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**Dynamic Effects of Agriculture Trade
in the Context of Domestic and
Global Liberalisation: A CGE
Analysis for Pakistan**

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ABSTRACT

This paper studies dynamic effects of agriculture trade in the context of domestic and global liberalisation. Being the largest sector of the economy, the agriculture sector contributes substantially to the growth process. Using a small CGE model for Pakistan and a 2002 Pakistan Social Accounting Matrix as data base, the simulations are conducted to measure the effects of domestic agriculture trade liberalisation in isolation and in conjunction with changes in the world economy. The novelty of this paper is that it introduces dynamics in the Pakistani CGE model through capital accumulation. The results illuminate the greater effectiveness of agriculture trade liberalisation in promoting the overall growth process, given increased market access because of liberalisation in the world economy.

JEL classification: O4, F15, F14

Keywords: International Trade, Growth, Dynamic CGE

1. INTRODUCTION

Despite falling share of agriculture in GDP, it plays a dominating role in growth process of the country. An improvement in agriculture not only increase growth potential but also benefit to a large portion of population who lives in the rural areas, earns income from agriculture and spend relatively larger share on agriculture goods. Though a small number of agriculture sectors are protected, but they constitute about 65 percent of total agriculture output and 64 percent of agriculture imports which face tariff. Thus, the liberalisation of this sector may have significant effect on the lives of a large proportion of population form income as well as from consumption side.

In the past, trade in agriculture products was largely excluded from the GATT rules as a number of exceptions. First time in 1995, agriculture trade was brought under multilateral disciplines through the Uruguay round agreement on agriculture (URAA).¹ However, tariff on agriculture import remains very high in both the rich and poor countries. Developing countries exporters face tariff rate of 15.6 percent for agriculture and food imports, while developed countries' exporters face even higher tariff 17.8 percent [Anderson and Martin (2005)]. These food and agriculture policies are responsible for more than three fifth of global gains forgone because of merchandise trade distortions. Although agriculture and food processing account for less than ten percent of world trade and less than 4 percent of GDP, but a larger proportion (54 percent) of the economically active population is engaged in agriculture [Anderson and Martin (2005)]. Similarly, a small number of agriculture products are subject to tariff rate or quotas, but they protect more than half of all production in developed countries and 44 percent of their agriculture imports. Food and agriculture policies contribute 63 percent of welfare cost of merchandise trade distortions, whereas 58 points are due to agriculture tariff² at the world level [Anderson and Martin (2005)]. This may be more harmful for the developing countries as majority of population living in rural areas largely engaged in production of agriculture goods. If agriculture is further ignored in policy agenda then future losses may be higher than now.

¹After that it has been widely discussed in Doha round, Cancun conference etc.

²4 percent from subsidies on farm production and one percent of exports.

Pakistan undertook significant liberalisation measures in its agriculture sector by reducing state intervention and bringing prices closer to world market levels during the nineties. But, due to slow liberalisation of agriculture in developed countries, the country has not been able to realise its expected benefits³ [Siddiqui (forthcoming)]. Thus the main issue to be analysed here is twofold. (1) Whether country would benefit by liberalisation of agriculture trade by removing existing distortions in it? (2) Whether global liberalisation would enhance benefits/losses of domestic liberalisation for Pakistan? Following the theoretical growth literature, the study explores the answers to the above mentioned questions using CGE frame work in the short run and in the long run.

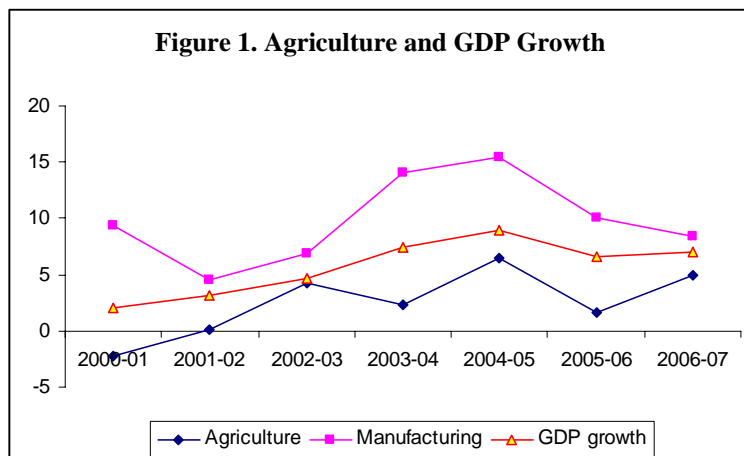
Majority of the CGE models for Pakistan, developed for trade policy analysis, are static in nature [Siddiqui, *et al.* (2006), Siddiqui (forthcoming), Siddiqui and Kemal (2006)]. These models are unable to capture long run growth effects which emerge from trade liberalisation policies. In these models, consumers and producers made “optimal” decisions within a single period. This study overcomes this problem by developing a dynamic CGE model for Pakistan. The plan of the study is as follows. Next section presents historical view of growth and trade with a focus on agriculture. Section three briefly discusses trade-growth relationship based on the existing literature. Following this, two sections discuss main features of the data used in the study and model’s static and dynamic features, respectively. Section six discusses the simulation results. Finally, I conclude by summarising the key findings and noting the policy implications of my work.

