.45*
Urban Non poor	3.31	0.34	3.16	3.34	0.34	3.19	1.29	0.13	1.24	3.37	1.98	1.69	1.7	0.76	1.02
Urban poor	3.52	0.21	3.39	3.55	0.21	3.42	1.37	0.08	1.32	4.43	1.78	2.778	2.04	0.66	1.4
Total urban	*3.37*	*0.31*	*3.22*	*3.40*	*0.31*	*3.25*	*1.31*	*0.12*	*1.26*	*3.65*	*1.93*	*1.98*	*1.79*	*0.73*	*1.12*
Pakistan	4.07	0.98	3.21	4.11	0.98	3.24	1.59	0.39	1.26	4.11	1.59	2.68	1.86	0.56	1.35

Consumer price of rice-paddy and rice-milled increases by 29.1 percent and 13.5 percent respectively, CPI rises more for the households who spend more on rice in both the rural and the urban area. Rice has larger share in food expenditure of rural households in Sindh in each category of household —large, medium and small farm, landless farmers, and agriculture labourer — relative to households in other regions, Punjab and other Pakistan. On the other hand, non farm poor in the rural area and poor households in the urban area spend relatively more on rice (Table 5.8). CPIs rise more for these households (Table 5.12). Overall rural households consume more rice than urban households. Thus CPI increases more for the rural households than the urban households, 3.2 percent and 3 percent, respectively.

These changes in income and consumer prices have welfare implications. Increase in income of all households is more than to off set the impact of increase consumer indices. Resultantly, all households are better-off after global full liberalization of rice. In the urban area, welfare gains to rich group of households are larger than the poor households 0.34 percent compared to 0.21 percent, respectively. In rural area, larger welfare gains accrue to households in Sindh, whether they belong to farm households (large, medium, and small), landless farmer or rural agriculture labourer compared to households in Punjab and other part of Pakistan in the same categories. Within non farm households in rural area, larger welfare gain accrues to non poor households.

We may conclude that global liberalization of rice trade benefit more to households in Sindh. Among non farm households, poor households are relatively better off than the non-poor in both the urban and the rural area. In aggregate, welfare of rural households' and urban households improves by 3.3 percent and 5.7 percent, respectively. This indicates that the gap between rural and urban increase. However, the gap between rich and poor reduces in the urban area but increases in the rural area. Country as a whole gains by 2.4 (Table 5.12).

Table 5.13: Poverty Indices - Percentage Variation over the Base Value

Households	Simulation 1				Simulation 2				Simulation 3				Simulation 4				Simulation 5			
	Poverty Line	Head Count	Poverty Gap	Severity	Poverty Line	Head Count	Poverty Gap	Severity	Poverty Line	Head Count	Poverty Gap	Severity	Poverty Line	Head Count	Poverty Gap	Severity	Poverty Line	Head Count	Poverty Gap	Severity
Large farm Sindh	3.41	-1.20	-3.97	-3.71	3.44	-1.20	-3.97	-3.71	1.33	0.00	-1.59	-1.56	3.35	-1.20	-4.60	-4.35	1.59	-0.12	-1.15	-1.03
Large farm Punjab	3.04	0.00	-5.92	-8.86	3.07	0.00	-6.02	-9.13	1.19	0.00	-2.37	-3.62	2.92	0.00	-6.41	-9.68	1.42	0.00	-1.68	-2.52
Large farm Other Pakistan	2.95	-0.94	-3.96	-4.18	2.98	-0.94	-4.06	70.61	1.16	-0.30	-1.50	-1.58	2.65	-0.94	-4.27	-4.48	1.32	-0.30	-1.24	-1.38
Medium farm Sindh	3.41	-0.02	-5.01	-6.06	3.44	0.00	-5.09	-6.26	1.33	0.00	-2.08	-2.61	3.35	0.00	-5.74	-7.08	1.59	0.00	-1.43	-1.79
Medium farm Punjab	3.04	0.02	-28.35	-51.04	3.07	0.02	-29.36	-51.04	1.19	0.02	-11.20	-18.40	2.92	0.02	-29.36	-51.04	1.42	0.02	-7.16	-18.40
Medium farm Other Pakistan	2.95	-3.73	-5.15	-6.07	2.98	-3.73	-5.20	-6.18	1.15	-1.07	-1.98	-2.39	2.65	-4.09	-6.07	-7.23	1.32	-0.58	-1.74	-2.07
Small farm Sindh	3.74	0.00	-1.78	-1.81	3.77	0.00	-1.85	-1.81	1.46	0.00	-0.69	-0.69	3.58	0.00	-1.62	-1.65	1.68	0.00	-0.30	-0.36
Small farm Punjab	3.3	-0.01	-4.55	-8.64	3.32	-0.01	-4.66	-9.16	1.29	-0.01	-80.00	-3.48	3.3	-0.01	-4.32	-8.64	1.57	-0.01	-1.14	-2.44
Small farm Other Pakistan	3.29	-0.38	-1.03	-1.11	3.32	-0.76	-1.07	-1.11	1.29	-0.38	-0.36	-0.42	3.18	-0.38	-0.77	-0.80	1.53	-0.38	-0.36	-0.36
Landless farmer Sindh	3.83	0.00	-1.24	-1.79	3.86	0.00	-1.30	-1.92	1.5	0.00	-0.59	-0.85	3.6	0.00	-1.72	-2.59	1.69	0.00	-0.36	-0.58
Landless farmer Punjab	3.27	0.00	-2.33	-2.49	3.3	0.00	-2.15	-2.31	1.28	0.00	-0.79	-0.81	3.18	0.00	-2.42	-2.58	1.53	0.00	-0.83	-0.89
Landless farmer Other Pakistan	3.2	0.00	0.00	0.00	3.23	0.00	0.00	0.00	1.25	0.00	0.00	0.00	3.08	0.00	0.00	0.00	1.48	0.00	0.00	0.00
Rural agriculture laborer Sindh	3.61	0.00	-0.46	-0.61	3.64	-9.52	75.52	201.06	1.41	0.00	-0.02	-0.07	3.56	0.00	-0.64	-0.71	1.69	0.00	-0.33	-0.39
Rural agriculture laborer Punjab	3.44	0.00	-0.24	-0.31	3.47	0.00	-0.27	-0.31	1.34	0.00	-0.12	-0.15	3.42	0.00	-0.27	-0.31	1.62	0.00	-0.22	-0.27
Rural agriculture laborer Other Pakistan	3.27	0.00	-0.24	-0.23	3.3	0.00	-0.14	-0.16	1.28	0.00	-0.02	-0.02	3.22	0.00	0.31	0.30	1.55	0.00	0.03	0.02
Rural non-farm non-poor	3.22	0.00	0.00	0.00	3.25	0.00	0.00	0.00	1.26	0.00	0.00	0.00	2.85	0.00	0.00	0.00	1.41	0.00	0.00	0.00
Rural non-farm poor	3.42	0.00	0.18	0.15	3.45	0.00	0.10	0.09	1.34	0.00	0.04	-0.01	3.33	0.00	0.46	0.47	1.59	-0.26	-0.07	-0.07
Total Rural	3.20	-0.75	-1.84	-1.91	3.23	-0.83	-1.68	15.81	1.25	-0.24	-0.72	-0.77	2.98	-0.80	-1.89	-1.95	1.45	-0.30	-0.65	-0.68
Urban Non Poor	3.16	0.00	0.00	0.00	3.19	0.00	0.00	0.00	1.24	0.00	0.00	0.00	1.69	0.00	0.00	0.00	1.02	0.00	0.00	0.00
Urban Poor	3.39	0.00	-0.32	-0.22	3.42	0.00	-0.14	-0.12	1.32	0.00	-0.05	-0.07	2.78	-2.64	-3.10	-2.23	1.4	-0.62	-1.37	-0.99
Total urban	3.22	0.00	-0.32	-0.22	3.25	0.00	-0.14	-0.12	1.26	0.00	-0.05	-0.07	1.98	-2.64	-3.10	-2.23	1.12	-0.62	-1.37	-0.99
Pakistan	3.21	-0.62	-1.59	-1.62	3.24	-0.69	-1.44	13.03	1.26	-0.20	-0.61	-0.65	2.68	-1.12	-2.09	-2.00	1.35	-0.35	-0.76	-0.73

Poverty impacts can be deduced indirectly from changes in CPI and households income. Poverty is expected to reduce or remain at the base level, if income increases more or less equal to the amount to compensate the rise in cost of living. Table 5.13 presents percentage variation in poverty measured by different indices. The results show that the value of poverty line rises for all households due to increase in CPIs, but the impact on poverty reduction is positive due to increase in income that offsets the negative impact of rising CPIs. Consequently, poverty reduces in Pakistan as a whole by 0.6percent. In the urban area, population below poverty line remains at the base level, because increase in income is very small in real terms that is not enough that the poor households jump out of poverty. However, gap and severity indices show that poverty has

reduced among the urban poor households. In the rural area population below poverty line reduces in majority of farm households and remains constant in all other households. On the whole, poverty in the rural area is reduced by 0.75 percent. Other two indices, poverty gap and severity, also indicate declines in poverty not only in farm households but also in non farm households. While estimating the poverty incidence, as the severity index gives more weight to poorer households, it may be inferred that the policy shock under consideration reduces chronic poverty within each household group.

Simulation 2: Full Liberalization of Rice Trade in Developed Countries [full_rice_dev]

A comparison of the change in world export demand, world export price, and world import price in first simulation and second simulation in GTAP model reveal very small difference. This implies that liberalization in developing countries does not change terms of trade for Pakistan [Appendix 5.2]. The reason may be that developing countries have already removed distortion in rice production and rice trade. It is only the developed countries who still have tariff and domestic support measures on rice trade and production. Therefore, removal of tariff and domestic support measure in the world or only in the developed world generate almost the same change in terms of trade and world export demand. The only difference found is in the import price of rice-milled. The import price of rice increases less in this exercise by 2 percentage points. However, this difference does not affect outcome as Pakistan has no imports of rice-milled or paddy in the base period. The difference in the change in world export demand, world export prices and world import prices of all items in the two exercises is less than 0.01 percent. Thus full liberalization of rice in the world or in the developed world has quantitatively same impact on Pakistan's economy. Resultantly, households' welfare and poverty incidence remains the same as in the previous exercise. The results are given in Tables 5.10, 5.12 and 5.13. The detailed results at the sectoral level are given in Appendix Table 5.3.

