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# Poverty Implications of Agricultural and Non-Agricultural Price Distortions in Pakistan

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## Abstract

Using recent estimates of industry assistance rates, the effects of trade liberalization in the rest of the world and in Pakistan alone are analyzed using a global and a Pakistan CGE model under two tax replacement schemes: a direct income tax and an indirect tax replacement. The results indicate that the distributional and poverty effects in Pakistan of a unilateral liberalization of all traded goods are significantly greater than the effects of trade liberalization in the rest of the world. There is relatively higher increase in real income and larger decline in poverty incidence in poor households both in rural and urban areas. The effects of agricultural trade liberalization alone in both the rest of the world and in Pakistan are considerably smaller than those from trade liberalization involving all goods. In both the agricultural and all-goods trade liberalization scenarios involving direct income tax replacement, real household income is raised and the poverty incidence is lowered at varied rates across all household groups except for the urban non-poor. When an indirect tax replacement is used, where the burden of replacing tariff revenue is shared by all household groups depending on their consumption structure, there is reduction in household income for most of the groups and less reduction of poverty.

**JEL codes:** D30, D58, D63, F13, O53, Q18

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# Poverty Implications of Agricultural and Non-Agricultural Price Distortions in Pakistan

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This chapter analyzes the macroeconomic, sectoral and poverty implications of removing agricultural and non-agricultural price distortions in the domestic markets of Pakistan and in the rest of the world. The analysis uses rest-of-world trade liberalization results from the World Bank's global LINKAGE model (hereafter referred to as the global model, see van der Mensbrugghe 2005) and derives results for rest-of-world and own-country liberalization from the Pakistan computable general equilibrium (CGE) model of Cororaton and Orden (2008). The global model incorporates new estimates of assistance to farm industries for various developed and developing countries including Pakistan from the World Bank Agricultural Distortions project.<sup>1</sup> Using these new estimates, the global model simulates two separate scenarios involving a full trade liberalization and an agricultural-only trade liberalization, both excluding Pakistan. The global model simulations generate changes in the import prices for Pakistan at the border together with changes in world export prices and shifts in the export demand for Pakistan products. We utilize these results in the Pakistan CGE model with the new estimates of industry assistance for Pakistan generated by Dorosh and Salam (2009) to analyze various liberalization scenarios and measure their impacts on national welfare, income inequality and poverty in Pakistan.

Trade reform entails a fiscal revenue loss to the government of Pakistan because trade taxes are an important source of revenue. We conduct experiments using two alternative tax replacement schemes to retain a fixed fiscal balance: a direct tax on household income, and an

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<sup>1</sup> Estimates of agricultural assistance for Pakistan, based on Dorosh and Salam (2009), are incorporated in the World Bank's global agricultural distortions database (Anderson and Valenzuela 2008). Those estimates cover five decades, but the representative values for CGE modeling as of 2004 that are used here are available in Valenzuela and Anderson (2008).

indirect tax on consumption. We are thus able to show how the results differ according to the choice of tax replacement.

The simulation analysis is conducted in stages. In the first stage, we run two separate experiments. One involves using the changes in the border prices and the computed shifts in the world export demand for Pakistani products from the global model (see Anderson, Valenzuela and van der Mensbrugghe 2010) as an exogenous shock to the Pakistan model without altering the existing structure of price-distorting policies in Pakistan itself. The other involves simulating unilateral trade liberalization in Pakistan without incorporating the changes from the global model. In the second stage, we combine those two separate experiments to examine their total effects. We conduct separate experiments in each stage for trade liberalization in all tradable goods sectors, and in agriculture (including lightly processed food) only. The simulations generate vectors of household income and consumer prices, which we use in conjunction with data from the 2001-02 Pakistan Household Integration Economic Survey (HIES, see Federal Bureau of Statistics 2003) to calculate the impact on national income inequality and poverty.

The chapter is organized as follows. The next section discusses the structure of agricultural and trade distortions in Pakistan based on the new estimates of industry assistance. The Pakistan CGE model is then outlined, including its database which reveals the structure of sectoral production, trade and consumption, sources of household income, and the tax structure based on a 2001-02 social accounting matrix (SAM). This is followed by a description of trends in rural and urban poverty in Pakistan. The policy experiments and the results generated by the various modeling scenarios are discussed in detail before the last section presents a summary of findings and policy insights. The choice of tax replacement schemes plays an important role in the results we present and discuss.

### **Agricultural policies and industry assistance in Pakistan**

The period from the 1960s to the mid-1980s involved heavy government intervention in Pakistan (Dorosh and Salam 2009). The government's hand on agricultural markets, trade policies, and the market for foreign exchange depressed real prices of tradable agricultural commodities. The

fixed exchange rate policy during these years, together with high domestic inflation, eroded significantly the competitiveness of export sectors. However, during these years the so-called green revolution took place in agriculture. That involved a package of inputs such as seeds, fertilizer and irrigation that boosted agricultural production through higher farm productivity. Then from the mid-1980s to the early 1990s, the government started to liberalize the agriculture sector, but it still maintained heavy control over the domestic wheat market and imposed high tariffs on vegetable oils and milk products.

Prior to the 1990s, Pakistan had been pursuing an import-substituting industrialization strategy, which involved high tariff rates and quantitative import restrictions (QRs) to promote the manufacturing sector. Then major reforms were implemented in 1991 and 1997, involving a series of cuts to tariff rate cuts and the phasing out of QRs. The maximum tariff rates were reduced from 65 to 45 percent, and the number of tariff categories was cut from 13 to 5. This led to a significant drop in government revenue from trade taxes, as tariffs had been the major contributor to government funds.

The key policy changes affecting agricultural prices are summarized in the rest of this section, while those affecting the manufacturing sector are described later in the chapter.

Wheat is the staple food in Pakistan. Its market is still heavily controlled by the government through various instruments: government procurement (to stabilize supply), support price (to assist farmers), and a ceiling price (to ensure affordability to consumers). However, Pakistan's trade and pricing policies on wheat effectively taxed wheat producers while at the same time providing substantial fiscal subsidies to wheat millers through the government sale of wheat at below market prices (Dorosh 2005).

Government involvement in the market for cotton, which is the largest cash crop in Pakistan, has changed substantially over time. In 1974, the government prevented the private sector from engaging in international cotton trade, but this changed in 1989 when the private sector was allowed to directly buy cotton from the ginners and to export and sell cotton domestically. Also, exports of cotton were subjected to an export tax. With the abolition of the export duty on cotton in 1994, domestic prices came closer in line with international prices (Cororaton and Orden 2008). Since the mid-1990s, exports and imports of cotton have been practically duty free, although seed cotton continues to enjoy indirect protection because of

import tariffs on vegetable oils that increase the price of cotton seed oil. Otherwise, government intervention has recently been limited to the annual review of the support prices of seed cotton and some public-sector procurement to maintain it.

Rice is the third largest crop in Pakistan after wheat and cotton. There were heavy controls on rice in the early 1970s when the government instituted a monopoly procurement scheme to limit domestic consumption and expand exports. The two varieties of rice (basmati and the ordinary coarse rice called IRRI) are exported. The intervention system still exists but, since 2003-04, government procurement has been minimal. There were no export taxes on rice in the mid-2000s, but imports were subject to a 10 percent customs duty. The average domestic price of rice is below the export price (often about 20 percent) because of quality differences.

The domestic marketing and processing of sugarcane were highly regulated until the mid-1980s. The zoning of sugar mills required farmers to sell sugarcane to mills inside their zone until 1987. There has been no government procurement of sugarcane, but the federal government annually announces a support price which greatly assists sugarcane and refined sugar production, and it adjusts import tariffs and related taxes to stabilize domestic prices. There are export bans on sugarcane and refined sugar, but they do little to reduce the high level of assistance to the industry.

There was a minor tax on vegetable oils in the 1970s and 1980s. However, since the 1990s, vegetable oil imports have been taxed heavily. For example, in 2005-06 the tariff was 32 percent on imported soybean oil and 40 percent on palm oil. Likewise, the domestic prices of sunflower oil are considerably higher than the border price. Even so, two-thirds of the edible oil requirements in Pakistan are imported.

Maize is mainly used as feed in the livestock and poultry sectors in Pakistan. Its production has expanded rapidly in recent years because of the strong demand for poultry products. The government has not intervened in the production and marketing of maize. However, there are tariffs on imported maize which range from 10 to 25 percent. Maize was a non-tradable crop between 1990 and 2005, thus import tariffs had only minor effects on domestic prices.

Import tariffs on milk are very high in Pakistan. In the 1970s and 1980s, the average protection was estimated at 74 percent, but the extent of protection has diminished and in the first half of the present decade averaged about 35 percent (Dorosh and Salem 2009).

## **The Pakistan CGE Model**

This section summarizes the structure of the Pakistan CGE model, details of which can be found in Cororaton and Orden (2008). It also discusses how we introduce changes in the model to interface with the results generated from the global Linkage model. The model's database representing the Pakistan economy is also summarized, along with the key parameters of the model.

### ***Structure of the national model***

The Pakistan CGE model of Cororaton and Orden (2008)<sup>2</sup> is calibrated to the 2001-02 Social Accounting Matrix (SAM) constructed by Dorosh, Niazi and Nazli (2004). The model has 34 production sectors in primary agriculture, lightly processed food, other manufacturing, and services. There are five categories of productive factors: 3 labor types (skilled labor, unskilled labor, and farm labor) as well as capital and land. As well there are 19 household categories, a government sector, a firm sector, and the rest of the world.

In the model, output (X) is a composite of value added (VA) and intermediate inputs. Output is sold to the domestic market (D) and can also be sold to the export market (E). Goods E and D are perfect substitutes. Supply in the domestic market comes from domestic output and imports (M), with substitution between D and M dependent on the change in the relative prices of D and M and on the substitution parameter in a constant elasticity of substitution (CES) function.

The primary factors of production in agriculture are unskilled labor (a composite of farmers' own labor and hired unskilled labor), land and capital, while in non-agriculture they are

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<sup>2</sup> The specification of the model is based on "EXTER" (Decaluwe, Dumot and Robichaud 2000).

skilled labor, unskilled labor and capital. Farmers' own on-farm labor is used only in primary agriculture. Other unskilled labor (including by farmers) is mobile across sectors and is employed in agricultural and non-agricultural sectors, while skilled labor is only mobile among non-agricultural sectors. Capital is fixed in each sector, with separate sectoral rates of return.<sup>3</sup> The use of land can shift among agricultural industries.

Household income sources are from factors of production, transfers, foreign remittances, and dividends. Household savings are a fixed proportion of disposable income. According to the SAM, non-poor urban households pay direct income tax to the government, while other households do not. Household demand is specified as a linear expenditure system (LES).

The government sources its revenue from direct taxes on household and firm income, indirect (consumption) taxes on domestic and imported goods, tariffs and other receipts. It spends on consumption of goods and services, transfers and other payments. We assume a fixed government fiscal balance in nominal terms. Tariff policy reforms result in changes in government income and expenditure, but the government balance is fixed through a tax replacement. We use a direct income tax replacement, but also compare the results under an adjustment via an indirect sales tax replacement on domestic consumption.<sup>4</sup> Either way, the tax replacement is endogenously determined so as to maintain the level of government balance fixed.