2. AGRICULTURE AND GROWTH

Despite falling share of agriculture in GDP, it is the single largest sector of the economy. It is main source of livelihood for 66 percent of the country’s population and accounts for 21 percent of the GDP. It employs 43.4 percent of the total work force. Agriculture sector has strong linkages with other sectors of the economy. Hence it contributes to growth directly and indirectly by increasing its own production and by providing raw material to industry. However, growth of this sector is very sensitive to changing whether conditions.

Figure 1 shows that agriculture growth has cyclical trend during 2001 to 2007. During the first two years it contracts due to draught. After that due to better availability of irrigation water, it experienced high growth. Recently, agriculture sector registered a sharp recovery in 2006-07 and grew by 5 percent (see Figure 1).

³Favourable development in the domestic supply is only beneficial if they can be absorbed by the importing countries. For instance price support measure applied in the United States and European community resulted in an increase of wheat production, which the world market has been unable to absorb.



Pakistan trade has shown excellent performance during the last few years with exports growing at the rate of 16 percent per annum [Pakistan (2007)]. However, recently it has declined to 4 percent. On the import side, growth rate was significant of 29 percent during 2003-06. But it has declined to around 8 percent. The deceleration in imports growth is due to tight monetary policy to trim excess demand, decline oil price, decline in imports of car due to change in policy, and large decline if imports of fertiliser due to large stock from the last year and decline in imports of iron and steel due to improved production of steel mill [Pakistan (2007)].

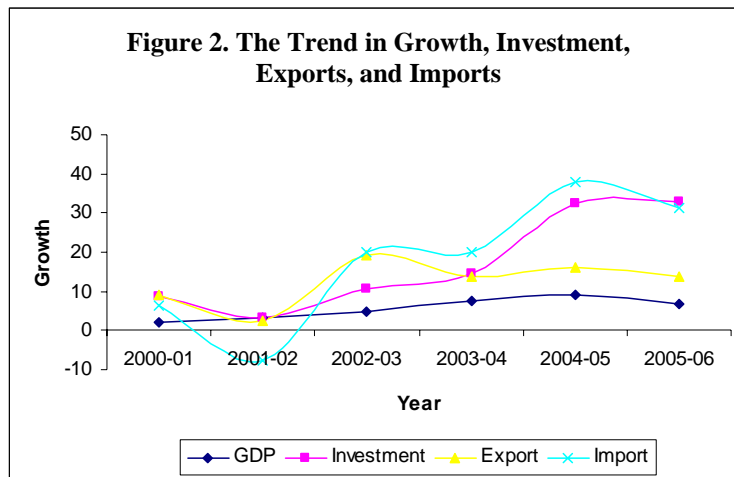
Table 1 reveals that exports of primary commodity (basically agriculture) fluctuate between 13 and 11 percent in the total exports; semi manufactured and manufactures exports accounts for 89 percent of exports. On the imports side, import of raw material for consumer goods and final consumer goods which basically consist of agriculture commodities or agriculture based manufactured goods have declined to 45 percent from 55 percent and 14 to 10 percent over the period of 2000-01–2006-07. This may be deduced that trade in agriculture has declined over time.

Table 1

The Structure of Trade (Percentage)

Year	Exports of Primary commodities	Exports of Semi Manufactured and Manufactured	Imports of Raw Material for Consumer Goods	Imports of Consumer Goods	Raw Material for Capital Goods and Capital Goods
2000-01	13	87	55	14	31
2001-02	11	89	55	11	34
2002-03	11	89	53	10	37
2003-04	10	90	49	9	42
2004-05	11	89	46	10	44
2005-06	11	89	45	11	44
2006-07	11	89	45	10	45

Figure 2 shows that investment and imports has strong positively relationship. This indicates imports of Pakistan highly affect investment in the domestic economy. This also indicates that majority of import consist of investment goods such as machinery. On the other hand association between growth and exports is positive. Prior to 2003 association was weak, export growth was higher than GDP growth. This indicate that existing policies could generate enough demand. Thus output is directed to foreign market. From this we may also conclude that policies at the domestic level could not generate enough demand for goods and services. But after that the relationship between the two became strong. This may indicate that the policies have positive welfare effect on the economy. However, there are many interlinked factors which determine the direction of causality.