Simulation 3: Partial Liberalization of Rice Trade in all Countries [part_rice]

In third *simulation* fifty percent removal of tariffs and domestic support measures on rice in all countries affect Pakistani economy in the same way as *full_rice* though quantitatively impact reduces to one third of the change in full liberalization case (Appendix 5.2). For instance, the change in world export price and world export demand for rice reduces from 74 percent and 1.3 percent in first simulation to 29.5 percent and 0.5 percent in the third simulation, respectively. This may be due to non linear relationships and assumption of imperfect substitutability. In some cases results differ not only quantitatively but also change sign such as world import price of wheat-milled, cotton, other major crop, other food, other manufacturing, construction, trade and transport etc. But quantitatively change is negligible, less than 0.05 percent.

The results show that effects on the macro variables are proportionate to one third of the changes in the simulation one, which is proportionate to the differences in world export price of rice and world export demand in two exercises. A comparison of the results of this exercise with the results of simulation 1 presented in [Tables 5.10, 5.12, and 13] indicates that the effect on all these variables reduces by about 66 percent compared to the effect in *full_rice*. For instance, imports increase by 0.58 percent and export decline by 0.27 percent in this exercise compared to 1.5 percent and 0.78 percent, respectively, in simulation-1. The same pattern is found in

household's income and consumption. The result of this exercise at sector level is given in Appendix Table 5.3. The results confirm that direction of change is similar to the change in first exercise. However impact reduces by more than fifty percent in majority of variables.

Table 5.12 indicates that direction of the change in income and CPI remains the same as in the previous exercise. However, the rise in CPI and income is not as much as the fifty percent of the change in previous exercise. The results indicate that all households are better off over the base year. Poverty reduces by all measures among all households (Table 5.13). Head count, income gap and severity indices reduce by 0.2 percent, 0.6 percent, and 0.7 percent, respectively, over the base year. The results show that partial liberalization of rice trade in the global economy still has positive impact in terms of welfare and poverty. A comparison of the results in simulation one and three shows that increase liberalization increase gain more than proportionate.

4.2 Agriculture Trade Liberalization

Simulation 4: Full Liberalization of Agriculture Trade in All Countries [full_ag]

Full liberalization in agriculture trade in the developed as well as in the developing countries have led to significant increase in world export demand for agriculture exports from Pakistan leading to the increase in world export price of agriculture items. On the other hand world imports price of agriculture commodities and agro based manufactured commodities increases significantly. For all other commodities, world export demand, world import prices and world export prices changes marginally in absolute term (Appendix Table 5.2). These changes in export demand, export prices and import prices in the world economy along with zero tariff on agriculture imports in Pakistan are introduced in the country model. The loss in government revenue due to tariff reduction is compensated by increase in taxes on production.

Macro Effects

Global full liberalization of agriculture trade and elimination of tariff on all agriculture imports benefit more than rice trade liberalization to the country. The elimination of tariffs on imports of agriculture commodities directly reduces relative import prices of agriculture items in the country. The results show significant decline in import price of horticulture, where tariff was very high in the base period, 27 percent (Table 5.14). Import price of two agro based manufactured commodities, food and leather, also decline due to cheap availability of intermediate inputs. But import price of all other commodities show marginal changes, either positive or negative. A comparison of domestic export prices and import prices reveals that export prices increase more than the import prices. Overall, negative effect on import price of horticulture dominates and import price index of agriculture reduces by 8.9 percent. While import price indices of industry and services both increase by only 0.2 percent.

The results at the macro level show that imports increase by 2.1 percent over the base year with a significant increase in imports of agriculture [the liberalize sector] 17.4 percent, moderate increase in import of services-unprotected sector-4 percent and only 1.2 percent increase in import of industry-the protected sector. Significant increase in world export prices of agriculture commodities translate into increase domestic prices. Resultantly, export price index of

agriculture, industry and services increase by 14.8 percent, 3.3 percent and 2 percent leading to increase in export price index for Pakistan by 3.5 percent. Exports of agriculture commodities increase significantly, 13.4 percent, whereas exports of industry decline by 0.7 despite significant increase in rice exports. Total exports from Pakistan decline by 0.5 percent due to dominating effects of export of industry in the total exports i.e., export from industry are 78.6 percent, in the base year.

Due to increase in domestic prices level, CPIs rise by 2.4 percent in equilibrium despite decline in import prices. Households' real income increases by 1.1 percent with an increase in the income of rural and urban households by 1.5 percent and 0.8 percent, respectively. Aggregate private consumption rises by 1.7 percent with an increase in the consumption of urban households by 2.2 percent and consumption of rural households by 1.3 percent (Table 5.10). Despite reduction in domestic protection, agriculture sector expand. But liberalization of agriculture sector in world market increases demand for agriculture exports of Pakistan. World price of agriculture exports increase and producers tend to export more. The change in structure of trade brings change in sectoral output which transmits to demand for factors of production and their remuneration. On average, wage rate increases more in agriculture than in non agriculture sectors, 4.8 percent and 2.3 percent, respectively, which benefits more to rural households [Table 5.10]. This shows that global full liberalization of agriculture benefits more than global full liberalization of rice.

At the sector level, it can be observed from Table 5.14 that import response is highest in horticulture though not proportional to reduction in import price due to imperfect substitutability between domestic goods and imports and non linear functional form. Reduction in tariff reduces import price of horticulture by 19 percent and its imports rise by 33 percent. Whereas import prices of all other agriculture items, which has no tariff in the base period, rise marginally [Table 5.14]. Aggregate agriculture import price index declines by 8.9 percent and agriculture imports record an increase of 17.4 percent. Despite increase in import price of some agriculture goods, imports rise because of two reasons (1) CPIs of these goods increase more than import prices and (2) import price index of industry and services rise. Liberalization of all agriculture sectors reduces the positive impact on rice exports from 23.9 percent in first simulation to 17.1 percent in this simulation. Because other agriculture goods are relatively cheaper now, therefore, consumers increase consumption of agriculture goods not just rice.

Table 5.14: Simulation -4-Effects on Quantities and Prices *(Percentage Variation over Base Values)*

Sectors	Imports	Composite Demand	Domestic Sale	Exports	Output	Labour Demand	Domestic Price	Value Added Price	Producer Price	Import Price	Consumer Price	Export Price
Agriculture(Total)	**17.4**	**0.1**	**-0.3**	**13.4**	**0.0**	**0.0**	**-0.3**	**7.0**	**5.8**	**-8.9**	**5.3**	**14.8**
Wheat	7.9	0.5	0.3	-3.1	0.2	0.6	0.3	8.1	5.6	0.06	5.7	2.8
Rice -Paddy	0.0	4.3	4.3	0.0	4.3	24.9	4.3	34.8	22.5	0.00	22.6	0.0
Cotton	0.0	-1.9	-1.9	0.0	-1.9	-4.1	-1.9	4.6	3.6	0.00	3.7	0.0
Other Major Crop	7.3	0.2	0.0	1.8	0.0	0.3	0.0	8.0	6.7	0.58	6.5	9.1
Horticulture	33.3	0.6	-2.1	44.1	-0.1	-0.1	-2.1	7.7	6.1	-18.99	2.4	35.5
Livestock and poultry	5.6	-0.1	-0.1	6.2	-0.1	-0.6	-0.1	5.0	5.0	0.17	4.9	10.4
Forestry	1.6	-0.3	-1.0	-0.9	-1.0	-4.7	-1.0	2.6	2.6	0.41	2.1	2.6
Industry(Total)	**1.4**	**0.1**	**-0.7**	**-0.8**	**-0.7**	**-2.3**	**-0.7**	**3.3**	**3.2**	**0.19**	**2.1**	**3.3**
Mining	0.0	-0.3	-1.3	-0.7	-1.2	-3.9	-1.3	1.0	1.4	0.32	0.5	1.8
Food	6.1	0.4	-0.5	4.4	0.6	2.8	-0.5	7.7	5.0	-1.29	3.4	8.6
Wheat-Milled	-4.8	-0.1	0.1	30.9	0.7	4.0	0.1	9.3	6.0	10.00	5.7	31.9
Rice-Milled	0.0	-0.5	-0.5	17.1	5.8	29.7	-0.5	24.4	17.4	0.00	11.6	27.8
Textile	1.8	-0.9	-1.1	-3.9	-2.1	-7.7	-1.1	-1.7	1.5	0.08	2.2	0.2

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Leather	5.3	-0.6	-0.9	-5.8	-3.0	-10.9	-0.9	-5.6	3.0	-0.38	4.5	0.7
Other manufacturing	1.3	0.5	-0.8	-1.7	-1.0	-4.1	-0.8	1.4	1.6	0.15	0.8	0.7
Chemicals	1.6	1.0	-0.6	-2.4	-0.9	-4.3	-0.6	1.7	1.7	0.13	0.7	0.7
Energy	2.0	0.2	-0.4	0.0	-0.4	-2.0	-0.4	3.5	2.3	0.37	1.9	0.0
Services(Total)	**4.0**	**1.5**	**1.5**	**-2.0**	**1.3**	**0.3**	**1.5**	**2.0**	**1.5**	**0.20**	**1.5**	**2.0**
Construction	0.0	0.7	0.7	0.0	0.7	1.0	0.7	5.2	2.7	0.00	2.8	0.0
trade and transport	4.5	0.2	0.2	-2.0	0.0	0.1	0.2	5.1	3.4	0.08	3.6	2.0
Housing	0.0	16.9	16.9	0.0	16.9	0.0	16.9	-30.3	-24.3	0.00	-24.3	0.0
Services	4.0	0.5	0.3	-1.7	0.3	0.5	0.3	5.1	3.2	0.21	3.1	1.4
ALL	**2.1**	**0.7**	**0.4**	**-0.5**	**0.4**	**0.0**	**0.4**	**3.5**	**2.9**	**-0.09**	**2.4**	**3.5**

Domestic export price increases significantly for all agriculture and agro-based industrial goods and increase marginally for all other goods in industry and services in equilibrium after reduction in distortions in agriculture global market. Consumer prices of all traded goods increase. CPI increase by 2.1 percent for industry. Therefore, demand for industrial goods decline as consumers shift to relatively cheap imported industrial goods. Industrial imports increases by 1.4 percent and output decline by 0.7 percent. Sale of majority of domestically produced agriculture and industrial goods declines. Demand for domestic services rise as consumers shifts from agriculture and industrial goods to relatively cheap services. Consequently, domestic sale decline by 0.3 percent and 0.7 percent in agriculture and industry, respectively, and rises in services sector by 1.5 percent.