Foreign savings are also fixed. The numeraire is a weighted index of the price of value added where the weights are the sectoral value added shares in the base calibration. The nominal exchange rate is flexible. Furthermore, we introduce a weighted price of investment and derive total investment in real prices. We hold total investment in real prices fixed by introducing an adjustment factor in the household savings function. The equilibrium in the model is achieved when supply and demand of goods and services are equal and investment is equal to savings.

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<sup>3</sup> Cororaton and Orden (2008) includes a dynamic analysis in which sectoral capital adjusts over time.

<sup>4</sup> The direct tax replacement on household income is specified as  $dyh = yh(1-dtxrh[1+ndtxrh])$ , where  $dyh$  is disposable income;  $yh$  income before income tax;  $dtxrh$  income tax rate at the base; and  $ndtxrh$  income tax replacement. On the other hand, indirect tax replacement on commodities is specified as  $pd = pl(1+itxr)(1+nitx)$  where  $pd$  is domestic price;  $pl$  local price before indirect tax;  $itxr$  indirect tax rate at the base; and  $nitx$  indirect tax replacement.

### ***Linking the global model with the Pakistan model***

There are various ways of transmitting the results derived from a global CGE model to a single-country CGE model. Horridge and Zhai (2006) propose for imports the use of border price changes from the global model's simulation of rest-of-world liberalization (that is, without Pakistan). For Pakistan's exports, their proposed scheme is as follows.

The export demand in the Pakistan model is

$$(1) \quad E = E_0 \left[ \frac{PWE_0}{PWE} \right]^\eta$$

where  $E$  refers to exports,  $PWE_0$  to international prices,  $PWE$  to the fob (border) prices of Pakistan's exports,  $\eta$  to the export supply elasticity whose value is equal to  $ESUBM$  which is the Armington parameter in the global model, and  $E_0$  is the scale parameter in the demand function. Since exports and domestic goods are perfect substitutes, the export price in local currency is equal to the local price, where the local price does not include indirect taxes.

The change in the export demand shifter,  $E_0$ , is derived as

$$(2) \quad E_0 = 100 \cdot (a-1) \text{ where } a = (1+0.01p) ([1+0.01q]^{[1/ESUBM]})$$

and where  $p$  is the change in the border export price and  $q$  is the change in the export volume from the global model with liberalization in all countries except Pakistan (Horridge and Zhai 2006). The idea of introducing the export demand shift calculated from (2) is to let the Pakistan model, not the simpler representation of Pakistan in the global model, determine the export supply behavior and the equilibrium prices and quantities for Pakistan's exports, taking into account the world demand shift from the global model.

### ***Economic structure in the SAM and key parameters in the Pakistan model***

Table 1 shows the sectoral structure of production and trade in the model based on the 2001-02 SAM. Of the 34 sectors, 12 are primary agricultural ones (sectors 1 to 12), and sectors 14 to 18, which are lightly processed food, are part of the broadly defined agricultural sector in this

analysis. The non-agricultural sectors include the mining industry (sector 13), other food (sector 19), manufacturing industries (sectors 20 to 27), energy (sector 28), construction (sector 29), and 5 service sectors (sectors 30 to 34). With these broad sectoral groupings, agriculture produces 27 percent of sectoral value added and 28 percent of the gross value of sectoral output. In the SAM, it accounts for 12.5 percent of total employment.<sup>5</sup>

There are 19 household groups in the model. The agricultural-based groups are categorized by household location (Punjab, Sindh, and other Pakistan) and size of land holdings (large, medium and small farms, landless small-farm renters, and agricultural workers without land). In addition, there are four non-farm national aggregates: rural non-farm poor and non-poor, and urban poor and non-poor. Table 2 shows the 19 households in the SAM and the corresponding characteristics of these 19 household groups in the HIES.

The structure of consumption varies among household groups. A composite sector of ‘Livestock, cattle and dairy’ has the highest share in the consumption basket, varying from 14 percent in large and medium farms in other Pakistan provinces to 25 percent in agricultural workers in Punjab. The other major items in the consumption basket are private services (about 14 percent), transport (about 13 percent), wheat milling (from 4 percent among urban non-poor to 12 percent among agricultural workers in other Pakistan provinces), textile (from 5 percent in large and medium farms in other Pakistan provinces to 7 percent among agricultural workers in Punjab and urban poor), other manufacturing (from 1 percent in agricultural workers in Sindh to 10 percent in large and medium farmers in other Pakistan provinces), sugar (from 3 percent in urban non-poor to 10 percent in agricultural workers in other Pakistan provinces), and fruits and vegetables (from 4 percent among large and medium farms in Punjab to 7 percent in agricultural workers in other Pakistan provinces). Commodities with high foreign trade content will be impacted significantly by changes in trade policies and world prices. This will have varying effects across household groups because of differences in their consumption bundles.

The sectoral indirect tax structure is presented in table 1. The highest tax rate of 45 percent is on other food whose share in the consumption of households is only about 1 percent.

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<sup>5</sup> In the SAM, there is also sectoral informal capital. Returns to informal capital may be considered as primarily payment to labor outside of the formal labor market. However, instead of modeling informal capital separately, we aggregated it together with formal capital. There is no significant underestimation of household income, because informal capital is still being paid based on the return to capital. However, this aggregation makes the labor share in agriculture appear relatively low.

Indirect taxes are also relatively high on cement and bricks and petroleum refining, which generally account for less than 1 percent of household consumption directly but affect housing and transportation costs. The tax rate on cotton lint and yarn is 12 percent and on textiles is zero. However, since cotton lint and yarn are major inputs into textile production, an increase in the tax on them will increase the cost of production of textiles. This will affect consumers since the share of textiles in the consumption basket is about 5 percent.

Sugar has the highest tariff rate of 59 percent (table 3). Another commodity that has high tariffs, averaging 55 percent, is ‘Livestock, cattle and diary’ which accounts for a large share in the consumption basket of households. Other agricultural commodities that have high tariffs and substantial consumption shares are wheat milling and vegetable oil. A few primary agricultural and light food-processing sectors have low or even negative import tariffs. In contrast, tariffs are uniformly relatively high across the manufacturing sectors.

Overall, the foreign trade sector in Pakistan is not very large relative to the domestic sector (table 1). Of the total domestic output, only 10 percent goes to the export market. Of the total goods and services available in the domestic market, only 15 percent is imported. However, there are large differences across sectors. Within agriculture, the sectors with the highest share of their production exported are rice milling IRRI 47 percent, forestry 31 percent, and fishing 24 percent, while it is very small for the rest of the agricultural sectors. Within the non-agricultural sectors, ‘other food’ has the highest share of production exported at 52 percent, leather is 43 percent, textiles 40 percent, and cotton lint and yarn 27 percent. The textile sector dominates exports. In the SAM, textiles account a 32 percent of total exports, cotton lint and yarn for 9 percent, and other food 12 percent.

Because of crude oil imports, mining has the highest share of domestic consumption imported at 81 percent. The share for other manufacturing is 71 percent, for chemicals is 70 percent and for petroleum is 50 percent. Other manufacturing accounts for 54 percent of overall imports, chemicals 11 percent, and mining and petroleum refining each about 9 percent. Except for forestry (25 percent) and vegetable oil (20 percent), import intensities for agricultural sectors are well under 10 percent.

Table 1 includes values of key elasticity parameters in the model: the import substitution elasticity ( $\text{sig}_m$ ) in the CES composite good function and the production substitution elasticity

(sig\_va) in the CES value added production function.<sup>6</sup> The values of the export demand elasticity (eta) are the Armington parameters of the global model.

The sources of household income in the model are labor income, capital income, income from land, and other income (table 4). Other income is composed of foreign remittances, assumed in the SAM to be distributed proportionately among all households, and dividend income, which is earned only by urban non-poor households. The sources of income vary across household groups. Farmers are dependent on income from land, farm labor and capital. Other rural households depend on income from unskilled labor and capital. About three-fourths of income of urban poor comes from unskilled labor. Urban non-poor households derive 44 percent of their income from other income (composed largely of dividend income) and 33 percent from skilled labor income. According to the Pakistan SAM, it is only the urban non-poor household group that pays income tax, amounting to 8.4 percent of their income.

## Poverty indicators

The overall poverty rate based on the official national poverty line in Pakistan declined from around 30 percent in the latter 1980s to 26 percent in 1990-91. During these years both urban and rural poverty declined. However, in 1993-94 rural and urban poverty incidences started to move in different directions: urban poverty continued to decline while rural poverty began to rise, thereby widening the gap between urban and rural areas (figure 1). The gap reached its peak in 2001-02, which was largely due to the crippling drought that severely affected agricultural output that year, together with relatively low international agricultural commodity prices. Almost 70 percent of the people live in rural area and, since the majority of them (40 percent of all households nationally) depend on agriculture for income, the incidence rural poverty increased to 39 percent that year while urban poverty was stable at 23 percent.

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<sup>6</sup> We set the sectoral values of the parameter eta in the export demand function equal to the Armington elasticities in the LINKAGE model. The sectoral values of the parameter sig\_e in the export supply function and the sectoral values of the parameter sig\_m in the import demand function are half the values of eta.

There is some disagreement about more-recent estimates of poverty. For 2004-05, the estimates of the Planning Commission of Pakistan show overall poverty incidence declining from the peak of 34 percent in 2001-02 to 24 percent in 2004-05. The World Bank (2007) estimates a smaller decline, to 29 percent. Despite the disparity between these estimates (due primarily to the inflation factor used in computing the relevant poverty lines), each suggests the incidence of poverty declined in urban and rural areas in the most recent years and that the gap between rural and urban poverty rates remains large. The depth of poverty in Pakistan as indicated by the Foster, Greer and Thorbecke (1994) poverty gap and squared poverty gap also suggest that the poverty problem is more severe in rural than in urban areas, and that this was especially true during the 2001-02 drought year (table 5).

## **Simulations**

The first part of this section defines our six policy experiments, while the second part discusses the results. The experiments use direct tax replacement to hold the government fiscal balance fixed. The idea is to replace distorting trade taxes with less-distorting income taxes. The fiscal burden falls on the urban non-poor because, according to the SAM of Pakistan, other household groups do not pay income tax (table 4). An alternative indirect tax replacement experiment was also conducted to check the sensitivity of the results to that specification, given that financing a trade reform is a non-trivial issue from the government's point of view (Ahmed, Abbas and Ahmed 2009). In our analysis we separate the effects on the economy of reducing distortions in the rest of the world and in domestic markets in Pakistan, and evaluate the effects of both on income inequality and poverty.