Overtime protection to manufacturing sector has declined significantly from 25.5 percent in 1989-90 [Siddiqui, *et al.* (2006)] to 11.8 percent in 2002 [Siddiqui (forthcoming)]. But tariff on agriculture imports has increased from 6.9 percent to 11.8 percent over the same time period. Anderson and Martin (2005) indicate that high tariff on agriculture products relative to non-agriculture products are the major reason that food and agriculture policies contribute 63 percent of welfare cost of current merchandise trade distortions.

3. LITERATURE REVIEW

The idea that international trade enhances economic growth goes back at least to Adam Smith. Since then a number of studies have supported the hypothesis that countries with higher trade shares are likely to grow faster than other countries [Harrison (1996)]. Recently, the emphasis has been shifted from 'trade' to 'free trade', i.e., a trade system where all trade distortions are

eliminated. Since then, a large number of studies have looked at the relationship between average tariff rates and growth. They reported mixed empirical results. For example, Lee (1993), Harrison (1996) and Edwards (1998) found a significant and negative relationship between tariff rates and growth. Edwards (1992), Sala-i-Martin (1997) and Clemens and Williamson (2001) concluded that this relationship is weak. Contrary to these findings, Yanikkaya (2002) show that trade barriers are positively and, in most specifications, significantly associated with growth, especially for developing countries and they are also consistent with the findings of theoretical growth and development literature. Similarly, Rodriguez and Rodrick (2001) found that average tariff rates had a positive and significant relationship with total factor productivity (TFP) growth for the 1980–1990 periods. All studies mentioned above are partial in their analysis estimating average relationship between trade and growth and trade restrictions and growth.

Recently many studies namely Siddiqui (forthcoming) for Pakistan, Raihan and Razzaque (forthcoming) for Bangladesh, Weerahewa, *et al.* (forthcoming) for Sri Lanka, and Sahay and Chattopadhyay (forthcoming) for India analyse the effect of agriculture and rice trade liberalisation using computable general equilibrium framework. The studies show mix finding. Two studies show that agriculture trade openness reduces poverty and improve welfare [Siddiqui (forthcoming); Sahay and Chattopadhyay (forthcoming)]. Whereas, the studies by Raihan and Razzaque (forthcoming) and Weerahewa, *et al.* (forthcoming) show deteriorating impact of these policies on welfare and poverty. The results show that impacts of these policies are dependent on status of the countries; net importers or net exporters of agriculture basically food items. An important shortcoming of these studies except Raihan and Razzaque (forthcoming) is that the majority of them ignored dynamic effects.

Recently books edited by ‘Aksoy and Beghin’, ‘Ingco and Winters’, ‘Ingco and Nash, and Anania’, and ‘Bowman, Carter, and McCalla’ have analysed the effect of Doha Development Agenda and agriculture trade on welfare and poverty for a number of countries [Anderson and Martin (2005)]. The studies explore the contribution of the three pillars of agriculture distortions (market access, export subsidies, and domestic support), to welfare losses and gains. The results show that full liberalisation of agriculture trade and elimination of agriculture subsidies boost global welfare by nearly \$300 billion a year by 2015.

4. METHODOLOGY

The theoretical growth literature studying growth effects of the trade restrictions report that these effects are very complicated to be analysed. Various openness measures have different theoretical implications for growth. Some researchers think that expansion of exports enhances growth by using country’s abundant factor, labour. Therefore, benefits of ‘growth through expansion of

export oriented industry' have higher probability to be trickled down to poor segment of population. Contrary to this view, some researchers claimed that the benefits of openness lie on the import side, rather than the export side. International trade leads to a more efficient use of a country's resources through the inflow of import of goods and services that otherwise are too costly to produce within the country. This clearly shows that imports are as important as exports for economic performance. They should be considered complementary to each other rather than alternatives and should be analysed using framework with export import and output linkages.

Despite some deficiencies, economy wide CGE framework with multiple direct and indirect linkages has widely been used for the agriculture trade policy analysis [Siddiqui, *et al.* (2006), Siddiqui (forthcoming) for Pakistan, Weerahewa, *et al.* (forthcoming) for Sri Lanka, Raihan and Razzaque (forthcoming) for Bangladesh, Cororaton, *et al.* (2005) for Philippine, Sahay and Chattopadhyay (forthcoming) for India, Anderson and Martin (2005)]. The most of these trade-focused computable general equilibrium models were static in nature. In these models consumers and producers made decisions within a single period. The focus of these studies is not on growth but on welfare and poverty. Here we develop a simple CGE model with dynamic features for growth impact analysis.