At the sectoral level, it can be observed from Table 5.14 that export supply from country increase significantly, where export price increase significantly i.e., horticulture, livestock, rice-milled, wheat and food. Exports from all other sectors fall. Agriculture exports increase by 13.4 percent and exports of industry decline by 0.8 percent. Though exports of rice-milled and wheat-milled increase significantly, but negative impact on exports of other industrial goods dominate due to their larger share in total exports in the base period.

These changes translate into structure of production. Table 5.14 shows that domestic production of two agriculture sectors -rice-paddy and wheat- increases by 4.3 percent and 0.3 percent, respectively. Wheat export decline by 3.1 percent. Release output from exports, increase production and import inflow, all is absorbed by domestic economy. Production of wheat-milled expands by 0.7 percent and export increase by 30.9 percent. There is no export or import of paddy. Increase production of rice paddy is absorbed in the domestic economy as intermediate input. Despite decline in domestic sale of rice-milled, its production increase, which is directed to foreign market as export increase by 17 percent. The results indicate that global agriculture full liberalization reduce impact on exports of rice by 6 percentage points than in global liberalization of rice sector only. Liberalization of all agriculture sector change price of all agriculture goods significantly not just rice. Therefore with the availability of cheap agriculture goods along with rice make consumers shift their consumption from rice to other agriculture goods.

Domestic production declines in majority of agriculture and industrial sectors, but it increases in services non-traded sectors, because of change in relative prices. Table 5.14 shows that production increases significantly in two sectors; rice-paddy and rice-milled, by 4.3 percent and 5.8 percent, respectively, and marginally in wheat, wheat milled and food sectors by 0.2 percent, 0.7 and 0.6 percent. Overall results show that agriculture output remains at the base level though composition of out put change. Output declines in industry and rise in services.

Due to differential effects from exports and imports transmitting to structure of production, labour move towards paddy and wheat crops from other agriculture sectors. In the industry, labour move toward agro-based manufacturing sectors, food, wheat-milled, and rice-milled sectors. With fixed labour supply, the change in demand for labour translates into changes in wage rate. Average real wage rate in agriculture and non agriculture sectors rises by 4.8 percent and 2.3 percent, respectively, with increase demand for labour in the economy. Agriculture wage rate rises more as liberalization of agriculture trade in world market lead to increase agriculture prices as well as exports. That led to increase domestic price level and demand for labour employed in agriculture sectors.

Welfare and Poverty Effects

Table 5.12 indicates that income effects are positive for all households in both regions, rural and urban. Rural household receive income from factors of production such as farm labor, agriculture wage labor and non farm labor, land and mobile farm capital which are employed in agriculture activities. Though agriculture is liberalized sector, which should contract with tariff reduction, but global liberalization of agriculture trade lead to increase demand for agriculture exports and agro based exports that benefit more to rural households in Pakistan. Thus nominal income of rural household rises more than income of the urban household, 4.3 percent and 3.7 percent, respectively [Table 5.12]. Among rural households, the largest increase is in income of the large farm households Sindh, 6.4 percent, who receive relatively larger share from large farm labour compared to other sources, i.e., 6.9 percent of large farm income. Among non farm households, income of non farm non poor households increases more than the income of non farm poor households, 3.5 percent and 3.1 percent, respectively. These households receive wage income from unskilled labour and capital. Former receive lager share of unskilled wage labour income, 27.1 percent, which is higher than the unskilled labour income accrue to non farm poor households, 6.3 percent [Table 5.8]. These households do not receive income from farm labour or land. Therefore, they receive least benefit of global liberalization of agriculture sector. In the urban area, income of poor households increases more than the rich households. The urban poor households receive relatively larger share of their income from unskilled labor compared to other sources. The wage rate of unskilled labour rises more than the wage rate of skilled labour. Although all household gain in terms of income but income distribution has worsened in the rural area and improves in the urban area as in the case of global liberalization of rice.

CPI increases the most in agriculture, 5.3 percent and the least in services by 1.5 percent [Table 5.14]. Table 5.12 indicates that CPI increase for all households leading to rise in the cost of living. It increases relatively more for households who spends more on agriculture goods and less for households who spent larger share of their income on services (see Appendix Table 5.4). Rural households spend more on agriculture and industry, whereas urban households spend more on services. Therefore, CPIs increase more for the rural households than the urban households, 3 percent and 2 percent, respectively. Table 5.12 shows variation within the rural and the urban households. The largest increase is in the consumer price of households in Sindh in each category; large farm, medium farm, small farm, landless farmer, and rural agriculture labourer, who spend more on agriculture and industry than on services. Agriculture and industry also has larger share in expenditure of non farm poor in the rural area than non farm non poor households. Therefore, CPI rises more for poor. Similarly, in the urban areas poor spend relatively more on

agriculture and industry, 63.6 percent than non poor households, 60.8 percent [Appendix Table 5.3]. Thus in urban area, CPIs rises more for poor households, 2.8 percent compared to CPI for the urban rich households, 1.7 percent [Table 5.12].

Households gain if increase in income is more than to off set the negative impact of increase consumer prices. Table 5.12 shows that all household in the rural area gains except two, 'rural agriculture labourer in other Pakistan' and 'rural non farm poor', where CPI rises more than the rise in income. The largest welfare gains accrue to large farm households in Sindh. Within non farm households in rural area and the urban area, larger welfare gain accrues to non poor households. Overall, positive impact of income of [4.1 percent] dominates the negative impact of increase consumer prices [2.7 percent][rising cost of living], hence country as a whole gain by 1.6 percent in terms of welfare (Table 5.12). This exercise indicates that global agriculture trade liberalization benefit more to households in urban area leading to increase in rural urban gap. In each region, the rural and the urban, gap between the poor and the rich increases as agriculture liberalization benefits more to relatively rich group of households.

Table 5.13 presents percentage variation in poverty over the base year values measured by FGT indices-headcount, poverty gap and severity. The results show that poverty line rises for all households due to increase in CPIs, but the impact on poverty is positive[reduces] measured by head count ratio due to increase in income that off set the negative impact of CPIs. Resultantly, poverty reduces in Pakistan as a whole by 1.1 percent. Population below poverty line reduces more in the urban area than in the rural area, 2.6 percent and 0.8 percent, respectively. Table 5.13 indicates that increase in income is just enough to compensate the loss in real income due to increase in CPI for majority of households in the rural area. Population below poverty line reduces in majority of farm households and remains constant in all other households. Resultantly poverty reduces in the rural area by 0.8 percent. Other two indices, poverty gap and severity indices indicate decline in poverty; not only in farm households but also in non farm households. These indices give more weight to those households who are far from the poverty threshold level. From this we may conclude that this shock reduce chronic poverty within each household group except in rural agriculture labourer and non farm poor, where it rises. In the urban area, population below poverty line decreases by 2.6 percent in the poor group of households.

Table 5.13 also shows that larger benefit in terms of welfare gain and poverty reduction from global full liberalization of agriculture trade accrue to farm households. The only household where population below poverty line increases marginally is 'medium farm households in Punjab', the reason may be that households lie far from the poverty line. Therefore, increase in income is not enough that they will jump out of poverty. A comparison of poverty outcomes of global liberalization of rice with global liberalization of agriculture trade shows that poverty reduces more in the later by 0.5 percentage points.

Simulation 5: Partial Liberalization of Agriculture Trade in All Countries [part_ag]

In Simulation 5 partial liberalization in agriculture trade in developed as well as in developing countries is introduced by reducing all trade restrictions and domestic support measures by 50 percent in GTAP model. The direction of change in world import prices, world export prices and world export demand remains the same as in previous exercise of *full_rice* though quantitatively

it reduces in absolute term. A closer look at the results from GTAP model given in Appendix Table 2 reveals that the change in world export prices is proportionate to fifty percent for agriculture and agro based manufactured goods. The change in world export demand is less than fifty percent for export oriented sectors such as rice and textile. The world import prices show proportionate decline in majority of agriculture and agro-based manufactured goods. The horticulture sector-the most protected sector in Pakistan show that world import price reduces more than fifty percent. World import price reduces more for export oriented sectors such as leather and textile. World export price and world export demand reduce more than fifty percent for import competing sectors in Pakistan. These changes are fed into the country model along with fifty percent reduction in tariff on agriculture imports. The detailed results of this exercise from the country model are presented in Appendix Table 5.3. Here we discuss the difference in the out come of the two exercises, global liberalization of agriculture trade-full and partial.

Macro Effects

A comparison of the results of this exercise with the results of simulation 4 indicates reduction in the impact on macro as well as on micro level variables. The price index of agriculture import-the liberalized sector reduces by 4.4 percent instead of 8.8 percent. Whereas relative import price indices of industry and services sector show marginal difference in the two exercises, 0.18 percent instead of 0.19 percent and 0.16 percent instead of 0.2 percent, respectively. The impact on export price index of industry and services reduces by fifty percent, but the impact on export price index of agriculture-the liberalized sector- reduces by greater than two-third. This indicates that the impact on directly affected sectors such as agriculture is not proportionate. These results are largely driven by the assumption of imperfect substitutability between imports and domestically produced goods and imperfect substitution/transformation between exports and domestically consumed goods, which depend on their respective elasticity of substitution. These also depend on the functional form used in the model-non linearity in the relationship. As export price and export demand does not change much exports decline by 0.1 percent instead of 50 percent of 0.5 percent change in full liberalization case [Table 5.10]. Imports increase by less than one percent instead 2.1 percent [Table 5.10]. These results indicate reduction in trade by more than fifty percent over full liberalization case. From this we conclude that elasticity of substitution play a significant role in outcome of any shock. Consumer prices of agriculture-the liberalized sector- decline more than fifty percent, industry by fifty percent and services less than fifty percent. Hence, domestic demand for agriculture goods increases more than the demand in the previous exercise. The demand for industrial goods and services show fifty percent and less than fifty percent change over the change in full liberalization case[simulation 4].

At the sector level, it can also be observed from Appendix Table 5.3 that the reduction in impact is not proportionate to fifty percent for all commodities. In some cases impact reduces more than fifty percent and in other it is less than fifty percent. Demand for local service rise more due to relatively cheap availability compared to goods from other two sectors, agriculture and industry. On average, labour move towards service out of industry (Appendix Tabel 5.3). The positive impact on income of rural households reduces more than urban households; 66 percent and 50 percent, respectively.