### ***Design of the policy experiments***

Table 3 shows the sectoral correspondence between the Pakistan model and the global model. It also shows the sectoral tariff rates and export taxes, which are based where possible on the set of

estimates on nominal rate of assistance for Pakistan from Dorosh and Salam (2009). We use these trade distortions in all our policy experiments. The table also presents changes in the border import prices under full trade liberalization and agricultural liberalization by the rest of the world from the global model, and the sectoral export demand shifters calculated on the basis of equation (2). These are also inputs in the six policy experiments which we conducted, which are as follows:

- *S1A* – Full world trade liberalization in all tradable goods sectors by all countries excluding Pakistan. This experiment uses the results of the global model under full trade liberalization in table 3. It retains all existing trade distortions in Pakistan.
- *S1B* – Agricultural price and trade liberalization by all countries excluding Pakistan. This scenario uses the results of the global model and, as with S1A, all existing distortions in Pakistan are retained.
- *S2A* –Full goods trade liberalization in Pakistan carried out unilaterally. All Pakistani trade distortions are set to zero. There are no changes in the sectoral border export and import prices or in the export demand shifters because there is no rest-of-world trade liberalization.
- *S2B* – Agriculture trade liberalization in Pakistan carried out unilaterally. Thus all Pakistani distortions in primary agriculture and in lightly processed food are set to zero. Similar to S2A, there are no changes in the sectoral border export and import prices and in the export demand shifters because there is no rest-of-world trade liberalization.
- *S3A* – Full world trade liberalization including Pakistan of all tradable goods. This combines S1A and S2A.
- *S3B* – Agricultural world trade liberalization including Pakistan. This combines S1B and S2B.

In analyzing the results under each of the scenarios, we indicate first the effects on poverty for the whole of Pakistan, for rural and urban areas, and for major household groups. The poverty results include changes in poverty incidence and in the depth of poverty as measured by the poverty gap and squared poverty gap. These poverty effects are traced and analyzed through the various determining channels: macro, sectoral, commodity and factor prices, and household income. In estimating the poverty effects, we apply the results on

household income and consumer prices for each of the 19 household groups from the CGE model simulations to the households as classified in the HIES. Each of the CGE simulations generates a new vector of household income and consumer price for each of the groups, which we use to compute new sets of poverty indices to compare with the baseline indices.

### ***Simulation results***

In this sub-section we present modeling results from the six policy experiments listed in the previous section sequentially. The discussion continues with some additional results that show the sensitivity of the core results to changes in the treatment of tax adjustments in the model.

#### *S1A –Trade liberalization by rest-of-world (without Pakistan)*

Full trade liberalization abroad, while retaining all existing trade distortions in Pakistan, causes the overall poverty incidence index to decline by 1.3 percent from its base value as shown in table 6 (from 31.2 to 30.8). Those at the bottom of the income ladder benefit the most, as indicated by higher reduction in poverty gap (1.6 percent) and squared poverty gap (1.9 percent). Among rural households it is the poorest, those in the rural non-farmer group, that benefit the most.. Thus rural-urban income inequality is lowered in this scenario also.

What are the forces that drive these reductions in poverty and income inequality? The S1A simulation leads to a real exchange rate appreciation<sup>7</sup> of 1.24 percent (table 7). The terms of trade (the ratio of domestic export to import prices) improve by 1.38 percent in agriculture and by 1.56 percent in non-agriculture. This is because of lower world import prices of some of the agricultural products as well as most of the non-farm goods (table 3).

The import price of agricultural goods drops by 1.7 percent (table 7) despite increases in livestock, wheat, vegetable oil and sugar import prices (table 3). This is due to a number of factors which include the appreciation of the currency, the decline in the border import prices of

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<sup>7</sup> There is no real exchange rate variable in the model. The real exchange rate is defined as the world price multiplied by the nominal exchange rate divided by the local price, where the world price is trade-weighted world import and export prices and the local price is the sectoral output-weighted local prices.

fruits and vegetables and other major crops (table 3), both of which have relatively large import components (table 1), and the slight reduction in the border import price of forestry which has high import intensity. The domestic price of farm products declines by 0.3 percent, which is lower than the drop in import prices. This results in higher imports of agricultural goods (a rise of 2.4 percent) and a marginal increase in the domestic demand for agriculture of 0.1 percent. Since demand for both imported and domestic agricultural products increase, domestic consumption of farm products increases, by 0.2 percent.

Table 3 shows that border import prices of non-agricultural goods decline. This, together with the appreciation of the exchange rate, reduces the import price of non-agricultural goods by 2.4 percent (table 7). The domestic price of non-agricultural products also declines, by 0.6 percent, which is lower than the decline in the import price. Thus, imports of non-farm products increases, by 1.0 percent. At the sectoral level, there is a relatively large increase in imports of ‘cotton lint and yarn’, textiles, and leather because of the relatively greater decline in the border price of these products. Higher imports of non-farm goods reduce marginally the domestic demand but, despite this, overall domestic non-agricultural consumption increases by 0.1 percent.

The export price of farm products declines by 0.3 percent. Since their border prices increase, the decline is due to the appreciation of the exchange rate. There is a slightly greater decrease in the domestic price of agricultural products. Thus exports of agriculture improve, by 0.73 percent, and overall output of agriculture increases by 0.11 percent.

The effects on value added, value added prices and factor prices in agriculture are explained by the changes in sectoral export prices, factor intensities, and import and export intensities. The overall output price of agriculture declines by 0.29, while the value added price increases by 0.16 percent. The difference in the sign is due to relatively higher increase in the value added price of rice milling (2 percent) and vegetable oil (1.7 percent).<sup>8</sup> The increase in the border export price of rice milling of 1.18 percent has larger effects on its value added price because rice has a high export intensity ratio (table 1). Although the border import price of rice milling increases more (10.18 percent), it has no effects because of zero imports. The increase in

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<sup>8</sup> Detailed sectoral results are shown only for scenario S2A (see table 9 below). Detailed comparable sectoral results for the other scenarios are available from the authors on request.

the import border price of vegetable oil of 1.78 percent increases its value added price because it has a high import intensity ratio.

Farm wages and the return to land each decline by around 1.0 percent. This is due to the decline in the output and value added prices in primary agriculture, which employs farmers and uses land. The average rate of return to capital in agriculture improves by 1 percent. This is due to the increase in the value added price of rice milling and vegetable oil. These sectors are relatively capital intensive, with capital-labor ratios of 3.7 for rice and 6.7 for vegetable oil (table 1). As wage rates increase less than the value added price, returns to capital rise. The return to capital in these sectors increases by more than 2 percent for rice milling and 1.9 percent for vegetable oil. The change in the return to capital in livestock and poultry is also positive, but smaller. The change in the return to capital in the other primary agricultural commodities is negative.

The decline in the value added price in primary agriculture and in non-agriculture lowers wages of unskilled labor by 0.14 percent. However, with the increase in the value added price of rice milling and vegetable oil, the wages of skilled workers decrease by only 0.04 percent. The average return to capital used in non-agriculture declines by 0.14 percent.

We have also included the results on factor prices that are net of inflation effects. The overall consumer price index in this experiment decreases by 0.5 percent. Net of inflation effects, there is a negative result for farm wages and the return to land, but the other factors have positive net price effects.

All these effects lead to changes in household income, which are summarized in table 8. The change in nominal income of households is negative across groups except rural non-farm and rural agricultural workers; the latter because of their heavy reliance on agricultural capital income (mostly informal capital), as shown in table 4, and the increase in the average return to capital in agriculture (1 percent, see table 7). However, the consumer prices for each of the groups decline faster than the drop in nominal income because of the higher reduction in import prices. Thus, all household groups realize improvement in real income. The highest increases in real income are for rural non-farmers (0.63 and 0.53 for non-poor and poor, see table 8) and for agricultural workers in other Pakistan provinces (0.58 percent). This explains the high reduction in the depth of poverty in rural areas, in particular among rural non-farmers.

In sum, this scenario of full trade liberalization by the rest of the world reduces both poverty and income inequality. It reduces import prices, especially for commodities that have relatively large shares in the consumption basket of consumers. This translates to declining consumer prices. It also improves agricultural relative to non-agricultural production because of improvements in the world price of farm commodities. The poorest in non-farm households in rural areas benefit the most from the favorable improvement in real wages of unskilled labor and returns to capital and reduction in consumer prices.

#### *S1B – Agricultural liberalization by rest-of-world*

This second experiment incorporates the results of the global model for agricultural liberalization only by the rest of the world, while retaining all existing trade distortions in Pakistan. Compared to scenario S1A, border import prices of some of the commodities increase more in the present scenario. For example, there is a higher increase in border import prices of wheat, livestock, cotton, rice milling, and sugar (table 3). Furthermore, border import prices of non-agricultural products increase in the present scenario while they decline in scenario S1A (table 7). Also, for commodities that have declining border import prices, the drop is relatively higher compared to scenario S1A. Thus, the increase in the terms of trade for both agriculture and non-agriculture is lower in this experiment compared to scenario S1A. Also, the increase in the terms of trade in non-agriculture is significantly lower than in agriculture.

The results in table 6 show that while Pakistan's overall poverty incidence index declines marginally, the reduction in poverty is not across the board. Poverty in urban areas declines, but not all rural households experience a drop in poverty. Rural non-farmers have the highest poverty reduction, but among farmers and agricultural workers there is a slight increase in poverty.

What are the factors that drive these poverty results? Import prices of agriculture decline by 0.7 percent (table 7). This is due to the real exchange rate appreciation of 0.13 percent, and the reduction in the border price of wheat milling, and fruits and vegetables, which are import-intensive. There are a number of primary agricultural commodities that have relatively higher increase in their import prices, but these commodities are not imported. The domestic price of

agricultural goods decreases, but by less than the decline in their import price. Thus, imports of agricultural goods increase, by 0.9 percent.

In non-agriculture, the smaller decline in its domestic prices relative to its import prices leads to a marginal increase in imports, by 0.12 percent. This increases slightly the domestic consumption of non-agricultural products.

The increase in the export price of agriculture by 0.33 percent and the decline in its domestic price by 0.07 percent result in exports rising by 1.8 percent. This increases the overall output of agriculture slightly, despite the decline in its domestic demand because of higher imports. But the increase in exports of non-agricultural goods is not quite enough to offset the decline in domestic demand, so overall output of non-agriculture declines by 0.01 percent.

The difference in the results between the prices of value added and output in agriculture is due to the varying results across agriculture. The higher increase in the border price of rice milling leads to a higher value added price, offsetting the decline in the value added price of the rest of agriculture. The decline in farm wages by 0.27 percent and the return to land by 0.32 percent is due to the decrease in the value added price of primary agriculture. There is an increase in the return to capital in agriculture by 0.27 percent mainly because of the improvement in the value added price of rice milling, a sector which has high capital-labor ratio. The decline in wages of unskilled labor is smaller than farm wages because of the increase in the value added price of rice milling, which neutralizes much of the falling value added price of the rest of agriculture and some nonagricultural sectors. Since rice milling employs more skilled labor than unskilled labor (table 1), the increase in its value added price also offsets the negative effects coming from the rest of the economy, such that wages of skilled labor do not change.