The CGE Model

Earlier, the static CGE models for Pakistan using 1990 data set [Siddiqui and Iqbal (2001); Siddiqui and Kemal (2006)] and 2002 data set [Siddiqui (forthcoming)] focusing on the real side of the economy analyse the consequences of trade liberalisation, stabilisation policies, agriculture and rice trade liberalisation via relative price changes. The analysis is not enough to analyse the long run impact of these programs. Here, comparative static CGE model is transformed into a simple dynamic-recursive model with four trading sectors and one non-trading sector.

Salient Features of a Static Model

The sectors employ two primary factors of production; labour and capital. It has four institutions namely household, firms, government and rest of the world. Households are grouped by region, rural and urban. In the model, prices adjust to clear the market. Labour market clears via wage adjustment. Imports are modeled using the Armington approach (CES function), exports with CET-function and consumption of households through Cobb-douglas utility function. A set of prices and quantities exists such that all excess demands for commodities and services are zero. The coefficients such as share and shift parameters are calculated from SAM data. Elasticities are taken from earlier studies. Perfect competition and full employment is assumed.

Dynamic Features of the Model

Within a period, module remains unchanged. The capital stock is defined on the basis of an ACOR. Unlike in static model, capital is assumed to be mobile across activities. Investment is assumed to be savings-driven. Capital stock growth is endogenous. Growth in labour force and total factor productivity (or technological progress)⁴ is exogenous. Total labour supply and total factor productivity increases at an exogenous rate. All other exogenous variables also increase at the same rate. The investment demand equation determines the pattern of reallocation of new investment among different sectors of the economy after the shock. The model is solved for each year (without gaps).

5. DATA

The base year data has been taken from SAM for the year 2002 [Dorosh, *et al.* (2006)]. It is aggregated from 71X71 matrix into 18X18 matrix with five sectors of production employing two primary factors of production and five institutions as participating agents.

Production: The economy is divided into three major classes namely agriculture, manufacturing and services. Manufacturing and services sectors are further sub-divided. Manufacturing sector is divided into MF1 (less protected sector) and MF2 (highly protected sector) with tariff rate on their imports are of 3 and 12 percent respectively. Services sector is divided into two on the bases of tradable (ST) and non-tradable services (SNT).

Table 2 presents cost structure of production. It can be observed from the Table 2 that intermediate consumption is larger in MF1 and value added share is

Table 2

Cost Structure of Production in 2002 (Percentage)

Sectors	Agriculture	Manufacturing		Services	
	(AGR)	(MF1)	(MF2)	(ST)	(SNT)
Agr	14.73	8.68	18.77	0.65	0.00
MF1	1.24	38.36	12.74	15.54	12.61
MF2	8.11	3.72	12.98	3.32	10.67
Services(ST)	18.34	16.89	12.79	13.88	11.45
Services(SNT)	0.00	0.41	0.27	4.37	2.56
Total Intermediate	42.42	68.06	57.54	37.76	37.29
Labour	10.67	6.06	5.87	32.03	40.76
Capital	46.55	16.53	26.68	30.21	21.90
Value-added	57.23	22.58	32.55	62.24	62.65
Import Duties	0.28	1.50	2.07	0.00	0.00
Other Taxes	0.07	7.86	7.83	0.00	0.05
Government Payment	0.35	9.36	9.91	0.00	0.05
Value of Output	100	100	100	100	100

⁴One of the channels, suggested by new growth theory, by which trade enhances growth, is that a country can obtain advanced technology from its trading partners through trade.

low, i.e., 68 and 23 percent respectively. This implies that this sector has strong linkages with other sectors of the economy. The growth of this sector largely contributes to the growth process in the country. Agriculture is highly protected sector through tariff on agriculture imports, 11.8 percent. Domestic taxes are very low on agriculture. Within manufacturing sectors, MF2 is the highly protected sector of the economy, whereas domestic taxes are higher on MF1. Services (ST) sectors do not face any form of taxes, neither tariff nor domestic tax.

The table also shows that MF2 uses relatively more inputs from agriculture. It may be due to composite expenditure on imported and domestic goods used as inputs.

Table 3 again shows strong linkages of MF1 with other sector of the economy as 50 percent of its out put is used as intermediate inputs in other sectors of the economy. It can also be observed from table that consumption share of households in the urban areas is larger than rural. This indicates wide disparity between the rural and urban areas as 30 percent of population consuming more than the consumption of 70 percent of population living in the rural areas. Table 3 shows that 1.9 percent of agriculture output is directed to foreign market and about 17 percent of output from MF1 is directed to foreign market. However, our majority of exports are agro-based. Thus the liberalisation of agriculture sector may have significant impact on trade through reduction in cost of production. Rest of the out put is used for investment purposes.

Household Income and Expenditure

Table 4 provides disaggregated information on income distribution between household in the rural and urban areas. Rural households receive larger share of factorial incomes from capital and labour, whereas urban households receive larger share of non-factor incomes (such as, dividends). The government transfers contribute equally in the income of both type of households-rural, urban (Table 4), whereas there is marginal difference in the income received by the rural and urban households from remittances.