Welfare and Poverty Effects

Table 5.12 indicates that the direction of change in income and CPI remains the same as in the previous exercise. All households still gain in terms of welfare with partial liberalization of agriculture trade. The distinct feature of this exercise is that two household 'rural agriculture laborer in other Pakistan' and 'rural non farm poor' in rural areas also gain, which are looser in the case of full liberalization of agriculture. They consume relatively more agriculture commodities. These are the households who do not own any land; therefore income effect does not reduce as much as the income of households who owns land. Price effect reduces more than fifty percent and income effect reduces less than fifty percent for these households than in full liberalization case. Resultantly, these households also gain. Table 5.12 shows that the effect on income of large farm holders reduces to one-third of the increase in full agriculture liberalization. As the size of the land reduces the intensity of impact also reduce from one third to one-half. The income effects of rural households dominate in the total and household income at the country level increases but less than in full liberalization case. The gain reduces by more than fifty percent with fifty percent reduction in liberalization.

The same pattern is found in poverty indicators. Poverty reduces by all measures over the base year among all households except in 'rural medium farm Punjab' leading to reduction in poverty by all measures in Pakistan (Table 5.13). Both types of indicators, welfare and poverty, indicate that welfare of the rural households increase less than proportionately, whereas benefit to the urban households is proportionate to the fifty percent. From this we may conclude that full liberalization of agriculture trade benefits more to the rural households and partial trade liberalization benefits more to the urban households. But in absolute term benefits are still higher for the rural household indicating reduction in the gap between the rural and the urban households.

Simulation 6: Long-run Effects of Global Rice Liberalization

This simulation is conducted to analyze the long-run effects of global full liberalization of rice trade by dropping the assumption of sector specific capital [non-agriculture] and land. In this exercise, changes in relative terms of trade and export demand from GTAP model are fed into Pakistani model as in simulation 1. Country leads to complete specialization as all factors of production adjust to changes in the economy. A comparison of results from two exercises [simulation 6 and simulation 1] reveals the difference between short-run and long-run impact.

Table 5.15: Long-run Effects on Quantities and Prices *(Percentage Variation over Base Values)*

Sectors	Imports	Composite Demand	Domestic sale	Exports	Output	Labour Demand	Capital	Land	Domestic Price	Value Added Price	Producer Price	Import Price	Consumer Price	Export Price
Agriculture(Total)	**-1.01**	**0.44**	**0.50**	**-1.26**	**0.46**	**-0.01**	**0.21**	**0.05**	**0.50**	**4.05**	**3.14**	**-0.02**	**4.94**	**0.28**
Wheat	13.38	-0.03	-0.34	-5.82	-0.53	-0.15	0	-0.72	-0.34	19.27	10.27	0.00	4.11	5.35
Rice -Paddy	0.00	1.63	1.63	0.00	1.63	2.08	0	1.56	1.63	148.36	91.03	0.00	29.06	0.00
Cotton	0.00	0.56	0.56	0.00	0.56	0.90	0	0.39	0.56	-7.33	-4.60	0.00	3.49	0.00
Other Major Crop	-5.14	0.81	1.01	1.24	1.02	1.43	0	0.85	1.01	-7.51	-5.52	-0.45	4.71	-5.26
Horticulture	-6.20	-1.21	-0.73	2.26	-0.61	-0.21	0	-0.71	-0.73	-7.00	-4.47	0.08	3.97	-2.64
Livestock and poultry	3.19	0.79	0.77	-1.13	0.75	-1.42	1.02	0	0.77	1.14	2.06	0.08	4.29	0.47
Forestry	8.01	0.51	-1.92	-5.97	-3.18	-2.78	0	-0.04	-1.92	8.92	7.47	0.03	1.28	5.40
Industry(Total)	**1.60**	**0.96**	**0.63**	**0.54**	**0.62**	**-0.89**	**0.35**	**0**	**0.63**	**1.29**	**1.98**	**0.01**	**1.67**	**2.25**

Mining	1.27	0.95	-0.36	-0.96	-0.48	-1.50	-0.03	0	-0.36	1.45	1.29	0.00	0.16	0.96
Food	1.41	1.29	1.27	0.09	1.04	-0.50	1.41	0	1.27	1.22	0.01	0.11	2.64	-0.82
Wheat-Milled	5.94	0.01	-0.26	-4.14	-0.33	-1.69	-0.01	0	-0.26	1.20	5.11	0.02	3.61	1.74
Rice-Milled	0.00	-4.07	-4.07	12.71	1.92	-0.10	2.48	0	-4.07	1.26	36.12	0.00	13.48	48.02
Textile	1.15	0.84	0.82	0.01	0.53	-0.88	1.03	0	0.82	1.36	0.10	0.06	2.18	-0.27
Leather	2.99	0.94	0.82	-0.81	0.12	-1.13	0.56	0	0.82	1.36	1.36	0.11	3.55	0.63
Other manufacturing	1.50	1.08	0.42	-0.31	0.25	-1.20	0.71	0	0.42	1.31	0.69	0.00	0.54	-0.01
Chemicals	1.64	1.37	0.69	-0.36	0.52	-1.32	1.01	0	0.69	1.25	0.69	0.01	0.47	0.10
Energy	2.18	1.56	1.34	0.00	1.34	-0.52	1.83	0	1.34	1.25	0.70	0.01	1.31	0.00
Services(Total)	**2.39**	**2.85**	**2.85**	**-0.05**	**2.74**	**0.13**	**-0.55**	**0**	**2.85**	**-0.99**	**-1.06**	**0.00**	**3.09**	**-0.09**
Construction	0.00	1.46	1.46	0.00	1.46	0.49	3.74	0	1.46	2.31	1.18	0.00	1.82	0.00
trade and transport	2.82	1.58	1.58	-0.05	1.44	0.61	2.55	0	1.58	2.03	0.90	-0.02	3.20	-0.09
Housing	0.00	20.11	20.11	0.00	20.11	0.00	-21.3	0	20.11	-33.89	-27.52	0.00	4.09	0.00
Services	2.37	1.66	1.63	0.37	1.63	-0.47	**5.4**	0	1.63	2.17	0.61	0.00	3.09	-0.44
ALL	**1.56**	**1.66**	**1.68**	**0.37**	**1.55**	**0.00**	**0**	**0**	**1.68**	**0.64**	**0.84**	**0.01**	**2.86**	**1.76**

Macro Effects

In this exercise, producers are able to shift 'land' from one crop to other crop and 'capital (non-agricultural)' from one industry to another. The results reveal that global liberalization in rice trade generate more favorable aggregate results in the long-run. In absence distortions in domestic rice market, price rises in all sectors of the economy, which have led to an increase in domestic price level. The change in domestic import price and consumer price remains the same as in the short-run. However, value added price increase by less than one percent compared to 4 percent in the short-run as all factors of production adjusts. Rice-paddy and rice-milled are land and capital [non-agriculture] intensive sectors. Producers shift from other crops to rice paddy by increasing land under paddy production by 1.6 percent and composite labour demand increase by 2 percent. In non agriculture sectors, capital moves toward rice-milled sector. Demand for capital increases by 2.5 percent but labor demand reduces marginally in this sector, with increase in demand for skill labour by 0.2 percent and decline in demand for unskilled labour by 0.4 percent. With fixed total supply of factors of production, the change in their demand translates into changes in their returns. Returns to capital increase by 0.8 percent and returns to composite labour used in agriculture and non agriculture sectors by 8.4 percent and 3 percent, respectively. Significant decline in capital demand can be observed in non traded sector-housing. The change in domestic export prices is less than the change in the short-run despite larger increase in export price of rice in the long-run, 48 percent instead of 36 percent and export of rice increase by 12.7 percent less than in the short-run. However, total exports and imports increase by 0.5 percent and 1.6 percent instead of 0.2 and 0.4 percent [short-run impact], respectively. This indicates that trade expend in the long-run.

The higher wages and returns to land and capital translate into higher income of the rural and the urban households by 2.9 percent and 4 percent, respectively. A significant rise in consumption of the households can be observed due to higher increase in income with the same price level as in the short-run [Table 5.10]. This leads to an increase in domestic absorption by 2.3 percent. Contrary to the short-run exercise, aggregate impact is more favorable for the urban households than the rural households in terms of both income and consumption. From this we may concluded that rice liberalization renders more benefits in the long-run, but rural-urban gap increases.

At the sector level, Table 5.15 shows export price rise in agriculture and industry as in the short-run but it declines in service sector. Though aggregate price index for three sectors increases in this exercise also but increase is less than the increase in the short-run. The largest increase is still in the industrial sector which includes liberalized sector in the global economy, rice. With rising world export demand of rice by 74 percent, domestic export price of rice milled rises by 48 percent, higher than in the short-run. Producer increase production of rice-paddy and milled- by 1.6 percent and 1.9 percent, respectively, less than in the short-run. Increase production of rice-milled is directed to world market and exports of rice-milled increase by 12.7 percent. The increase production of rice paddy is absorbed in domestic economy, as there is no export or import of this sector. Domestic sale of rice-paddy increases by 1.6 percent. It can also be observed from Table 5.15 that the change imports and exports differ from short-run. In the long-run export from industry increase instead of decline. In the long run exports from agriculture and services sector decline but the decline is less than in the short-run. Resultantly, total export increases by 0.4 percent instead of declining as in the short run. Similarly, imports increases more in industry, less in services and decline in agriculture. Due to a larger inflow of imports, demand for domestically goods fell more in the long-run than in short-run. Production in major crop and textile rise by larger percentage compared to the short-run increase. This indicates efficient allocation of resources. In the long-run, factors of production moves toward the sectors, where we have relatively comparative advantage. In aggregate, exports increase more in the long-run. The results indicate that intensity of the adverse impact reduces in the long-run. Contrary to short-run impact which benefits more to inward looking sectors agriculture and services open, complete specialization lead to expand the most open sector of the economy, industry. More than 80 percent exports and imports are from this sector.