Net of inflation effects, the impact on factor prices indicate declining farm wages and return to land. The rest of the factor prices have positive net effects. The nominal income effects are negative in all household groups (table 8), but smaller than what is generated in scenario S1A. Consumer prices decline. The decline, however, is not enough to offset the drop in the nominal income of farmers. But rural non-farmers and urban households enjoy marginal improvement in real income.

In sum, agricultural liberalization by the rest of the world would generate a marginal change in the terms of trade that favors agriculture compared to scenario S1A. Furthermore,

although overall import prices decline, the drop is much smaller in the present case than in the previous scenario. This translates to a smaller decline in consumer prices across household groups which is not enough to offset the drop in nominal income in some groups. These groups – farmers and agricultural workers – experience a slight increase in poverty. Moreover, given the small share of agriculture in the overall trade of Pakistan (less than 10 percent, table 1), an agriculture-only liberalization has much less impact on the Pakistan economy than a liberalization of all goods trade. Thus, the poverty impact in the present case is significantly less than in scenario S1A.

#### *S2A – Unilateral liberalization of all goods trade by Pakistan*

This third experiment sets to zero all sectoral import tariffs and export taxes in Pakistan and assumes no changes in policies abroad. Table 6 shows it would generate a significant drop in poverty, by 5.2 percent overall. There is also a significant reduction in the depth of poverty, with the poverty gap dropping by 10 percent and the squared poverty gap by 12 percent. However, the poverty incidence in urban areas increases by 2.3 percent. The detailed results discussed below show that the urban non-poor suffer a decline in income because of the additional tax burden. This is the result of the tax replacement where we replaced trade-distorting taxes in Pakistan with a less-distorting income tax that falls disproportionately on urban non-poor households.<sup>9</sup> The rest of the household groups enjoy higher income and therefore lower poverty. Overall income inequality is also reduced.

Most of the effects come from the elimination of tariffs, although there are also effects from the dismantling of export taxes in a number of sectors (table 3). The elimination of tariffs leads to a substantial reduction in import prices. The greatest reduction is in sugar and livestock, cattle and dairy, because these sectors have the highest tariff rates. Import prices of vegetable oil, wheat milling, other food, ‘cotton lint and yarn’ and textiles also decline notably (table 9). Overall, agriculture has import prices declining by 12 percent, while in non-agriculture they decline by 8.3 percent (table 7).

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<sup>9</sup> In the model, the overall government revenue from tariff is Rs154 billion and from export taxes Rs15 billion. Total government revenue is Rs446 billion. The total income of urban non-poor is Rs1.73 trillion.

Domestic prices also decline. However, the decline in domestic prices in most of the sectors is lower than the decline in import prices. Thus, imports in these sectors surge. Imports of sugar increase by 215 percent, ‘livestock, cattle and dairy’ 99 percent, wheat milling 40 percent, other food 38 percent, ‘cotton lint and yarn’ 38 percent, textiles 33 percent, and leather 28 percent (table 9). Other sectors have notable increase as well. Overall agriculture has higher imports by 22 percent, compared with just 4 percent for non-agriculture.

Since world prices are fixed, the decline in prices in Pakistan because of the trade reform increases its competitiveness.<sup>10</sup> There is a real depreciation of the exchange rate of 6.1 percent. The results in table 9 indicate that, except for forestry and fishing, exports of agriculture (primary agriculture and lightly processed food) improve. Overall exports of agriculture expand by 4.8 percent. However, this increase does not offset the displacement effects of the surge in imports of 22 percent. Thus, overall output of agriculture declines by 0.7 percent. The biggest reduction is in forestry (21 percent), vegetable oil (7 percent), and fishing (5 percent). However, there is an improvement in raw cotton production because of the increase in output of ‘cotton lint and yarn’ and textiles, as discussed below.

In non-agriculture, almost all sectors realize positive growth in exports. Overall exports of non-agriculture increase by 13 percent. The increase in manufacturing exports is also substantial, especially in major export items such as ‘cotton lint and yarn’, textile, other food, and other manufacturing. There is also a notable increase in exports of services such as commerce, transport, and private services.

For other food, the increase in imports displaces domestic demand by 6 percent. However, this is offset by the increase in exports; thus its output improves by 2.6 percent and output price by 2.9 percent. The impact on textiles can be analyzed in relation to the effects on the ‘cotton lint and yarn’ and raw cotton sectors. The increase in textile imports displaces domestic demand by 0.9 percent. However, this is offset by the increase in its exports; thus its output improves by 4.1 percent and output price by 1.6 percent. Since the ‘cotton lint and yarn’ sector supplies materials to the textile sector, the improvement in output of textiles due to higher exports leads to an improvement in domestic demand for the ‘cotton lint and yarn’, by 2.5

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<sup>10</sup> In our model, Pakistan is facing a downward sloping world demand curve. Since perfect substitution assumption is imposed between exports and Pakistani domestic sales, the export supply curve for Pakistan is horizontal. The decrease in output prices increases export supply, which shifts the horizontal export supply curve downwards.

percent. The increase in both exports and domestic demand for ‘cotton lint and yarn’ leads to a higher output by 5.0 percent and output price by 1.7 percent, which in turn leads to higher output of raw cotton by 4.3 percent.

The negative change in the value added price in agriculture leads to lower prices for factors that are heavily used in agriculture. Wages of farmers decrease by 0.6 percent, returns to land fall by 1.9 percent, and the average return to agricultural capital falls by 5 percent.

The average output price of non-agriculture decreases by 1.1 percent, but the value added price improves by 1.3. In table 9, the increase comes from the notable improvement in the value added price of leather (20 percent), ‘cotton lint and yarn’ (14 percent), other food (10 percent), textiles (10 percent), and transport (3 percent). Thus, prices of factors used in non-agriculture improve. Wages of unskilled workers increase by 1.5 percent, skilled labor by 2.1 percent, and the average return to non-agricultural capital by 1 percent. Furthermore, there is a significant decline in the consumer price index. Thus net of the inflation effects, factor prices improve except for the average return to capital used in agriculture.

Nominal income of farmers drops (table 8). As discussed above, this is largely due to declining wages of farmers, returns to land and the average return to capital in agriculture. Because of higher wages of workers, nominal incomes of non-farmers improve, except for the urban non-poor. Incomes of the urban non-poor decline because of the income tax replacement imposed on this group. However, the decline in consumer price in all groups is significant. This offsets the decline in nominal income except in urban non-poor.

In sum, all households, except urban non-poor, realize positive increase in real income, which leads to a significant decline in poverty. The urban poor have the highest increase in income and the largest drop in the depth of poverty. Again, income inequality is reduced.

## *S2B – Unilateral agricultural liberalization in Pakistan*

This fourth experiment sets to zero just agricultural price distortions in Pakistan<sup>11</sup> while retaining all non-agricultural trade taxes and assuming no changes from the global model. Overall poverty

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<sup>11</sup> The total tariff revenue from agricultural imports is Rs14.2 billion and farm export tax revenue is Rs 4.3 billion in the baseline.

effects are significantly lower in this experiment compared to S2A. Furthermore, there are differences in the effects across households. Urban households enjoy lower poverty and, although overall poverty in rural areas declines, large and medium farmers face increasing poverty.

The results at the macro, sectoral, factor and commodity price levels explain these poverty effects. At the sectoral level, import prices of agriculture drop by 14 percent (table 7), the largest declines coming from sugar (36 percent), ‘livestock, cattle and dairy’ (34 percent), wheat milling (18 percent), and vegetable oil (18 percent).<sup>12</sup> There is also a reduction in domestic prices, but that is significantly smaller than the drop in import prices. Thus imports of agricultural goods surge by 30 percent.

This agricultural liberalization results in a real exchange rate depreciation. Since tariffs and subsidies in non-agriculture are retained, their average import prices increase by just 2.6 percent and domestic prices increase by 1.11 percent. Thus, imports of non-agricultural products decline by 0.5 percent. On the other hand, exports of non-agricultural products improve by 3.1 percent. At the sectoral level, the increase is due to the strong export effect on leather, wood products, ‘cotton lint and yarn’, and commerce. Since world prices are fixed and domestic and output prices of non-agriculture are increasing, the increase in its exports is due to the depreciation of the exchange rate. The increase in exports, together with the marginal increase in the domestic demand for non-agriculture, leads to an improvement in output by 0.4 percent.

Prices of factors used in agriculture decline. Wages of farmers decrease by 2.2 percent, return to land by 2.5 percent, and the average return to capital by 3.8 percent. However, prices of factors heavily used in non-agriculture improve. A similar pattern in factor prices is observed after netting out the marginal decline in the consumer price index of 0.27 percent.

The nominal income of farmers declines, while the nominal income of non-farmers improves. The marginal decline in the consumer price index does not offset the decrease in the nominal income of farmers, especially large and medium farmers. Thus, their real income is lower. However, non-farmers enjoy higher real incomes, except the urban non-poor for whom real income falls slightly, again as a result of the tax burden they bear. But the additional tax burden is not large enough to push them below the poverty line as in S2A, so poverty declines in

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<sup>12</sup> Detailed sectoral results generated under this scenario are available from the authors upon request.

urban areas. Although overall poverty in rural areas declines, large and medium farmers face increasing poverty because of declining real income.

*S3A – Full trade liberalization by Pakistan and the rest-of-world*

This fifth experiment combines the trade liberalization in the rest of the world with that in Pakistan in all sectors. Without going through the detailed results, the effects coming from the unilateral trade liberalization in Pakistan are larger than the effects from the rest of the world's trade liberalization. Their combined impact on both exports and imports is strongly positive. There is also a large decline in the consumer price index. Factor prices in agriculture decline, but they improve in non-agriculture. However, net of the inflation effects, the only factor return decline is in the average return to capital used in agriculture. Nominal incomes of farmers decline, while nominal incomes for non-farmers improve. The large reduction in the consumer price index contributes to an increase in real income of all households except the urban non-poor.

This scenario generates the largest reduction in poverty. Another important point worth highlighting is that while the poverty incidence for the urban non-poor still increases, the increase is much lower in the present experiment than in scenario S2A.

*S3B – Agricultural liberalization by Pakistan and the rest-of-world*

This sixth experiment combines the agricultural liberalization of the rest of the world with that in Pakistan. It turns out that the effects from the reform in Pakistan dominate those from the agricultural liberalization in the rest of the world. There is also an upward response on imports and exports, but in agriculture only. The surge in imports of agriculture displaces local production. This results in lower prices of factors used in agriculture. Factor prices in non-agriculture increase because the sector remains protected. Therefore, farmers have lower incomes, while non-farmers benefit.

*Sensitivity analysis: indirect versus direct tax replacement*

The results discussed above are derived using a replacement tax on income. Since the Pakistan SAM used to calibrate the model has income tax on urban non-poor only (table 4), the direct tax replacement puts all the burden of financing the trade reform on this group. As an alternative, we consider in this sub-section indirect taxes to offset losses of government tariff revenue. We focus on the poverty effects under these two alternative tax replacement schemes in S3A (full trade liberalization of all goods in the rest-of-world and in Pakistan) and S3B (agricultural liberalization in the rest-of-world and in Pakistan).