Unequal resource allocation between rural and urban areas is evident from their consumption pattern, which has increased over time. Seventy one percent of the Pakistan's population living in the rural areas consume 49 percent of the total and 29 percent population in urban areas consume 51 percent of total in 2002. Rural households spend 93.4 percent on goods and services and save 6.6 percent of their income, whereas urban households spend 82 percent of their income on these items and pay 5.6 percent income tax and save 10.3 percent (Table 5). Rural households consume more of agriculture goods, 27 percent. Therefore, agriculture trade liberalisation is expected to benefit more to the rural households from the consumption side too.

Table 3

Distribution of Output among Different Uses

	Intermediate Consumption					Household Consumption			Government Final Consumption	Export	Accumulation	Total	
	Agr	MF1	MF2	ST	SNT	Total	Rural	Urban					Total
Agr	14.39	10.13	12.79	1.00	0.00	38.31	29.81	30.00	59.80	0.00	1.88	0.00	100
MF1	0.70	25.91	5.03	13.93	4.67	50.24	10.72	11.53	22.25	0.00	16.96	10.54	100
MF2	9.97	5.46	11.13	6.47	8.59	41.63	23.41	23.96	47.38	0.00	10.98	0.01	100
ST	11.29	12.42	5.49	13.55	4.62	47.36	20.01	21.17	41.18	3.54	5.32	2.60	100
SNT	0.01	0.74	0.29	10.58	2.56	14.18	8.23	15.98	24.21	36.98	0.00	24.63	100

Table 4

Household Income by Source (Percentage)

Sources of Income	Rural	Urban
Wages	27.95	48.10
Capital	65.86	11.34
Dividends	0.00	34.46
Government Transfers	0.89	0.80
Remittances	5.30	5.30
Total	100	100

Table 5

Household Budget (Percentage)

Commodities	Rural	Urban
Agr	26.79	21.84
MF1	16.63	14.50
MF2	16.72	13.86
Services1(ST)	28.54	24.46
Services2(SNT)	4.73	7.44
Total	93.41	82.10
Taxes	0.00	7.59
Saving	6.59	10.31
Grand Total	100	100

6. SIMULATION RESULTS⁵

In the CGE model, tariff rates, world export price, and world import prices are exogenous variables and used for policy simulations. The main objective of the study is to measure the association between growth and trade. Simulations are conducted for the short and long run analysis. First analysis is conducted in static framework. Then dynamic framework is used. We discuss results with a focus on growth-trade effects in all simulations.

Shocks*Static CGE-framework*

- Full Agriculture Trade Liberalisation in Domestic Economy without Growth.
- Full Agriculture Trade Liberalisation in Domestic Economy with Growth.

⁵Th detailed results are available from author.

Dynamic-CGE framework

- Base run.
- Full Agriculture trade liberalisation in domestic economy.
- Global Full liberalisation of agriculture trade.

Simulation 1: Full Agriculture Trade Liberalisation in Domestic Economy without Growth

This simulation is conducted in static framework in absence of growth. Tariff is eliminated on agriculture trade, which leads to efficient use of resources. Mobile factors of production, in this case labour, reallocates. The results show that elimination of import tariff reduces the import price of agriculture, increase quantity of imports inflow and decrease the output level in agriculture sector (Table 6). This leads to expand less protected sector of the economy—MF1. Factors of production reallocate towards this sector and its production increases by 1.96 percent. The overall results show that export increases by 1.14 percent and imports by 0.10 percent leading to an increase in openness by 0.5 percent. However, the growth effects cannot be observed in the short run in the absence of accumulation.

Table 6

	<i>Variation in Trade and Output (Percentage)</i>					
	Agr	MF1	MF1	ST	SNT	Total
Simulation 1: Full Agriculture Trade Liberalisation in Domestic Economy without Growth						
Imports	18.38	-0.59	-0.17	0	-	0.10
Exports	-0.79	1.96	-0.07	0	-	1.14
Openness	9.75	0.29	-0.13	0.00	-	0.51
Value-added	-0.81	1.96	-0.16	0	-0.12	0
Simulation 2: Full Agriculture Trade Liberalisation in Domestic Economy with Growth						
Imports	13.94	-0.49	0.16	0.37	-	0.11
Exports	3.66	1.76	0.07	0.18	-	1.25
Openness	9.31	0.28	0.12	0.24	0.56	0.60
Value-added	2.76	1.78	0.14	0.36	-0.17	0.96

The prices of factors of production, labour, rise and vice versa. The results show that on average real wage increases marginally by 0.1 percent but return to capital increase by 7.5 percent in MF1 sector and decline in all other sectors. Overall results show that returns to capital index decline by 0.53 percent (Table 7).