Welfare and Poverty Effects

This section compares long-run effects of welfare and poverty with the short-run effects. Table 5.16 indicates that nominal income and consumer price index of all households increase in the rural and the urban area. It can be observed that nominal income rises a little less in the long-run compared to short-run as price are lower in the long-run than in the short-run. A closer look at the results reveals that the difference in income of large and medium land holders, in the long-run and in the short-run, is less than one percent. The difference rises to over one percent in relatively poor households. In the rural area, income of non farm poor decline by 1.8 percentage points over the income in the short-run. On the other hand, the difference in the income of 'non-farm-non-poor' is 1.5 percentage points. Whereas, in the urban area, difference is smaller for poor and larger for non poor, 0.8 and 1.6 percentage points, respectively. This indicates that complete specialization benefit more to the rich households in rural area and less to the poor, increasing income in real term significantly in the long-run, while reverse is true for urban rich and poor households [Table 5.16].

Consumer price of rice increases by 13 percent as in the short-run. However, the change in consumer price indices for the households vary between the two exercises due to change in composition of demand for commodities due to difference in the change in the income earned in the short-run and in the long-run. CPI increases more for the households who spend more on rice in both rural and urban as in the previous exercise. The results show that CPIs increases less in this exercise than in the short-run. In aggregate, CPI increase for rural households by 0.7 percent

and decline for urban households by 0.4 percent. It increases for Pakistan by 0.4 percent while it increases in the short-run by 3.2 percent.

These changes in income and consumer prices translate into change in welfare gain to houeshoulds. Table 5.16 shows that welfare gains are higher in the long-run. The increase in welfare of rich households is larger than the increase in welfare of poor households in both the rural and the urban area. This indicates that disparity between rich and poor households increases in the long-run despite larger gain to all households.

Table 5.16 Welfare and Poverty Impact of Globalisation of Rice in the Long-run(Percentage Variation Over Base Values)

Households	Household Income	Equivalent Variation	Consumer Price	Poverty Indicators		
				Head Count	Poverty Gap	Severity
Large farm Sindh	6.1	5.08	1.46	-1.20	-6.54	-6.06
Large farm Punjab	5.09	4.9	0.64	0.00	-10.06	-14.91
Large farm Other Pakistan	4.38	4.45	0.42	-2.98	-6.93	-7.19
Medium farm Sindh	5.27	4.06	1.46	-5.88	-8.59	-10.53
Medium farm Punjab	4.16	3.76	0.64	-0.06	-52.57	-83.68
Medium farm Other Pakistan	5.39	5.26	0.42	-5.92	-9.19	-10.82
Small farm Sindh	3.39	1.64	2.03	0.00	-2.94	-2.78
Small farm Punjab	3.58	2.91	0.9	-0.01	-9.32	-17.93
Small farm Other Pakistan	2.73	2.28	0.71	-0.89	-2.56	-2.67
Landless farmer Sindh	3.68	2.1	1.87	0.00	-3.07	-4.46
Landless farmer Punjab	3.5	2.99	0.76	0.00	-4.97	-5.23
Landless farmer Other Pakistan	3.32	2.96	0.61	0.00	0.00	0.00
Rural agriculture laborer Sindh	2.35	1.18	1.44	0.00	-2.20	-2.42
Rural agriculture laborer Punjab	2.3	1.56	0.98	-0.51	-1.17	-1.37
Rural agriculture laborer Other Pakistan	1.46	1.05	0.67	0.00	-0.65	-0.62
Rural non-farm non-poor	1.95	1.9	0.53	0.00	0.00	0.00
Rural non-farm poor	1.63	0.79	1.11	-0.53	-1.01	-1.19
Total Rural	**3.20**	**2.84**	**0.73**	**-1.90**	**-3.89**	**-4.06**
Urban Non poor (Below poverty line)	1.72	3.14	-0.68	0.00	0.00	0.00
Urban poor (Below Poverty line)	2.74	2.6	0.48	-3.92	-4.26	-3.05
Total Urban	**1.99**	**3.00**	**-0.38**	**-3.92**	**-4.26**	**-3.05**
Pakistan	**2.83**	**2.89**	**0.40**	**-2.25**	**-3.95**	**-3.88**

Table 5.16 again confirms the larger benefits of liberalization on poverty in the long-run. Poverty reduces more in the long-run compared to short-run, 2.2 percent instead of 0.6 percent in the short-run. The same pattern is found in the rural and the urban area. In the short-run poverty reduces by less than one percent in the rural area and no change is observed in urban area. In the long-run, global liberalization of rice reduces poverty in urban area also. Population below poverty line reduces more in the long-run by 2.25 percent in Pakistan and by 1.9 and 3.9 percent in the rural and urban area, respectively.

V. Summary and Conclusions

This study is conducted in the context of current debate about whether Pakistan would gain by rice and agriculture trade liberalization or not. Pakistan is an agriculture economy and rice is an important staple food and cash crop in Pakistan. Being a net exporter of rice, it is expected that global liberalisation of rice trade and agriculture trade would have positive impacts on Pakistan. The study examines the impact of global liberalization of rice and agriculture on macro aggregates, welfare and poverty incidence by using a CGE model for Pakistan. It evaluates both the impact of supply-side (in Pakistan) and demand side (in world economy) reforms. It also investigates that the difference between the long-run and short-run effects from global liberalization of rice trade.

The results at the macro level suggest that the liberalization of rice makes the traditionally inward-looking sectors such as agriculture and services more open. However, in the long-run, complete specialization benefit more the most open sector, industry. On average, agriculture wage rate rises more than non-agriculture wage rate indicating more benefits accrue to rural labour. The rural farm communities reap more benefits in terms of income and consumer price relative to non farm community. Across the regions, large farm Sindh gains the most and rural non farm poor gain the least from global liberalization in terms of welfare in all exercises. In the urban area gains are also higher for rich households than poor. This indicates that both rice and agriculture liberalization increase disparity between rich and poor. However, Pakistan as a whole is better off in all exercises. The gains increase more than proportionate with the increase in liberalization level. The results indicate that global full liberalization of rice renders more benefits in the long-run compared to short-run.

The framework presented in this study has permitted us to generate detailed poverty outcomes. In all exercises farming community gain more than non-farm rural and all urban households. However, the results show that both global rice and agriculture liberalization (partial and full) reduces poverty. Some variation occurs across the scenarios. Poverty reduces the most in the households 'medium farm other Pakistan' and least among the rural non farm poor in all exercises. Poverty also reduces among urban poor households in all exercises. In the rural area population below poverty line reduces in majority of farm households and remains constant in all other households. While poverty gap and severity indices indicate reduction in poverty among all households-farm non farm. It may be inferred that the rice liberalization reduces chronic poverty within each type of household group. However, liberalization of rice and agriculture render more gain to rural households than urban households but not in the long-run. In the long-run, rural-urban gap increases. Overall results suggest that global liberalization [full or partial] of rice and agriculture renders welfare gains and reduce poverty in Pakistan. A comparison of poverty outcomes of global liberalization of rice with global liberalization of agriculture trade shows that poverty reduces more in the later.

The results from two sets of exercises; rice trade and agriculture trade liberalization reveals the relative importance of demand and supply-side conditions in determining the welfare and poverty implications for Pakistan. The size of rice sector is small relative to all agriculture sectors. Therefore, rice trade liberalization generates small changes relative to all agriculture. Domestic agriculture policies affecting supply-side performances such as reduction in tariff have larger positive influence on domestic economy. This leads one to lean towards the hypothesis that developing countries can attain considerable success in boosting their agricultural exports

through supply-side policies.

The evidence also supports the view that reforms in domestic policies are crucial to promote agricultural export performance in Pakistan and has significant poverty reduction and welfare enhancing impact in the rural and the urban as well as in Pakistan as a whole. The study suggests that global liberalization of rice generate more favourable results in terms of welfare gain and poverty reduction in the long-run. However, long-run should be the time enough in which producers would be able to shift their fixed factors of production like capital to more beneficial sectors of the economy to reap more benefits of global liberalization of rice trade. We may also conclude from the results that recent rise in poverty is not due to rice or agriculture trade liberalization.

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Appendix-I Figure 5.1. Multilateral Production Process

Non-Agriculture Activities

XS

LF

VA   ICJ

CES

LDC   KD

CES

Skill   Unskilled
Labor   Labor

Agriculture Activities

XS

LF

VA   ICJ

CES

LDC   KC

CD

Large Farm Small Farm   Wage   Land   KD
  Labour   Labour   Labor

33
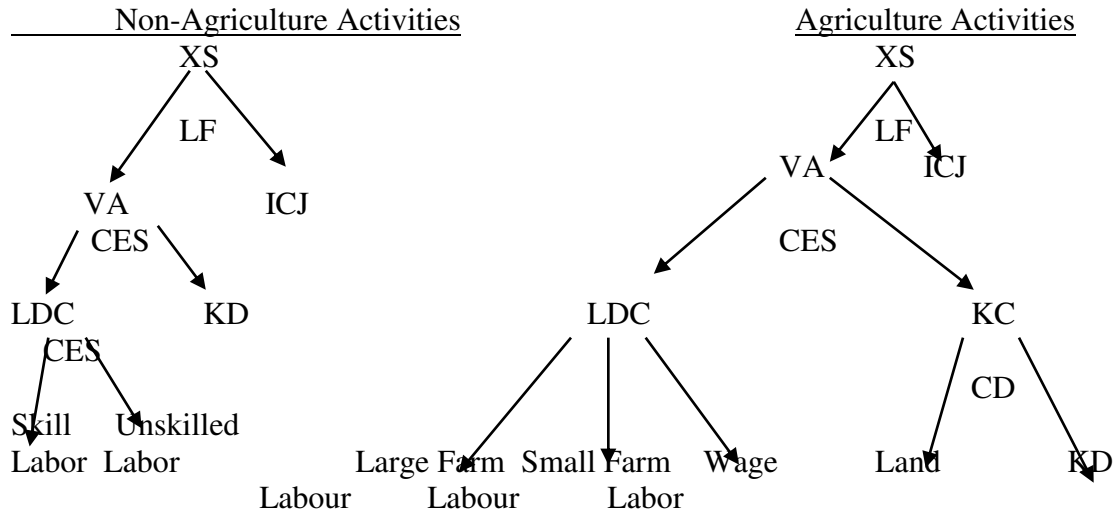
Appendix Table 5.1: Computable General Equilibrium Model for Pakistan

1. Income and Saving

1.1.

$$Y_H = \sum_S L_s * (\sum_m LD_{mS} * W_S) + \sum_S \lambda_H * \sum_m K_m * R_m + \Phi_h \sum LAND\_ * r\ln d + dvr_H * DIV_H + \overline{TR_H} * e + pindex * TGH_H$$