The effects on real income across households are presented in table 10. In S3A where all sectors are liberalized, changing the tax replacement from direct to indirect completely changes the results. Under the direct tax replacement all households enjoy higher real income except the urban non-poor. This tax replacement scheme redistributes income from the urban non-poor to the rest of the household groups. These household groups benefit from the reduction in consumer prices and from the redistribution of income from urban non-poor. However, when an indirect tax replacement is used, consumer prices increase due to the taxes and the burden is shared to all household groups depending upon their consumption structure. There will be a reduction in household incomes in most of the groups (all except the three relatively wealthy groups: large farmers in other Pakistan, rural non-poor, and urban non-poor). Under this tax replacement scheme, there is a significant increase in domestic prices because of higher indirect taxes.

When trade liberalization is focused on agriculture only under S3B, the income results are not sensitive to the tax replacement used. This is because net government budget implication of the elimination of distortions in agriculture is not as large as in non-agriculture. Thus, the impact on domestic prices through higher indirect tax in the agricultural liberalization case is not as significant as in the all-goods trade liberalization. In both tax replacement methods, farmers (particularly large and medium-sized farmers) will be negatively affected, while non-farmers will be favorably affected. However, in the direct tax replacement, urban non-poor will still be negatively affected, but they are favorably affected under the indirect tax replacement.

Table 11 presents poverty results for this sensitivity analysis. Trade liberalization in all goods globally under indirect tax replacement in scenario S3A is poverty-increasing. This is because of the declining real incomes of most groups. This effect comes largely from higher

consumer prices as a result of indirect tax replacement. Higher consumer prices wipe out the gains from higher border export prices, lower border import prices, and lower tariffs.

As for just agricultural liberalization, it entails less of a fiscal burden. Therefore, both the direct income and the indirect tax replacement generate favorable effects on poverty. In the case of indirect income tax replacement, although it increases consumer prices, it does not wipe out the gains from higher border export prices, lower border import prices, and lower trade taxes on agricultural commodities. Because of the negative effects of the agricultural liberalization on domestic agriculture in Pakistan, farmers will be hurt, especially large and medium-sized farmers. But this is a small group in the total population and has the smallest poverty incidence (23 percent in 2001-02, compared with the poverty incidence of small farmers and agricultural workers of 37 percent and rural non-farmers of 40 percent).

### **Summary and policy implications**

In this chapter we linked the results of two economic models (the LINKAGE model of the World Bank and the Pakistan CGE model which we developed) in order to analyze and compare the poverty effects of trade liberalization abroad with those of unilateral reform by Pakistan. We conducted six policy experiments: two rest-of-world trade liberalization experiments (full liberalization that covers all goods sector and agriculture only), two unilateral trade liberalization cases (all goods and agriculture only), and two combined scenarios. The results are evaluated under a direct tax replacement on household income, which is paid only by the urban non-poor. We also examine an alternative tax replacement scheme – an indirect tax replacement on commodities.

A number of policy insights can be drawn from the simulation results. The impact on the Pakistan economy and on the extent of its poverty from own-country liberalization is significantly larger than the effects of rest-of-world trade liberalization. The effect of agricultural liberalization (both in the rest of the world market and in Pakistan) is considerably smaller than

liberalization of all goods trade. This is because of the smaller share of agricultural trade in overall exports and imports in Pakistan, whose trade is dominated by non-agricultural products.

Income from trade taxes is a major source of revenue for the government. Trade tax revenue from agricultural commodities is considerably lower than from non-agricultural products. Thus the elimination of trade taxes on all tradable commodities creates a large dent in government income and on the fiscal balance. It therefore entails a significant government demand for tax revenue from other sources. The poverty and income effects of full trade liberalization greatly depend upon how the tax replacement is implemented. If an additional tax is imposed on household income to generate funds to finance the reduction in trade taxes in all sectors, there is a notable decline of consumer prices and a large income redistribution from urban non-poor to the rest of the household groups. There is therefore a considerable decline in the poverty incidence, in the depth of poverty, and in income inequality. This is because the burden of the additional tax falls entirely on the urban non-poor, while the rest of the groups benefit from higher real factor prices and larger reductions in consumer prices. However, if the tax replacement is imposed as additional indirect taxes on commodities, consumer prices increase and eliminate the benefits generated from the reduction in trade distortions. In this case, poverty increases.

Trade tax revenue from agricultural commodities is considerably lower than from non-agricultural products. If trade liberalization is focused on agricultural commodities only, the fiscal re-financing requirement is substantially less. The poverty reduction effects, although smaller, are robust to the change in tax policy. That is, poverty is reduced under both tax replacement schemes when only agricultural markets are liberalized.

All these results are derived using a static model. The dynamic impact of trade reform on capital accumulation from changes in prices has not been accounted for. For example, if the rates of return to capital are high in sectors where the poor are heavily engaged, it will attract investment, thereby increasing capital accumulation in and output from those sectors. This would have favorable implications for poverty. (It is also possible that the results would be reversed and would therefore generate negative effects on the poor.) Furthermore, the dynamic effects would also impact on technological progress, movement of farmers' own labor into non-farm

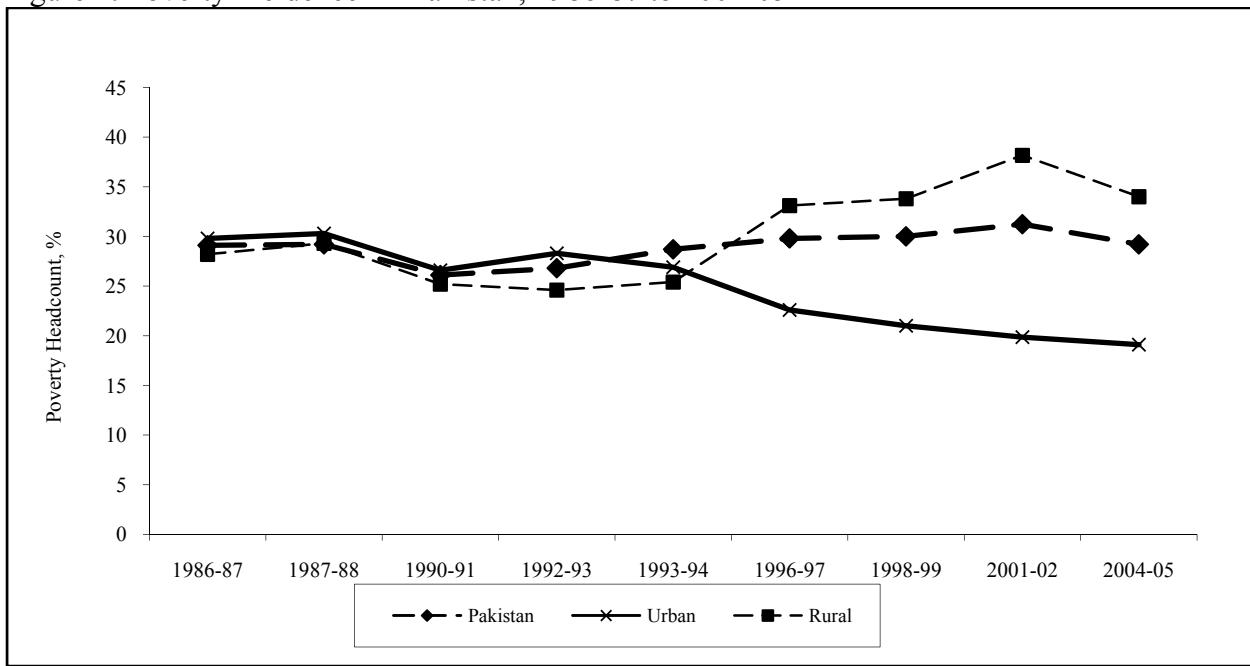
employment, factor and total productivity, and the flow of foreign direct investments. These are all empirical issues which are relevant topics for further research.

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Figure 1: Poverty Incidence<sup>a</sup> in Pakistan, 1986-87 to 2004-05<sup>b</sup>



<sup>a</sup> Percentage of the population living below the official national poverty line.

<sup>b</sup>The official figures for 1993-94 indicate overall poverty in Pakistan was above urban and rural poverty incidence ([http://www.accountancy.com.pk/docs/Economic\\_Survey\\_2002-03.pdf](http://www.accountancy.com.pk/docs/Economic_Survey_2002-03.pdf)). Chapter 4, Table 4.1, page 3)

Source: Ministry of Finance (2003) and, for 2004-05 estimates, World Bank (2007).

Table 1: Elasticity Parameters and Production Structure, Pakistan, 2000-01

Sectors	Production											Trade				
	Value-added Ratio va ÷ x, %	Value-added Share, %	Capital-Output Share, %	Employ-Labor Ratio /1/	Employ-memt Share, %	Share (%)			Land-output ratio, %	Indirect tax va /2/	Indirect tax rate, %	Elasticities eta /3/	Exports (%) sig m /4/	Trade share intensity /5/	Imports (%) share intensity /6/	
						Skilled Labor	Unskilled Labor	Farmers								
<b>Agriculture</b>	<b>26.8</b>	<b>27.7</b>			<b>12.6</b>							<b>8.5</b>		<b>6.6</b>		
<b>Primary Agriculture</b>	<b>23.2</b>	<b>20.1</b>			<b>10.7</b>							<b>3.9</b>		<b>3.1</b>		
1. Wheat irrigated	50.8	1.8	1.8	0.3	1.58	18.86	81.14	27.82	0.75	0.10	5.85	2.93	0.64	3.56	0.30	2.53
2. Wheat non-irrigated	50.9	0.1	0.1	0.3	0.07	18.85	81.15	27.25	0.75	0.00	5.85	2.93				
3. Paddy IRRI	60.2	0.2	0.2	0.5	0.10	18.84	81.16	45.35	0.75	0.30	4.45	2.23				
4. Paddy basmati	60.2	0.5	0.4	0.5	0.12	18.86	81.14	51.27	0.75	0.00	4.45	2.23				
5. Raw Cotton	61.2	1.4	1.1	0.3	1.11	18.87	81.13	35.97	0.75	0.04	3.94	1.97				
6. Sugarcane	60.0	1.0	0.8	0.7	0.32	18.87	81.13	46.68	0.75	0.07	5.91	2.96				
7. Other major crops	71.0	2.8	2.0	0.3	2.42	18.87	81.13	38.88	0.75	0.05	3.94	1.97	0.52	2.65	0.60	4.53
8. Fruits & vegetables	64.2	3.6	2.8	0.6	1.75	18.87	81.13	44.37	0.75	0.34	3.94	1.97	1.05	3.78	1.31	6.94
9. Livestock, cattle & dairy	53.2	10.3	9.7	9.0	2.56	100.00			0.75	0.00	3.94	1.97	0.05	0.06	0.70	1.08
10. Poultry	51.6	0.7	0.7	9.0	0.18	100.00			0.75	0.00	3.94	1.97	0.01		0.11	
11. Forestry	82.1	0.3	0.2	0.0	0.12	18.88	81.12	65.68	0.75	0.00	4.31	2.15	0.48	31.36	0.23	25.16
12. Fishing Industry	57.1	0.6	0.5	2.3	0.41	100.00			0.75	0.00	4.31	2.15	1.14	23.79	0.00	0.08
<b>Lightly Processed Food</b>	<b>3.6</b>	<b>7.6</b>			<b>1.8</b>							<b>4.6</b>		<b>3.4</b>		
14. Vegetable oil	7.9	0.2	1.4	6.7	0.07	60.28	39.72		1.50	0.02	3.94	1.97	0.00	0.02	2.33	19.99
15. Wheat milling	21.8	1.2	2.8	4.4	0.56	64.94	35.06		1.50	0.02	4.45	2.22	0.51	1.82	0.82	4.31
16. Rice milling IRRI	30.7	0.2	0.4	3.7	0.12	56.75	43.25		1.50	0.00	4.45	2.22	1.72		46.60	
17. Rice milling Basmati	29.0	0.5	0.8	3.7	0.25	56.77	43.23		1.50	0.00	4.45	2.22	2.34		28.58	
18. Sugar	32.2	1.4	2.2	3.3	0.82	69.96	30.04		1.50	6.75	5.91	2.96	0.03	0.11	0.28	1.89