Table 7

Variation in Income and Expenditure (Percentage)

Households			
Simulation 1			
	Rural	Urban	Total
Income	-0.37	-0.27	-0.31
Consumption	-0.37	-0.27	-0.31
	Labour	Capital	GDP-Deflator
Price	1.004	-0.53	-0.49
Simulation 2			
	Rural	Urban	Total
Income (Nominal)	-0.19	-0.89	-0.58
Consumption (Real)	1.17	0.46	0.8
	Labour	Capital	GDP-Deflator
Price	-3.7	0.87	-1.34

These changes determine the change in household income. In this exercise price decline more than decline in income of households. Table 6 shows that real income as well as consumption increases by 0.12 percent and 0.22 percent in the rural and urban areas, respectively. From the results we deduce higher real income generates lower poverty incidence. Similarly, increase in consumption has welfare enhancing impact. However, rural/urban gap increases after the shock as liberalisation benefits more to urban households than rural households.

Simulation 2: Full Agriculture Trade Liberalisation in Domestic Economy with Growth

This exercise is conducted with zero tariff on agriculture imports and assuming that economy grows by 2.5 percent. The growth impact is injected in the economy by increasing labour and capital accumulation by 2.5 percent. Tariff reduction leads to efficient use of resources. The results show that elimination of import tariff reduces the import price of agriculture as in the short run. But quantity of imports increases/decrease less in agriculture and less protected sector MF1 sector due to growth compared to Simulation 1. On the other hand, import of protected manufacturing sector (MF2) and services sector increases instead of decrease in the former and no impact on the later in the absence of growth (Table 6). This leads to reallocation of resources. The production in all sectors increases except in non-trading sector. This increase output is absorbed in domestic and foreign market. Domestic demand for all goods increases as well as exports to foreign market. The prices of factors of production increase, i.e., wages decline by 3.7 percent and returns to capital

increases by 0.87 percent. These changes determine the change in household income. The nominal income of households declines by 0.2 percent and 0.9 percent in the rural and urban areas, respectively. However the impact on welfare depend not only income but also on price levels. In this exercise, price level declines by 1.34 percent, more than in simulation 1 (Table 7). Household income and consumption increases in this exercise more than in the short run. From the results we deduce that trade liberalisation has increased consumption in real term, which has welfare enhancing impact. Similarly higher real income generates lower poverty incidence. Results show that rural households benefit more than urban households. The gap between rural and urban households reduces.

From the results it can be concluded that trade liberalisation benefits more to capital owner. The overall results show that export and imports increases over the short run by 0.01 and 0.11 percentage points and openness increases by 0.5 percentage points. This shows that growth of 2.5 percent increase trade by 0.5 percentage points which are observed in the short run in the absence of accumulation. However, these exercises show trade affects of liberalisation policies but we cannot observe how expanded trade affects growth process in the country. Next three simulation exercises are conducted to observe these effects.

Long-run Effects of Trade Liberalisation

A counterfactual analysis in static framework cannot reveal all effects of expanded trade due to liberalisation policies. In light of present discussion on trade-growth relationship, the analysis in dynamic framework is the necessary. Next three simulation are conducted for this analysis.

Simulation 3. Base Run

A dynamic CGE model allows economy to grow in the absence of any policy change. First this growth path is constructed that is called business as usual (BaU) growth path. This exercise takes into account efficiency effect as well as accumulation effect. The results indicate growth path for 2002 to 2011 in the absence of trade liberalisation. In contrast to static framework where analysis is done with respect to base run, BaU path is used as basis for the comparison of the values after shock in a dynamic framework.

Simulation 4. Full Agriculture Trade Liberalisation in Domestic Economy

In this experiment, tariff on agriculture imports in domestic economy is eliminated. In the dynamic CGE framework efficiency effects coming out of reallocation of factors of production due to liberalisation together with accumulation effects determine the impact on production, factors income, exports and imports etc. Here we assume that short run is one year and long run

is 10 years. The results show dynamic effects of agriculture trade liberalisation in the years 2003 (short-run) and 2011 (long-run) on GDP, export, import and openness. In both scenarios we assume both capital and labour are mobile contrary to short run of static analysis where capital is sector specific.

The initial effect of the experiment is reduction in import price of agriculture. As a result imports of agriculture goods go up by 8 percent (Table 8). The increase in imports inflow reduces demand for domestically produced agriculture good, which has downward pressure on domestic prices. In result of reduced domestic prices against the given export prices, export market becomes more competitive than the local market. Exports from all sectors of the economy increase. Except agriculture all sectors show an increase in production. Value added decline in liberalised sector, agriculture, by 0.13 percent. Consequently, factor of production released from agriculture move towards other sectors of the economy and output increases in manufacturing sectors, larger in less protected sector MF1 than highly protected sector MF2, 0.21 and 0.08 percent, respectively (Table 8). The Table 8 reveals that the economy-wide effect on GDP is positive, though it increases marginally, 0.03 percent.