Households' Income

1.2 $DIV_H = dvr_H * Y_{FK}$ Dividends

1.3 $YD(H) = (1 - t_{yh}) * Y_H$ Disposable Income

1.4 $S_H = aps_H * sav * YD_H$ Households' Saving

1.5 $Y_{FK} = (1 - \sum \lambda_k) \sum (R_i K_i)$ Firms' Capital Income

1.6 $Y_F = Y_{FK}$ Firms' Total Income

1.7 $S_F = Y_F - \sum DIV_H$ Firms' Saving

1.8 $TXS_i = tx_i * P_i * X_i^S$ Taxes on Production

1.9 $TXM_n = tm_n * \bar{e} * P_n^{WM} M_n$ Taxes on Imports

1.10 $TXE_n = te_n * \bar{e} * P_n^{WM} X_n$ Taxes on Exports

1.11 $Y_G = \sum(ty_H * Y_H) + \sum TXS_i + \bar{e} * \overline{TR_{RG}} + \sum TXM_n + \sum TXE_n$ Government Revenue

1.12 $S_G = Y_G - \sum \overline{TR_{GH}} - \sum C_{Gi}$ Government Saving

2. Structure of Production   **C**

2.1 $X_i^S = , IC_i / v_i$ Output

2.2 $IC_i = io(i) * (X_i)$ Intermediate Consumption from ith sector

2.3 $IC_{ij} = a_{ij} * X_i$ Intermediate Demand of ith sector from jth

2.4 $VA_i = B_i[\delta_i K_i^{\sigma_i} + (1 - \delta_i)(L_i^D)^{-\sigma}]^{-1/\sigma i}$ Production Function (CES)-non Agriculture

2.5 $L_i^D = [\{\delta_i /(1 - \delta_i)\}\{R_i / wna\}^{1/\rho+1}] * K_i$ Labor Demand-Non Agriculture

2.6 $R_i = (P_i^{VA} * VA_i - wna * L_i^D) / K_i$ Return to Capital

2.7 $LD_i = B_l[\delta_i Lus_i^{\sigma_{li}} + (1 - \delta_i)Ls_i^{-\sigma_l}]^{-1/\sigma i}$ Composite labor of skill and un skill – Non Agriculture

2.8 $Lus^D = [\{\delta_i /(1 - \delta_i)\}\{ws_i / wus_i\}^{1/\rho+1}] * Ls_i$ Labor Demand derived from2.7

2.9 $ws = [wnag * L_i^D - wus * L_i^{Dus}] / L_i^{Ds}$ Wages Rate in non agriculture

2.10 $VA_i = B_i[\delta_i (KT_{ag}^D)^{\sigma_i} + (1 - \delta_i)(La^D_i)^{-\sigma}]^{-1/\sigma i}$ Production Function (CES)- Agriculture

2.11 $L_i a^D = [\{\delta_i /(1 - \delta_i)\}\{rk_{ag} / wag\}^{1/\rho+1}] * Ka_i$ Labor Demand in Agriculture

2.12 $L^D a_i = B_i[\delta_{1i} La_{1i}^{-\rho} + \delta_{2i} La^{-\rho}_{2i} + (1 - \delta_{1i} - \delta_{2i}) La_{3i}^{-\rho_l}]^{-1/\rho i}$ Composite Labour in Agriculture

2.13 $L_i a^D = [\{\delta_i /(1 - \delta_i)\}\{w1/ w2\}^{1/\rho+1}] * Ka_i$ Labor Demand derived from2.12

2.14 $KT_{ag}^D = A_{ag} * KD^\alpha_{ag} * \overline{LND}^{(1-\alpha)}_{ag}$ CD-Composite Capital in Agriculture

2.15 $KDag = \alpha_{ag} /(1 - \alpha_{ag}) * r\ln d_{ag} * KT_{ag}^D / r_{ag}$ Demand For Agriculture Capital derived from 2.15

2.16 $r\ln d_{ag} = [rkag * KT_{ag}^D - r_a * KD_{ag}] / Lnd_{ag}^D$ Returns for Land

2.17 $Wag = [w1La1 + w2L_{a2} + w3La3] / L^D a$ Average wage in the agriculture Economy

3. Foreign Trade Statistics

3.1 $X_n^s = B^T_n [\delta_n^T EX_n^{\rho_n T} + (1 - \delta_n^T) D_n^{\rho_n T}]^{1/\rho_n T}$ Export Transformation (CET)

3.2 $Q_n = B_n^s[\delta_n^s M^{-\rho_n^s} + (1 - \delta_n^s) D_n^{\rho_n^s}]^{1/\rho_n^s}$ Constant Elasticity of Substitution between imports and domestic goods

3.3 $Q_{NT} = X_{NT}$ Domestic Demand for non traded goods

3.4 $Ex_n = (P_n^E / P_n^D)^{\sigma_n^T}[(1 - \delta_n^T) / \delta_n^T]^{\sigma_n^t} * D_n$ Export Supply Function

3.5 $M_n = (P_n^D / P_n^M)^{\sigma_n^s}[\delta_n /(1 - \delta_n]^{\sigma_n^s} * D_n]$ Import Demand function

3.6 $Exd = (P^{we} / P_{fob}^e)^{\sigma_e} * EXDo$ Export Demand

3.7 $\sum P_n^{WM} * M_n + (1/e)\overline{TR_{FR}} - \sum \overline{P_n^{WE}} * EX_n - \overline{TR_{RH}} - \overline{TR_{RG}} = \bar{e} * \overline{CAB}$ Equilibrium in Foreign Market

4. Demand

4.1 $CT_H = YD_H - S_H$ Total Households Consumption

4.2 $C_i (h) == \{ P_{ci} \gamma_i + \beta^c_{hi}(CT_h - \sum P_c^i \gamma_i)\}/P_c^i$ Households demand function (LES)

4.3	$CG_i = \beta^{\Gamma}_i CT_G / P_i^c$	Government Consumption
4.4	$C_i = \sum CT_{Hi} + CG_i$	Total Private and Public Consumption
4.5	$INTD_i = \sum a_{ij} IC_j$	Intermediate demand
4.6	$I_i = \beta_i^I * IT / P_i^c$	Investment Demand
4.7	$Cgr_i = CT_G / P_g$	Government Total consumption in Real term

5. Prices

5.1	$P_n^M = (1 + tm_n) * (1 + tx) * \bar{e} * P_n^{WM}$	Domestic Price of Imports
5.2	$P_e (1 + te) = Pe_{fob} * e$	Domestic Price of Exports
5.3	$P_i\, X_i^S = (Pt_i * D_i^s + EX_i * P_i^E)$	Producer Price
5.4	$P_i^{VA} * VA_i = (P * X_i^s) - \sum (P_i^c\, IC_{ji})$	Value Added Price
5.5	$PD_i = Pt_i * (1 + tx_i)$	Domestic Price after paying taxes
5.6	$P_n^C = (D_n / Q_n) * P_n^D + (M_n / Q_n)\, P_n^M$	Composite Price of traded goods (consumer prices)
5.7	$P_{nt}^C = PD_{nt}$	Composite Price of non-traded goods
5.8	$Pindex = \sum (\beta_i^X * P_i^{VA})$	GDP Deflator
5.9	$Pg = \sum (P_i^c * \beta_I^g)$	Price deflator for total Government Consumption
5.9	$P_I = \sum (P_i^c * \beta_I^I)$	Price deflator for total investment

6. Equilibrium

6.1	$IT = TS_H + S_G + S_F + \bar{e} * \overline{CAB}$	*Saving-Investment Equilibrium*
6.2	$Q_i = C_i + INTD_i + I_i$	Commodity Market Equilibrium
63	$K_{ag}^S = \sum KD_{ag}$	Equilibrium in agriculture Capital
64	$Ls_S = \sum (L_{is}^D)$	Labour Market Equilibrium for each type of Labour

VARIABLES

Endogenous Variables

#	Symbol	Description
1	C_i	Total Consumption of ith Good
2	CG_i	Government final Consumption of Good i
3	CT_G	Total Government Consumption
4	CH_i	Household Consumption of Good i
5	CT_H	Total Consumption of household
6	D_i	Domestic Demand for domestically produced good
7	DIV_H	Dividends distributed to Households from firms
8	EX_n	Exports of nth good (FOB)
9	IC_i	Total Intermediate Consumption of Good by ith sector
10	IC_{ij}	Intermediate Consumption of Good J by ith sector
11	$INTD_I$	Intermediate Demand of Good I
12	I_i	Consumption of Good for investment in sector i^{th} sector
13	IT	Total Investment
14	L_i^D	Labour Demand in sector i
15	Lnd	Land
16	M_n	Imports of nth good (CAF)
17	Pg	Price deflator for government consumption
18	P_i	Producer Price
19	Pt_i	Domestic price without taxes
20	P_i^C	Price of Composite good
21	P_n^D	Price of domestically produced and consumed good including taxes
22	P_n^E	Domestic price of Exports including all taxes
23	P_n^M	Domestic Price of Imports including all taxes
24	P_n^{VA}	Value Added Price
25	P_{INDEX}	Producer price Index
26	Q_i	Domestic Demand for Composite Good i
27	R_i	Rate of Return on capital in branch n
28	rlnd	Returns to land
29	Sav	Adjustment in saving rate
30	S_G	Government Saving (Fiscal Deficit)
31	S_H	Saving of Household h
32	S_F	Firms Savings
33	TS_H	Total Households Savings
34	TXE_n	Taxes on Exports of nth sector
35	TXM_n	Taxes on Imports of nth sector
36	TXS_i	Indirect taxes on ith sector production
37	VA_i	Value Added of sector i
38	W	Wage rate
39	X_i^s	Production of ith sector
40	Y_H	Total Income Household h
41	YD_H	Disposable income of h Household h
42	Y_F	Firms total income
43	Y_G	Government Revenue
44	Y_{FK}	Firms Capital Income

Exogenous Variables

#	Symbol	Description
1	CAB	Current Account Balance
2	CT_{GR}	Government final consumption in real terms
3	e	Nominal Exchange Rate
4	K_i	i^{th} Branch Capital Stock
5	L^S	Total Labour Supply
6	P_n^{WE}	World Price of Exports
7	P_n^{WM}	World Price of Imports
8	TR_{FR}	Firms transfers to the rest of world
9	TR_{GF}	Government transfers to Firms
10	TR_{GH}	Government Transfers to Households
11	TR_{RG}	Foreign transfer payments to the Government
12	TR_{RH}	Foreign transfers to Households

b. SYMBOLS.