Table 1 (continued): Elasticity Parameters and Production Structure, Pakistan, 2000-01

Sectors	Production										Trade					
	Value-added Ratio va ÷ x, %	Value-added Share, %	Output Share, %	Capital-Labor Ratio /1/	Employ-ment Share, %	Share (%)		Land-output ratio, %	Indirect tax rate, %	Elasticities		Exports (%)		Imports (%)		
					Skilled Labor	Unskilled Labor	Farmers	sig. va /2/	eta /3/	sig. m /4/	share	intensity /5/	share	intensity /6/		
<b>Non-Agriculture</b>	<b>73.2</b>	<b>72.3</b>		<b>87.4</b>								<b>91.5</b>		<b>93.4</b>		
<b>Mining and Manufacturing</b>	<b>13.2</b>	<b>24.2</b>		<b>7.9</b>								<b>74.1</b>		<b>88.2</b>		
13. Mining	74.6	0.6	0.4	2.3	0.47	85.00	15.00		1.50	14.50	4.31	2.16	0.78	18.61	9.29	80.53
19. Other food	36.9	1.7	2.3	4.7	0.75	61.57	38.43		1.50	44.69	3.94	1.97	12.07	51.47	1.06	12.45
20. Cotton lint & yarn	21.6	1.4	3.3	3.3	0.82	85.52	14.48		1.50	12.05	4.11	2.06	8.97	27.10	0.71	4.27
21. Textiles	22.2	3.6	8.0	2.7	2.43	78.91	21.09		1.50	0.00	4.11	2.06	31.91	39.66	1.61	4.81
22. Leather	8.3	0.1	0.5	2.9	0.06	60.36	39.64		1.50	0.00	4.11	2.06	2.27	42.79	0.11	5.21
23. Wood products	36.3	0.7	0.9	1.8	0.57	67.98	32.02		1.50	0.18	4.09	2.04	0.03	0.34	0.56	8.61
24. Chemicals	28.2	0.5	0.9	3.8	0.25	55.16	44.84		1.50	2.58	4.09	2.05	1.38	15.90	11.16	69.89
25. Cement & bricks	55.0	1.4	1.3	7.4	0.42	68.98	31.02		1.50	24.15	4.09	2.05	0.03	0.21		
26. Petroleum refining	19.4	0.6	1.5	2.9	0.36	71.95	28.05		1.50	28.96	4.09	2.05		9.71		50.11
27. Other manufacturing	25.4	2.6	5.0	2.6	1.75	67.99	32.01		1.50	4.39	4.09	2.05	16.61	33.17	54.00	71.03
<b>Other Industry</b>	<b>6.6</b>	<b>6.6</b>		<b>7.2</b>								<b>0.0</b>		<b>0.0</b>		
28. Energy	60.8	3.4	2.8	4.0	1.69	80.00	20.00		1.50	5.02	2.08	1.04				
29. Construction	41.6	3.2	3.8	0.4	5.48	50.00	50.00		1.50	0.16	2.08	1.04				
<b>Services</b>	<b>53.5</b>	<b>41.5</b>		<b>72.4</b>								<b>17.5</b>		<b>5.2</b>		
30. Commerce	84.0	15.3	9.1	0.4	26.52	20.00	80.00		1.50	0.00	2.08	1.04	0.07	0.07	0.21	0.35
31. Transport	53.9	11.8	10.9	1.5	11.73	20.00	80.00		1.50	0.27	2.08	1.04	17.38	15.88		
32. Housing	81.8	4.9	3.0						1.50	0.03	2.08	1.04				
33. Private services	53.5	12.9	12.0	1.5	12.79	20.00	80.00		1.50	0.00	2.08	1.04	0.01	0.01	5.03	5.98
34. Public services	66.2	8.6	6.5		21.35	100.00				0.00	2.08	1.04				
<b>Total</b>	<b>49.8</b>	<b>100.0</b>	<b>100</b>		<b>100.0</b>							<b>100.0</b>	<b>10.0</b>	<b>100.0</b>	<b>14.45</b>	

va-value added; x- output

/1/ total labor ÷ total capital

/2/ sig\_va=substitution parameter in CES production

/3/ eta is export demand elasticity

/4/ sig\_m=substitution parameter in CES composite good

/5/ export ÷ output

/6/ imports ÷ composite good

Source: Dorosh, Niazi and Nazli (2004)

Table 2: Household Categories in Pakistan

	2001-02 Social Accounting Matrix (SAM)	2001-02 Household Integrated Economic Survey (HIES)
Large farmers	- Sindh - Punjab - Other Pakistan	Landowners with more than 50 acres
Medium farmers	- Sindh - Punjab - Other Pakistan	Landowners with more than 12.5 acres but less than 50 acres
Small farmers	- Sindh - Punjab - Other Pakistan	Landowners with more than 0 acres but less than 12.5 acres
Small farm renters and landless	- Sindh - Punjab - Other Pakistan	No landholdings, but rented land for farm activities
Rural agri. workers and landless	- Sindh - Punjab - Other Pakistan	No landholdings, agricultural workers
Rural non-farm - non-poor		Rural non-poor, non-farmers and non-agricultural workers
Urban	- poor - non-poor	Rural poor, non-farmers and non-agricultural workers Urban non-poor Urban poor

Three Major Provinces: (1) Punjab; (2) Sindh; and (3) Other Pakistan - Balochistan, North-West Frontier Province,

Source: Dorosh, Niazi and Nazli (2004) and Federal Bureau of Statistics (2003).

Table 3: Parameters and exogenous demand and price shocks on Pakistan due to liberalization in the rest of the world

Pakistan CGE Model		LINKAGE Model		Trade Distortions		Full Trade Lib., excl. Pakistan		Agri. Trade Lib., excl. Pakistan	
Sector no.	Sector Description	Sector Description		Tariff, %	Export Tax, %	World Import Price Change, %	Export Demand Shifter /2/	World Import Price, % change	Export Demand Shifter /2/
<b>Agriculture</b>									
<b>Primary Agriculture</b>									
1	Wheat irrigated	Wheat		-4.9	0.0	2.41	1.0	3.12	1.00
2	Wheat non-irrigated	Wheat		-4.9	0.0	2.41	1.0	3.12	1.00
3	Paddy IRRI	Paddy rice		0.0	4.0	0.00	1.2	0.00	1.23
4	Paddy basmati	Paddy rice		0.0	4.0	0.00	1.2	0.00	1.23
5	Cotton	Plant-based fibers		4.9	0.0	4.44	1.1	6.68	1.14
6	Sugarcane	Sugar cane and beet		4.3	0.0	0.00	1.0	0.00	1.00
7	Other major crops	Other crops		15.3	0.0	-1.91	1.0	0.00	1.01
8	Fruits and vegetables	Vegetables and fruits		16.5	0.0	-2.93	1.0	-2.62	0.97
9	Livestock, cattle and dairy /1/	Cattle sheep etc		55.4	0.0	4.41	1.0	5.17	1.00
10	Poultry	Other livestock		10.8	0.0	-8.00	1.0	-6.77	0.99
11	Forestry	Other primary products		14.3	18.1	-0.14	1.1	0.79	1.01
<b>Lightly Processed Food</b>									
12	Fishing Industry	Other primary products		14.3	18.1	-0.14	1.1	0.79	1.01
14	Vegetable oil	Vegetable oils and fats		23.7	0.0	1.78	0.9	0.40	0.93
15	Wheat milling	Other food, beverages and tobacco		24.9	0.0	0.00	1.0	-1.68	0.97
16	Rice milling IRRI	Processed rice		0.0	4.0	8.21	1.1	10.18	1.08
17	Rice milling Basmati	Processed rice		0.0	4.0	8.21	1.1	10.18	1.08
18	Sugar	Refined sugar		59.0	0.0	1.62	1.0	3.44	1.00
<b>Non-Agriculture</b>									
<b>Mining and Manufacturing</b>									
13	Mining	Other primary products		14.3	18.1	-0.14	1.1	0.79	1.01
19	Other food	Other food, beverages and tobacco		24.9	0.0	0.00	1.0	-1.68	0.97
20	Cotton lint and yarn	Textile and wearing apparel		19.9	1.1	-0.68	1.0	0.48	1.00
21	Textiles	Textile and wearing apparel		19.9	1.1	-0.68	1.0	0.48	1.00
22	Leather	Textile and wearing apparel		19.9	1.1	-0.68	1.0	0.48	1.00
23	Wood products	Other manufacturing		16.6	5.4	-0.38	1.0	0.38	1.00
24	Chemicals	Other manufacturing		16.6	5.4	-0.38	1.0	0.38	1.00
25	Cement and bricks	Other manufacturing		16.6	5.4	-0.38	1.0	0.38	1.00
26	Petroleum refining	Other manufacturing		16.6	5.4	-0.38	1.0	0.38	1.00
27	Other manufacturing	Other manufacturing		16.6	5.4	-0.38	1.0	0.38	1.00
<b>Other Industry</b>									
28	Energy	Services		0.0	0.0	-0.22	1.0	0.19	1.00
29	Construction	Services		0.0	0.0	-0.22	1.0	0.19	1.00
<b>Services</b>									
30	Commerce	Services		0.0	0.0	-0.22	1.0	0.19	1.00
31	Transport	Services		0.0	0.0	-0.22	1.0	0.19	1.00
32	Housing	Services		0.0	0.0	-0.22	1.0	0.19	1.00
33	Private services	Services		0.0	0.0	-0.22	1.0	0.19	1.00
34	Public services	Services		0.0	0.0	-0.22	1.0	0.19	1.00

/1/ This is the trade weighted average of cattle sheep, other livestock, and dairy in the LINKAGE model

/2/ In equation 2, this is  $a=(1+0.01*p)(1+0.01*q)^(1/ESUBM)$ ; where p is export price change, q export volume change; and ESBUM Arimington elasticity,

Source: Linkage model simulations (see Anderson, Valenzuela and van der Mensbrugge 2010).