Table 8

Variation in Trade and Output in the Short-run and the Long-run (Percentage)

	Agr	MF1	MF2	ST	SNT	Total
Simulation 4: Simulation Results in Dynamic Framework						
Short Run Analysis (One Year)						
Value-added	-0.13	0.21	0.08	0.00	0.16	0.03
Imports	7.97	-0.18	-0.42	-0.33	-	0.02
Exports	0.07	0.25	0.23	0.15	-	0.22
Openness	4.1	-0.02	-0.11	0.01	-	0.10
Price Index						-1.09
Long Run Analysis (10 Years)						
Value-added	0.02	0.54	0.30	0.17	0.35	0.21
Import	16.31	-0.22	-0.76	-0.54	-	0.05
Exports	0.36	0.56	0.56	0.42	-	0.53
Openness	4.86	0.14	0.11	0.23	-	0.31
Price Index						0.0

Labour and capital are two major sources of household income. Rural households receive larger share of their income from capital and urban households receive relatively larger share from labour. The Table 9 shows that income of households in the rural and urban areas decline over the BaU values in the short run. Income of rural households, who receive larger share from capital income (land) declines more than income of urban household. As a result gap between the rural and urban households increases. Because, wage rate declines less than return to capital. Welfare implication for households can be indirectly drawn from the changes in income and consumption expenditure or

Table 9

Variation in Income and Expenditure (percentage)

	Short-run		Total
	Rural	Urban	
Income	-0.26	-0.25	-0.25
Consumption	-0.34	-0.40	-0.37
	Long-run		
Income	-0.57	-0.63	-0.60
Consumption	-0.47	-0.46	-0.47

price level. This implies that the income gap between the household in the rural and urban areas increases in the short-run.

On the other hand consumption of rural households declines less than consumption of urban households. Because agriculture goods have relatively larger share in the budget of rural households compared to urban households. Thus the negative effect on consumption of rural households reduces due to cheap availability of agriculture goods. Contrary to income effects, consumption effects show that rural-urban gap reduces.

The overall results reported in Table 9 show that urban households are relatively in better position as far as income effects are concerned but rural households are relatively better off as consumption decline less for rural households than urban households. The welfare and poverty analysis can be carried out through the analysis of change income, consumption and prices. The results show that prices decline by 1.09 percent, which is higher than the decline in income and consumption. The decline in prices offset the impact of decline in income and consumption. As a results, income and consumption rises, which may have poverty reducing and welfare improving impact on households.

The long run effect of domestic agriculture trade liberalisation through tariff elimination on agriculture imports show that growth accelerates in the long run as total production increases by 0.21 percent over BaU path i.e., seven times higher than the short run impact. From these results it can be concluded that trade liberalisation in the domestic economy has growth enhancing impact, which accelerate over time. At the sectoral level the long run impact significantly differs from the short run impact. Contrary to the short run impact, all sectors including agriculture register positive impact on their production.

The impact on trade is more significant in the long run than in the short run. Imports of agriculture goods increases by 8 percent points over the short run imports and by 16 percent over BaU path. It can also be observed from the table 8 that imports of goods other than agriculture decline larger in the long run than in the short run as output rises more in the long run. Decline in imports is offset by domestic production. Exports from all sectors of the economy increase more in the long run over BaU path compared in the short run. The table also reveals

significant increase in openness of agriculture sectors, 4.8 percent. Openness increases marginally in all other sectors of the economy. Depending on initial shares in the total, the results reveal that total imports increases marginally from 0.02 to 0.05 percent over BaU path in the short run and in the long run (Table 8). The total exports increases from 0.22 percent to 0.53 percent over BaU path. As a result, the overall enhancement in openness increases from 0.1 to 0.3 percent. I conclude from this that the gains from liberalised trade increase in the long run (Table 8).

With no change in price level in the country, income and consumption decline in real term. It is expected that the welfare deteriorate in the long run. Similarly with no change in price level and decline in income, poverty may go up.

Simulation 5: Global Full Liberalisation of Agriculture Trade

Generally, it is perceived that global liberalisation of trade increase price of the commodities which are liberalised, here agriculture. However, there are many other factors that influence the extent and direction of impacts. Although a small number of agriculture products are subject to tariff rate or quotas, but the losses from agriculture trade distortions are very high, 58 percent of the total. This may be harmful for the developing countries as majority of population living in rural areas largely engaged in production of agriculture goods. This experiment is conducted to estimate benefit or losses for Pakistan if global agriculture trade is liberalised completely.