Symbols	Variable names

#	Symbol	Description
1	a_{ij}	Input Output Coefficients
2		
3	B_i	CES scale parameter of value added
4	B_e^T	CES scale parameter of export transformation function
5	B_c^s	CES scale parameter of Import aggregation function
6	β_{hi}^c	Percentage share of good i in h^{th} household consumption
7	β_i^τ	Percentage share of good i in Public consumption
8	β_i^I	Percentage share of good i consumed for Investment Purposes
9	β_i^x	Percentage share of good i in total Production
10	γ_i	Subsistence expenditure by h^{th} household
11	λ_l	Household Share of Labour Income
12	λ_k	Household Share of Capital Income
13	io_I	Leontief technical coefficients (Intermediate Consumption of good i
14	mps_h	Households h marginal propensity to save
15	tk	Capital Income tax rate of firms
16	v_I	Leontief technical coefficients (value added)
17	σ_i	CES elasticity of substitution of value added
18	ρ_i	CES Substitution parameter of value added
19	δ_i	CES Distributive share of value added
20	σ_e^T	CES elasticity of transformation of export
21	ρ_e^T	CET Substitution parameter of export transformation
22	δ_e^T	CES Distributive share of exports and domestic production
23	σ_c^T	CES elasticity of substitution of imports
24	ρ_c^T	CES Substitution parameter of imports
25	δ_c^T	CES Distributive share of imports and domestically produced goods
26	σ_{ex}^e	Elasticity of Export Demand

Appendix Table 5.2: Simulation in GTAP-MODEL-Results for Pakistan-Variation over base year (Percentage)*

Sectors	Simulation 1			Simulation 2			Simulation 3			Simulation 4			Simulation 5	
	World import price	World export price	World Export demand	World import price	World export price	World export demand	World import price	World export price	World export demand	World import price	World export price	World export demand	World import price	World export price
Wheat (Raw)*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rice-Paddy	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cotton	0.02	0.311	-0.95	0.018	0.314	-0.961	-0.011	0.12	-0.662	3.268	1.891	15.355	1.465	0.7
Rice (Manufactured)	7.927	1.295	74.332	6.241	1.3	74.776	3.985	0.543	29.509	6.652	2.963	50.211	3.204	1.1
Wheat (Manufactured)	0.021	0.357	-2.62	0.018	0.359	-2.646	-0.025	0.153	-1.304	9.94	2.654	74.663	6.304	1.1
Other major crop	-0.449	0.365	-5.255	-0.483	0.365	-5.409	0.033	0.171	-0.794	0.526	1.662	10.434	0.759	0.7
Horticulture	0.076	0.425	-1.317	0.078	0.428	-1.248	0.004	0.181	-0.833	2.832	3.039	97.486	1.156	0.9
Other food	0.112	0.243	-1.133	0.12	0.245	-1.088	-0.002	0.104	-0.462	-1.341	1.416	12.931	-0.472	0.5
Forestry	0.033	0.07	-0.188	0.034	0.071	-0.194	0.018	0.031	-0.071	0.359	0.272	1.788	0.231	0.1
Live stock and Poultry	0.077	0.35	-0.987	0.077	0.352	-0.995	0.008	0.152	-0.432	2.247	1.902	16.447	1.127	0.7
MINING	0.003	-0.002	0.138	0.001	-0.004	0.13	0.009	0.006	0.065	0.266	0.206	1.172	0.179	0.1
Leather	0.109	0.09	-0.202	0.107	0.091	-0.217	0.01	0.04	-0.229	-0.438	0.383	-5.427	-0.144	0.2
Textile	0.057	0.101	-0.413	0.059	0.102	-0.406	0.014	0.043	-0.224	0.024	0.574	-4.323	0.08	0.2
Chemicals	0.014	0.062	-0.319	0.014	0.063	-0.319	0.01	0.03	-0.129	0.074	0.342	-2.046	0.108	0.2
Energy	0.009	0.031	-0.11	0.007	0.03	-0.113	0.008	0.018	-0.04	0.315	0.276	0.418	0.207	0.1
Other Manufacturing	-0.002	0.056	-0.392	-0.002	0.057	-0.399	0.007	0.028	-0.142	0.095	0.269	-1.181	0.113	0.1
Construction	-0.01	0.073	-0.294	-0.011	0.074	-0.301	0.007	0.034	-0.099	0.126	0.335	-1.134	0.122	0.2
Trade and transport	-0.022	0.077	-0.245	-0.023	0.078	-0.253	0.003	0.036	-0.099	0.023	0.347	-0.083	0.08	0.2
Housing	0.066	0.066	0.009	0.067	0.067	0.009	0.03	0.03	0.003	0.243	0.243	0.042	0.177	0.1
Services	0	0.065	-0.217	-0.002	0.066	-0.224	0.007	0.031	-0.084	0.153	0.271	-0.379	0.133	0.1

*The Results are derived by Razzaque *et al.* in Chapter 2 of this volume.

Simulation 1: 100 percent removal of tariff and domestic support measures on rice in all countries.

Simulation 2: 100 percent removal of tariff and domestic support measures on rice only in developed countries. The developing countries do not liberalize.

Simulation 3: 50 percent removal of tariff and domestic support measures on rice in all countries.

Simulation 4: 100 percent removal of tariff and domestic support measures on all agricultural commodities in all countries.

Simulation 5: 50 percent removal of tariff and domestic support measures on all agricultural commodities in all countries.

Appendix Table 5.3: Effects on Prices and Volumes(Percentage Variation over Base Values)