Table 4: Sources of Household Income and Income Taxes, Pakistan, 2001-02

Households	2001-02 Income				Income Sources, %					Direct tax, %
	Total mil Rs	Per Capita '000 Rs	2001-02 Pop.		Labor			K	Land	
			'000	% dist.	Farm	Unskilled	Skilled			
Large farmers										
- Sindh	19,079	112.9	169	0.12	13.2	0.3	-	31.4	49.8	5.3
- Punjab	64,116	173.7	369	0.25	8.6	0.5	-	43.3	42.2	5.4
- Other Pakistan /a/	10,755	152.9	70	0.05	9.8	0.2	-	52.4	32.3	5.4
Medium farmers										
- Sindh	44,625	30.4	1,466	1.00	14.5	3.1	-	39.6	37.4	5.3
- Punjab	145,995	48.4	3,014	2.07	10.8	4.3	-	52.3	27.2	5.4
- Other Pakistan	35,572	34.2	1,040	0.71	14.9	2.9	-	38.2	38.4	5.5
Small farmers										
- Sindh	57,648	14.9	3,873	2.65	6.8	9.0	-	57.9	20.4	5.8
- Punjab	318,888	18.1	17,605	12.06	7.9	14.2	-	51.8	20.3	5.8
- Other Pakistan	124,985	11.9	10,493	7.19	6.0	11.6	-	63.6	12.5	6.2
Small farm renters and landless										
- Sindh	43,672	7.7	5,682	3.89	11.6	18.7	-	48.5	15.6	5.7
- Punjab	45,963	10.7	4,307	2.95	9.0	20.5	-	48.7	16.1	5.8
- Other Pakistan	14,970	8.2	1,818	1.25	10.1	14.5	-	55.0	14.7	5.7
Rural agri. workers and landless										
- Sindh	20,782	6.4	3,241	2.22	-	51.0	-	42.8	-	6.2
- Punjab	68,172	12.0	5,693	3.90	-	49.3	-	45.2	-	5.5
- Other Pakistan	9,513	14.6	653	0.45	-	18.7	-	76.0	-	5.4
Rural non-farm										
- non-poor	400,771	19.8	20,233	13.86	-	43.0	-	49.9	-	7.2
- poor	134,398	5.5	24,525	16.80	-	29.7	-	63.4	-	6.9
Urban										
- non-poor	1,744,119	58.5	29,829	20.44	-	11.9	33.3	10.6	-	44.2
- poor	181,413	15.3	11,880	8.14	-	76.2	-	18.0	-	5.8

/a/ Other Pakistan - Balochistan, North-West Frontier Province, Azad Kashmir, Northern Areas, Federally Administered, and Federally Administered Tribal Areas

Source: Dorosh, Niazi and Nazli (2004).

Table 5: Poverty Estimates<sup>a</sup>, Pakistan, 1998-99 to 2004-05

<b>Poverty Index</b>	1998-99	2001-02	2004-05*
<b>Poverty Incidence (P0)</b>			
Pakistan	30.0	31.2	29.2
Urban	21.0	19.9	19.1
Rural	33.8	38.2	34.0
<b>Poverty Gap (P1)</b>			
Pakistan	6.3	6.5	6.1
Urban	4.3	3.9	3.9
Rural	7.1	8.0	7.2
<b>Squared Poverty Gap (P2)</b>			
Pakistan	2.0	2.0	2.0
Urban	1.3	1.2	1.2
Rural	2.2	2.5	2.3

Source: World Bank (2007), Pakistan Household Integrated Economic Survey

\*World Bank Estimates

<sup>a</sup>Foster, Greer and Thorbecke (FGT) (1994) Poverty Index. (P0 = poverty incidence; P1 = poverty gap; and P2 = poverty severity)

Source: Ministry of Finance (2003) and, for 2004-05 estimates, World Bank (2007).

Table 6: Poverty Effects for Pakistan of Prospective Liberalizations

<b>Households/Poverty Index/GINI</b>	Index in 2001-02	2001-02 Pop. Dist., %	% change from 2001-02 index					
			1A	1B	2A	2B	3A	3B
All Pakistan - P0	31.23		-1.3	-0.1	-5.2	-1.6	-6.4	-1.8
- P1	6.46		-1.6	-0.1	-10.0	-2.3	-11.5	-2.5
- P2	1.97		-1.9	-0.1	-12.1	-2.8	-13.8	-3.0
GINI	0.34		-0.08	-0.02	-3.3	-0.1	-3.3	-0.2
All Urban - P0	19.86	29.7	-1.5	-0.1	2.3	-2.4	0.4	-2.7
- P1	3.91		-1.5	-0.1	-13.3	-3.6	-14.8	-3.7
- P2	1.16		-1.7	-0.1	-16.9	-4.2	-18.3	-4.3
GINI	0.40		-0.03	-0.01	-2.0	-0.1	-2.0	-0.1
All Rural - P0	38.16	70.3	-1.2	-0.1	-7.6	-1.4	-8.6	-1.5
- P1	8.02		-1.6	-0.1	-9.0	-2.0	-10.5	-2.1
- P2	2.47		-2.0	-0.1	-10.8	-2.4	-12.5	-2.6
GINI	0.26		-0.01	-0.02	0.2	-0.1	0.2	-0.1
Large and Medium Farmers - P0	22.82	4.0	0.0	0.0	-7.9	3.4	-7.9	3.4
- P1	4.06		-0.7	0.4	-9.9	4.9	-10.0	5.3
- P2	1.13		-0.7	0.5	-10.5	5.2	-10.6	5.8
Small Farmers and Agri. Workers - P0	37.40	30.6	-1.4	0.1	-8.3	-0.9	-8.7	-0.9
- P1	7.47		-1.3	0.0	-9.3	-1.3	-10.3	-1.3
- P2	2.20		-1.6	0.0	-11.2	-1.7	-12.4	-1.6
Rural Non-Farmers - P0	39.89	35.7	-1.1	-0.2	-7.2	-1.9	-8.5	-2.1
- P1	8.71		-1.9	-0.2	-8.9	-2.6	-10.6	-2.8
- P2	2.76		-2.2	-0.2	-10.6	-3.1	-12.6	-3.4

P0=poverty headcount; P1=poverty gap; P2=poverty severity

1A - Full trade liberalization, excluding Pakistan

Source: Authors' national CGE model simulation results.

Table 7: Aggregate simulation results of prospective liberalizations for Pakistan, agriculture and non-agriculture  
(% change from the base)

<b>Variables</b>	1A		1B		2A		2B		3A		3B	
	Agri.	Non-Agri.	Agri.	Non-Agri.	Agri.	Non-Agri.	Agri.	Non-Agri.	Agri.	Non-Agri.	Agri.	Non-Agri.
<b>Real GDP</b>	0.15		0.04		0.81		0.26		0.95		0.29	
<b>Real and Relative Prices</b>												
Real Exchange Rate	-1.24		-0.13		6.09		1.87		4.79		1.73	
Domestic Terms of Trade /1/	1.38	1.56	0.98	0.13	12.61	9.37	17.30	-0.84	14.19	11.06	18.52	-0.71
<b>Prices</b>												
Export Price in Local Currency	-0.26	-0.82	0.33	-0.13	-1.92	0.09	-0.63	1.70	-2.16	-0.66	-0.30	1.59
Import Price in Local Currency	-1.70	-2.35	-0.73	-0.24	-12.26	-8.34	-14.49	2.57	-13.74	-10.41	-15.13	2.33
Domestic Price	-0.29	-0.55	-0.07	-0.08	-2.47	-1.23	-1.53	1.11	-2.74	-1.69	-1.56	1.06
Output Price	-0.29	-0.58	-0.06	-0.08	-2.45	-1.07	-1.50	1.18	-2.73	-1.57	-1.52	1.12
Value Added Price	0.16	-0.12	0.03	-0.06	-3.14	1.32	-2.88	1.01	-2.98	1.24	-2.79	0.97
Consumer Price Index	-0.51		-0.11		-2.81		-0.27		-3.24		-0.34	
<b>Volume</b>												
Imports	2.41	0.96	0.89	0.12	22.15	4.45	29.64	-0.48	24.75	5.46	30.42	-0.36
Exports	0.73	-0.16	1.79	0.11	4.78	13.24	6.20	3.07	5.28	13.07	8.00	3.17
Domestic Demand	0.09	-0.07	-0.01	-0.02	-0.87	-1.12	-1.05	0.03	-0.76	-1.19	-1.06	0.01
Composite Good	0.18	0.12	0.02	0.01	0.09	-0.08	0.20	-0.07	0.30	0.05	0.22	-0.06
Output	0.11	-0.08	0.05	-0.01	-0.69	0.39	-0.82	0.39	-0.57	0.50	-0.77	0.38
Value Added	0.07	-0.03	0.03	-0.01	-0.51	0.19	-0.39	0.13	-0.43	0.16	-0.35	0.12
<b>Factor Prices</b>												
Farm Wages	-0.95		-0.27		-0.58		-2.16		-1.67		-2.44	
Wages of Unskilled Labor	-0.14		-0.05		1.49		0.47		1.38		0.45	
Wages of Skilled Labor		-0.04		0.00		2.06		0.73		2.04		0.74
Return to Land	-1.00		-0.32		-1.90		-2.52		-3.06		-2.85	
Return to Capital	1.00	-0.14	0.27	-0.09	-5.02	1.00	-3.80	1.41	-3.92	0.93	-3.41	1.34
<b>Factor Prices less Inflation</b>												
Farm Wages	-0.44		-0.16		2.23		-1.88		1.56		-2.10	
Wages of Unskilled Labor	0.37		0.05		4.30		0.74		4.61		0.79	
Wages of Skilled Labor		0.47		0.11		4.87		1.00		5.28		1.09
Return to Land	-0.49		-0.21		0.91		-2.25		0.18		-2.51	
Return to Capital	1.51	0.37	0.37	0.02	-2.21	3.81	-3.53	1.68	-0.69	4.17	-3.07	1.68

/1/ Change in the ratio of domestic export and import prices

1A - Full trade liberalization, excluding Pakistan

1B - Agricultural trade liberalization, excluding Pakistan

2A - Full trade liberalization in Pakistan only

2B - Agricultural liberalization in Pakistan only

3A - Full world trade liberalization and full Pakistan trade liberalization (combined S1A and S2A)

Source: Authors' national CGE model simulation results.