Simulation 2	Imports	Composite Demand	Domestic sale	Exports	Output	Labour Demand	Value Added Price	Producer Price	Import Price	Consumer Price	Export Price
Agriculture(Total)	**5.0**	**0.2**	**0.0**	**-2.9**	**0.0**	**0.0**	**6.1**	**5.1**	**-0.03**	**5.0**	**1.7**
Wheat	5.4	0.0	-0.2	-2.5	-0.2	-0.4	5.8	4.2	0.00	4.2	2.2
Rice-Paddy	0.0	6.2	6.2	0.0	6.2	37.3	46.1	29.2	0.00	29.2	0.0
Cotton	0.0	-0.8	-0.8	0.0	-0.8	-1.8	4.7	3.5	0.00	3.5	0.0
Other Major Crop	6.3	0.0	-0.2	-4.4	-0.3	-0.6	5.6	4.8	-0.48	4.7	-0.5
Horticulture	4.8	0.1	-0.4	-3.3	-0.5	-1.2	5.0	4.3	0.08	4.0	2.3
Livestock and poultry	5.2	0.0	0.0	-2.8	0.0	-0.4	4.4	4.3	0.08	4.3	2.0
Forestry	1.4	-0.1	-0.6	-1.4	-0.9	-4.3	1.4	1.5	0.03	1.3	1.2
Industry(Total)	**1.2**	**0.2**	**-0.4**	**-0.4**	**-0.4**	**-1.3**	**2.4**	**2.7**	**0.01**	**1.7**	**3.0**
Mining	0.0	-0.2	-1.0	-0.9	-1.0	-3.3	0.3	0.8	0.00	0.2	0.9
Food	3.4	0.3	-0.1	-2.2	-0.5	-2.8	1.1	2.7	0.12	2.7	1.2
Wheat-Milled	4.6	0.2	0.1	-3.3	0.0	0.0	3.6	3.8	0.02	3.6	0.9
Rice-Milled	0.0	-0.6	-0.6	24.0	8.3	44.1	31.5	22.0	0.00	13.6	36.5
Textile	2.5	-0.3	-0.5	-1.8	-0.9	-3.6	0.6	2.0	0.06	2.2	1.3
Leather	4.1	-0.1	-0.3	-2.4	-1.2	-4.6	-0.7	3.1	0.11	3.6	2.1
Other manufacturing	1.0	0.3	-0.7	-1.2	-0.8	-3.3	0.7	1.2	0.00	0.5	0.8
Chemicals	1.6	1.0	-0.4	-1.4	-0.5	-2.5	1.8	1.5	0.01	0.5	1.0
Energy	1.8	0.2	-0.3	0.0	-0.3	-1.6	2.5	1.8	0.01	1.3	0.0
Services(Total)	4.2	0.3	0.2	-2.0	0.1	0.2	3.8	3.1	0.00	3.1	1.6
Construction	0.0	-0.4	-0.4	0.0	-0.4	-0.6	3.5	1.8	0.00	1.8	0.0
trade and transport	4.2	0.3	0.3	-2.0	0.1	0.1	3.7	3.1	-0.02	3.2	1.6
Housing	0.0	0.0	0.0	0.0	0.0	0.0	4.6	4.1	0.00	4.1	0.0
Services	**4.2**	**0.4**	**0.2**	**-1.8**	**0.2**	**0.4**	**3.7**	**3.3**	**0.00**	**3.1**	**1.5**
ALL	**1.5**	**0.2**	**0.0**	**-0.8**	**-0.1**	**0.0**	**4.0**	**3.4**	**0.01**	**2.9**	**2.7**
Simulation3											
Agriculture(Total)	**1.9**	**0.1**	**0.0**	**-1.2**	**0.0**	**0.0**	**2.4**	**2.0**	**0.01**	**1.9**	**0.7**
Wheat	2.1	0.0	-0.1	-1.0	-0.1	-0.2	2.3	1.6	0.00	1.6	0.9
Rice -Paddy	0.0	2.7	2.7	0.0	2.7	15.1	18.0	11.4	0.00	11.4	0.0
Cotton	0.0	-0.3	-0.3	0.0	-0.3	-0.8	1.8	1.4	0.00	1.4	0.0
Other Major Crop	2.2	0.0	-0.1	-1.2	-0.1	-0.2	2.3	1.9	0.03	1.9	0.5
Horticulture	1.9	0.0	-0.2	-1.5	-0.2	-0.5	2.0	1.7	0.00	1.6	0.8
Livestock and poultry	2.0	0.0	0.0	-1.1	0.0	-0.2	1.7	1.7	0.01	1.7	0.8
Forestry	0.6	0.0	-0.3	-0.6	-0.4	-1.7	0.6	0.6	0.02	0.5	0.5
Industry(Total)	**0.5**	**0.1**	**-0.2**	**-0.1**	**-0.1**	**-0.5**	**0.9**	**1.1**	**0.01**	**0.7**	**1.2**
Mining	0.0	-0.1	-0.4	-0.3	-0.4	-1.3	0.1	0.3	0.01	0.1	0.4
Food	1.4	0.1	-0.1	-0.9	-0.2	-1.1	0.4	1.0	0.00	1.0	0.5
Wheat-Milled	1.8	0.1	0.0	-1.4	0.0	-0.1	1.4	1.5	-0.03	1.4	0.3
Rice-Milled	0.0	-0.3	-0.3	10.9	3.7	18.1	13.1	8.8	0.00	5.4	15.1
Textile	0.9	-0.1	-0.2	-0.7	-0.4	-1.5	0.2	0.7	0.01	0.9	0.5
Leather	1.6	0.0	-0.1	-1.0	-0.5	-2.0	-0.5	1.2	0.01	1.4	0.8
Other manufacturing	0.4	0.1	-0.3	-0.5	-0.3	-1.3	0.3	0.5	0.01	0.2	0.3
Chemicals	0.6	0.4	-0.1	-0.5	-0.2	-1.0	0.7	0.6	0.01	0.2	0.4
Energy	0.7	0.1	-0.1	0.0	-0.1	-0.6	1.0	0.7	0.01	0.5	0.0
Services(Total)	1.6	0.1	0.1	-0.8	0.0	0.1	1.5	1.2	0.01	1.2	0.6
Construction	0.0	-0.2	-0.2	0.0	-0.2	-0.2	1.4	0.7	0.00	0.7	0.0
trade and transport	1.6	0.1	0.1	-0.8	0.0	0.1	1.4	1.2	0.00	1.3	0.6
Housing	0.0	0.0	0.0	0.0	0.0	0.0	1.8	1.6	0.00	1.6	0.0
Services	**1.6**	**0.2**	**0.1**	**-0.7**	**0.1**	**0.1**	**1.4**	**1.3**	**0.01**	**1.2**	**0.6**
ALL	**0.6**	**0.1**	**0.0**	**-0.3**	**0.0**	**0.0**	**1.6**	**1.3**	**0.01**	**1.1**	**1.1**
Simulation 5											
Agriculture(Total)	**7.18**	**0.14**	**-0.06**	**2.98**	**0.00**	**0.00**	**2.66**	**2.31**	**-4.38**	**2.12**	**4.29**
Wheat	3.20	0.36	0.29	-1.14	0.24	0.53	2.97	2.18	0.03	2.20	1.00
Rice -Paddy	0.00	1.81	1.81	0.00	1.81	9.74	12.72	8.31	0.00	8.34	0.00
Cotton	0.00	-0.75	-0.75	0.00	-0.75	-1.72	1.39	1.22	0.00	1.26	0.00
Other Major Crop	2.23	0.21	0.15	2.25	0.19	0.47	2.97	2.55	0.79	2.48	5.19
Horticulture	13.96	0.50	-0.70	7.63	-0.38	-1.12	1.68	1.62	-9.57	0.42	6.99
Livestock and poultry	2.55	-0.01	-0.04	2.70	-0.01	-0.06	2.38	2.25	0.10	2.24	4.56
Forestry	0.54	-0.14	-0.37	-0.22	-0.32	-1.60	0.99	1.03	0.26	0.84	1.10
Industry(Total)	**0.60**	**0.05**	**-0.26**	**-0.10**	**-0.22**	**-0.77**	**1.79**	**1.50**	**0.18**	**1.00**	**1.67**
Mining	-0.03	-0.13	-0.58	-0.34	-0.53	-1.75	0.44	0.67	0.21	0.30	0.80
Food	2.72	0.21	-0.17	3.10	0.50	2.58	4.58	2.54	-0.44	1.63	4.90
Wheat-Milled	-4.20	-0.05	0.14	19.54	0.52	2.87	5.22	2.78	6.34	2.65	18.74
Rice-Milled	0.00	-0.15	-0.15	7.25	2.43	11.82	9.98	6.83	0.00	4.62	11.01
Textile	0.86	-0.36	-0.42	-1.59	-0.84	-3.18	-0.45	0.77	0.11	1.05	0.22
Leather	2.38	-0.25	-0.40	-2.65	-1.36	-5.12	-2.63	1.42	-0.11	2.08	0.39
Other manufacturing	0.54	0.18	-0.37	-0.74	-0.46	-1.89	0.59	0.77	0.15	0.44	0.41
Chemicals	0.74	0.45	-0.26	-1.02	-0.39	-1.85	0.86	0.87	0.14	0.38	0.44
Energy	0.88	0.09	-0.19	0.00	-0.19	-0.92	1.55	1.10	0.24	0.90	0.00
Services(Total)	1.87	0.44	0.41	-0.94	0.36	0.11	1.28	1.00	0.16	1.02	0.99
Construction	0.00	0.08	0.08	0.00	0.08	0.12	2.25	1.22	0.00	1.26	0.00
trade and transport	2.07	0.12	0.12	-0.94	0.02	0.04	2.25	1.64	0.11	1.73	0.99
Housing	0.00	4.49	4.49	0.00	4.49	0.00	-9.02	-7.15	0.00	-7.12	0.00
Services	**1.86**	**0.19**	**0.12**	**-0.84**	**0.12**	**0.19**	**2.25**	**1.58**	**0.17**	**1.56**	**0.77**
ALL	**0.87**	**0.23**	**0.11**	**-0.13**	**0.09**	**0.00**	**1.70**	**1.44**	**0.04**	**1.22**	**1.66**

Appendix Table 5.4. Consumption Pattern by Households

Sectors	Large farm Sindh	Large farm Punjab	Large farm Other Pakistan	Medium farm Sindh	Medium farm Punjab	Medium farm Other Pakistan	Small farm Sindh	Small farm Punjab	Small farm Other Pakistan	Landless farmer Sindh	Landless farmer Punjab	Landless farmer Other Pakistan	Rural agriculture laborer Sindh	Rural agriculture laborer Punjab	Rural agriculture laborer Other Pakistan	Rural non-farm non-poor	Rural non-farm poor	Total Rural	Urban Non Poor	Urban Poor	Total urban
Agriculture Total	27.35	27.95	21.94	27.34	27.95	21.94	28.34	31.90	28.88	29.29	29.21	25.73	28.27	31.93	24.49	27.83	26.03	28.67	26.64	26.23	26.60
Wheat	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rice-Paddy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cotton	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Major Crop	0.14	0.10	0.14	0.14	0.10	0.14	0.14	0.11	0.22	0.18	0.14	0.20	0.17	0.12	0.24	0.18	0.16	0.15	0.21	0.18	0.20
Horticulture	4.80	4.34	5.67	4.80	4.34	5.67	5.58	5.19	6.07	6.56	6.16	6.91	5.96	6.49	7.08	6.02	6.70	5.66	6.17	6.84	6.24
Livestock and poultry	22.38	23.38	16.12	22.38	23.38	16.11	22.59	26.52	22.54	22.52	22.87	18.57	22.13	25.29	17.14	21.57	19.13	22.80	20.22	19.20	20.11
Forestry	0.03	0.12	0.01	0.03	0.12	0.01	0.03	0.08	0.05	0.03	0.04	0.05	0.02	0.03	0.02	0.06	0.03	0.06	0.05	0.01	0.04
Industry Total	37.16	36.05	41.59	37.17	36.05	41.61	36.30	32.85	35.76	35.50	35.44	38.88	36.92	33.15	40.49	35.93	38.88	35.71	34.20	37.40	34.55
Mining	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02
Food	10.10	8.02	10.15	10.11	8.02	10.17	10.39	9.91	13.90	12.06	11.39	14.74	14.16	11.21	17.05	10.89	13.53	10.89	8.94	12.29	9.30
Wheat	6.71	4.30	7.28	6.71	4.30	7.28	6.49	6.29	7.19	8.04	7.56	8.10	10.65	8.95	11.41	5.80	10.04	6.67	3.86	8.91	4.41
RICE-Milled	3.08	0.70	0.82	3.08	0.70	0.81	5.30	0.97	0.98	4.99	0.97	0.85	2.84	1.22	0.68	1.33	2.12	1.51	1.11	1.83	1.19
Text	5.44	6.48	4.79	5.44	6.48	4.79	5.94	6.15	5.18	6.64	6.36	5.21	6.00	6.71	5.01	5.69	6.50	5.98	5.70	6.69	5.81
Leather	0.24	0.34	0.28	0.24	0.34	0.28	0.24	0.33	0.34	0.25	0.34	0.33	0.19	0.35	0.33	0.31	0.33	0.32	0.32	0.36	0.32
other manufacturing	7.15	10.27	11.62	7.15	10.27	11.62	4.58	5.34	4.25	1.18	4.88	5.34	1.01	2.25	2.73	6.90	3.03	5.99	8.35	3.32	7.80
Chemicals	3.17	4.55	5.14	3.17	4.55	5.15	2.03	2.36	1.88	0.52	2.16	2.36	0.45	0.99	1.22	3.06	1.34	2.65	3.69	1.47	3.45
Energy	1.26	1.38	1.49	1.26	1.38	1.49	1.32	1.48	2.01	1.79	1.75	1.91	1.61	1.45	2.04	1.93	1.98	1.68	2.21	2.50	2.24
Service Total	35.49	36.00	36.47	35.49	36.00	36.46	35.35	35.24	35.36	35.21	35.35	35.39	34.80	34.92	35.02	36.24	35.09	35.62	39.16	36.37	38.85
Construction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trade and Transport	16.60	16.74	16.62	16.60	16.74	16.62	16.48	16.51	16.37	16.25	16.41	16.38	16.16	16.29	16.20	16.43	16.27	16.47	16.06	16.05	16.05
Housing	1.38	1.61	2.31	1.38	1.61	2.31	1.49	1.31	1.73	1.82	1.63	1.72	1.59	1.44	1.73	2.47	1.65	1.78	6.17	3.39	5.86
Services	17.51	17.65	17.53	17.51	17.66	17.53	17.38	17.42	17.26	17.14	17.31	17.28	17.05	17.19	17.09	17.33	17.16	17.37	16.94	16.93	16.93
Total consumption	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Agriculture and industry	64.51	64.00	63.53	64.51	64.00	63.54	64.65	64.76	64.64	64.79	64.65	64.61	65.20	65.08	64.98	63.76	64.91	64.38	60.84	63.63	61.15