Table 8: Household Welfare and Price Effects in Pakistan of Liberalization of All Goods Trade by the Rest-of-world

- Punjab	0.17	-0.35	-0.58	0.23	-0.20	-0.09	-0.11	-0.48	-2.82	2.35	-1.34	-0.16	-1.17	-0.86	-3.31	2.47	-1.51	-0.22	-1.29
- Other Pakistan	0.01	-0.24	-0.67	0.43	-0.17	-0.13	-0.04	-0.39	-2.94	2.57	-1.11	-0.03	-1.08	-0.64	-3.52	2.90	-1.25	-0.12	-1.12
Medium farmers - Sindh	0.99	-0.46	-0.51	0.05	-0.20	-0.08	-0.11	-0.61	-2.60	2.00	-1.21	-0.28	-0.93	-1.11	-3.03	1.94	-1.39	-0.32	-1.06
- Punjab	1.89	-0.30	-0.58	0.28	-0.15	-0.09	-0.06	-0.50	-2.82	2.33	-0.87	-0.16	-0.71	-0.81	-3.31	2.52	-0.99	-0.22	-0.77
- Other Pakistan	0.75	-0.47	-0.67	0.20	-0.20	-0.13	-0.07	-0.62	-2.94	2.33	-1.25	-0.03	-1.22	-1.14	-3.52	2.40	-1.43	-0.12	-1.30
Small farmers - Sindh	2.79	-0.19	-0.44	0.25	-0.12	-0.06	-0.06	-0.33	-2.40	2.08	-0.60	-0.40	-0.19	-0.51	-2.78	2.28	-0.68	-0.43	-0.25
- Punjab	12.87	-0.22	-0.45	0.23	-0.13	-0.09	-0.04	-0.20	-2.47	2.28	-0.59	-0.53	-0.06	-0.41	-2.84	2.44	-0.68	-0.57	-0.10
- Other Pakistan	5.67	-0.10	-0.46	0.36	-0.09	-0.11	0.01	-0.19	-2.37	2.19	-0.37	-0.53	0.16	-0.26	-2.77	2.52	-0.42	-0.60	0.18
Small farm renters and landless - Sindh	0.16	-0.22	-0.38	0.16	-0.12	-0.07	-0.06	-0.03	-2.16	2.14	-0.53	-0.56	0.03	-0.24	-2.48	2.25	-0.62	-0.59	-0.03
- Punjab	1.50	-0.20	-0.47	0.27	-0.12	-0.10	-0.02	0.00	-2.41	2.42	-0.48	-0.52	0.05	-0.19	-2.82	2.64	-0.57	-0.59	0.03
- Other Pakistan	0.58	-0.18	-0.52	0.35	-0.11	-0.12	0.01	-0.13	-2.41	2.29	-0.50	-0.44	-0.05	-0.29	-2.87	2.59	-0.58	-0.53	-0.04
Rural agri. workers and landless - Sindh	4.12	-0.01	-0.38	0.37	-0.06	-0.09	0.03	0.87	-2.08	2.96	0.26	-0.68	0.95	0.91	-2.41	3.33	0.24	-0.73	0.98
- Punjab	2.02	0.00	-0.40	0.39	-0.06	-0.09	0.03	0.82	-2.19	3.02	0.25	-0.71	0.97	0.87	-2.52	3.40	0.23	-0.76	1.00
- Other Pakistan	0.86	0.10	-0.48	0.58	-0.04	-0.13	0.09	0.07	-2.20	2.28	0.10	-0.60	0.71	0.24	-2.62	2.87	0.11	-0.70	0.82
Rural non-farm - non-poor	17.60	0.11	-0.52	0.63	-0.06	-0.11	0.04	0.94	-2.68	3.63	0.10	-0.30	0.41	1.12	-3.12	4.25	0.09	-0.37	0.47
- poor	18.14	0.06	-0.46	0.53	-0.05	-0.10	0.06	0.35	-2.23	2.58	0.16	-0.57	0.73	0.47	-2.63	3.11	0.16	-0.64	0.80
Urban - non-poor	22.50	-0.22	-0.53	0.31	-0.11	-0.12	0.01	-7.21	-3.13	4.06	-0.25	-0.11	-0.13	-7.27	-3.57	-3.69	-0.32	-0.19	-0.12
- poor	7.23	-0.09	-0.46	0.37	-0.08	-0.11	0.03	1.49	-2.44	3.94	0.38	-0.51	0.90	1.44	-2.83	4.28	0.34	-0.58	0.93

EV = equivalent variation

1A - Full trade liberalization, excluding Pakistan

1B - Agricultural trade liberalization, excluding Pakistan

2A - Full trade liberalization in Pakistan only

2B - Agricultural liberalization in Pakistan only

3A - Full world trade liberalization and full Pakistan trade liberalization (combined S1A and S2A)

3B - Agriculture trade liberalization and agriculture Pakstan trade liberalization (combined S1B and S2B)

Source: Authors' national CGE model simulation results.

Table 9: Sectoral Effects on Pakistan of Unilateral Liberalization of All Goods Trade

Sectors	Output	Domestic	Demand	Composite Good		Exports		Imports		Value added		Return to capital
	x	px	d	pd	q	pq	e	pe	m	pm	va	pva
<b>Agriculture</b>												
<b>Primary Agriculture</b>												
1. Wheat irrigated	2.2	-2.2	0.6	-2.2	-0.4	-1.9	58.0	-2.2	-30.9	11.2	2.2	-0.9
2. Wheat non-irrigated	-0.6	-2.5	-0.6	-2.5	-0.6	-2.5	0.0	0.0	0.0	0.0	-0.6	-1.3
3. Paddy IRRI	0.7	-2.5	0.7	-2.5	0.7	-2.5	0.0	0.0	0.0	0.0	0.7	-1.5
4. Paddy basmati	0.9	-2.6	0.9	-2.6	0.9	-2.6	0.0	0.0	0.0	0.0	0.9	-1.7
5. Raw Cotton	4.3	-2.6	4.3	-2.6	4.3	-2.6	0.0	0.0	0.0	0.0	4.3	-0.8
6. Sugarcane	-1.3	-2.7	-1.3	-2.7	-1.3	-2.7	0.0	0.0	0.0	0.0	-1.3	-1.8
7. Other major crops	-0.2	-1.6	-1.0	-1.6	-0.4	-1.9	32.6	-1.6	13.9	-8.3	-0.2	-1.3
8. Fruits & vegetables	-0.8	-1.5	-2.0	-1.5	-0.4	-2.3	32.2	-1.5	15.2	-9.3	-0.8	-1.7
9. Livestock, cattle and dairy	-0.5	-3.3	-0.6	-3.3	0.1	-3.6	41.8	-3.3	99.0	-32.0	-0.5	-5.0
10. Poultry	-0.6	-3.6	-0.7	-3.6	-0.7	-3.6	43.9	-3.6	0.0	0.0	-0.6	-5.7
11. Forestry	-21.2	-1.9	-3.3	-1.9	-0.3	-3.2	-41.7	-1.9	9.9	-7.5	-21.2	-1.6
12. Fishing Industry	-4.9	-9.2	0.6	-9.2	0.6	-9.2	-18.5	-9.2	-3.4	-7.5	-4.9	-13.7
<b>Lightly Processed Food</b>												
14. Vegetable oil	-6.8	-3.8	-6.8	-3.8	0.1	-7.2	44.8	-3.8	17.7	-14.5	-6.8	-34.9
15. Wheat milling	-0.6	-1.2	-1.1	-1.2	0.2	-1.7	34.8	-1.2	39.6	-15.4	-0.6	0.1
16. Rice milling IRRI	1.5	0.7	-0.1	0.7	-0.1	0.7	3.3	0.7	0.0	0.0	1.5	5.5
17. Rice milling Basmati	1.3	0.3	-0.3	0.3	-0.3	0.3	5.2	0.3	0.0	0.0	1.3	5.0
18. Sugar	-1.4	-1.5	-1.4	-1.5	0.0	-2.0	51.5	-1.5	215.2	-33.5	-1.4	-1.2
<b>Non-Agriculture</b>												
<b>Mining and Manufacturing</b>												
13. Mining	-4.0	-8.6	1.1	-8.6	-1.3	-7.5	-21.0	-8.6	-1.9	-7.3	-4.0	-10.4
19. Other food	2.6	2.9	-6.0	2.9	-1.1	0.2	11.3	2.9	38.1	-15.4	2.6	10.3
20. Cotton lint & yarn	5.0	1.7	2.5	1.7	3.7	1.1	12.0	1.7	37.5	-11.8	5.0	13.8
21. Textiles	4.1	1.6	-0.9	1.6	0.8	0.8	12.3	1.6	32.8	-11.8	4.1	9.6
22. Leather	8.9	-0.5	-0.2	-0.5	1.1	-1.2	22.7	-0.5	27.8	-11.8	8.9	20.0
23. Wood products	-1.8	-1.7	-1.8	-1.7	-0.5	-2.3	7.2	-1.7	15.9	-9.3	-1.8	-0.3
24. Chemicals	-2.5	-4.6	-6.7	-4.6	0.6	-8.0	21.2	-4.6	3.6	-9.3	-2.5	-4.6
25. Cement & bricks	-1.4	-4.7	-1.4	-4.7	-1.4	-4.7	21.7	-4.7	0.0	0.0	-1.4	-4.8
26. Petroleum refining	-3.8	-4.8	-3.8	-4.8	1.1	-7.1	0.0	0.0	6.3	-9.3	-3.8	-5.5
27. Other manufacturing	-0.8	-3.5	-7.9	-3.5	1.0	-7.7	15.5	-3.5	4.7	-9.3	-0.8	0.5
<b>Other Industry</b>												
28. Energy	0.3	-0.5	0.3	-0.5	0.3	-0.5	0.0	0.0	0.0	0.0	0.3	2.7
29. Construction	-1.7	-2.9	-1.7	-2.9	-1.7	-2.9	0.0	0.0	0.0	0.0	-1.7	1.3
<b>Services</b>												
30. Commerce	-0.4	0.5	-0.4	0.5	-0.4	0.5	11.1	0.5	-5.5	5.7	-0.4	1.5
31. Transport	1.7	-1.3	-0.6	-1.3	-0.6	-1.3	15.2	-1.3	0.0	0.0	1.7	3.4
32. Housing	0.0	-11.7	0.0	-11.7	0.0	-11.7	0.0	0.0	0.0	0.0	0.0	-13.6
33. Private services	-0.4	-0.7	-0.4	-0.7	-0.8	-0.3	13.9	-0.7	-6.7	5.7	-0.4	1.2
34. Public services	-0.7	0.5	-0.7	0.5	-0.7	0.5	0.0	0.0	0.0	0.0	-0.7	2.1

where x=output; px=output price; d=domestic demand, pd=domestic price; q=composite good; pq=composite price; e=exports; pe=export price

Source: Authors' national CGE model simulation results.

Table 10: Sensitivity Analysis of Household Welfare Effects to Type of Tax Replacement,  
Pakistan

Source: Authors' national CGE model simulation results.

Table 11: Sensitivity Analysis of Poverty Effects to Type of Tax Replacement, Pakistan

P0=poverty headcount; P1=poverty gap; P2=poverty severity

3A - Full world trade liberalization and full Pakistan trade liberalization (combined 1A and 2A)

3B - Agriculture trade liberalization and agriculture Pakstan trade liberalization (combined 1B and 2B)

Source: Authors' national CGE model simulation results.