For this exercise, change in the world import price, world export price, and export demand are calculated from Siddiqui (forthcoming).⁶ The change in these variables for Pakistan is aggregated from 20 sectors in Siddiqui (forthcoming) to five sectors of the economy in this paper by taking weighted average.⁷ The results show that world export price rise more than world import price for all commodities (Table 10). These changes in term of trade lead to increase in demand for agriculture exports from Pakistan by 1.5 percent. Whereas export demand for MF1 decline by 0.64 percent and increases for MF2 sector by 0.9 percent. Export demand for services sector fell marginally. These changes together with tariff elimination on agriculture imports in domestic economy are fed into CGE model for Pakistan.

⁶These calculations are based on the results of Simulation 4 [full agriculture trade liberalisation in the world economy] in global CGE (GTAP) model conducted for Siddiqui (forthcoming). In that simulation all trade barriers and domestic support measures on all agricultural commodities in all countries in the world have been removed. In result world export price, world import price, demand for exports changes for all countries. For this paper, the change in these variables is calculated using imports as weight.

⁷Imports share are used as weight.

Table 10

Results from the GTAP Model (Percentage)

Sectors	Variation in		
	World Import Price	World Export Price	Export Demand
Agr	0.057	0.064	1.460
MF1	0.077	0.180	-0.642
MF2	0.071	0.139	0.897
Service 1(ST)	0.008	0.014	-0.019
Service 2(SNT)	0	0	0

The simulation results for short run and long run are presented in Tables 11 and 12. These tables report the percentage variation between BaU path and post simulation path. It appears from the results that global liberalisation of agriculture sector leads to an increase in world import price for Pakistan, but tariff elimination on agriculture imports in the domestic economy offset the rise in import price and net effect is fall in import price of agriculture by 5.34 percent.

Table 11

Variation in Quantity and Price Index over BaU (Percentage)

	Short-run Analysis					
	Agr	MF1	MF2	ST	SNT	Total
Value-added	-0.17	-0.15	0.73	-0.06	0.48	0.06
Imports	15.88	-0.68	-1.55	-1.12	-	-0.35
Exports	2.83	-0.96	3.08	0.43	-	0.17
Openness	1.05	0.55	0.35	1.92	-	1.25
Price Index						-1.09
	Long-run Analysis					
Value-added	1.47	-1.50	3.75	0.54	-0.90	0.74
Import	13.18	-1.38	-3.88	-2.63	-	-1.43
Exports	15.36	-6.47	14.52	1.59	-	-0.06
Openness	13.09	-2.28	4.38	0.22	-	-1.41
Price Index						3.51

Table 12

Income and Consumption (Percentage)

	Short-run		
	Rural	Urban	Total
Income	-0.88	-0.86	-0.87
Consumption	-1.11	-1.27	-1.19
	Long-run		
Income	3.18	3.28	3.24
Consumption	2.50	2.14	2.31

Reduction in import price in agriculture lead to a higher inflow of agriculture imports as consumer demand switches from domestic goods to cheap imported good. The producers of agriculture goods lower production of agriculture goods. With given export price, domestic price decline for MF2 and remains constant for MF1. As a result the producers increase production in MF2 sector and reduce in MF1. In the long run, except MF1 and non trading sector, all the other three sectors grow; agriculture by 1.5 percent, MF2 by 3.8 percent and Services (ST) by 0.5 percent.

It can be observed from Table 10 that export demand for agriculture commodities significantly increase. In the long run, a significant rise in imports of agriculture goods accompanied by moderate rise in exports of agriculture can be observed from Table 11, i.e., 15.9 and 2.8 percent, respectively, in the short run. In the long run, impact on exports is accelerated as output increases in this sector by 1.5 percent. Increase output is directed to foreign market. As a result export of agriculture significantly increases in the long run; 15.4 percent. Imports for all other sectors decline more in the long run than in the short run. Similarly, the direction of change in exports remains the same both in the short run and in the long run. However, the impact enhances in the long run both positive and negative. In aggregate, negative impact on exports dominates the positive impact and exports marginally decline, 0.06 percent.

Openness indicator shows that all sectors become more open in the short run over BaU path. However, in the long run, index increases for all sectors except for MF1. The indicator of openness for agriculture and MF2 increases significantly from 1.05 and 0.35 to 13.09 and 4.38, respectively. However, the indicator shows decline in openness of two sectors, the most open sector MF1 and tradable services sector. these both sectors have been more open than agriculture in the base value. The negative effect dominates in the total effect therefore openness for Pakistan decline in the long run by 1.4 points over the BaU path. Whereas in the short run after liberalisation of one year it increases by 1.2 points over the BaU value.

Moving from macro effects to the micro effects, we explore the change in household income, consumption and prices. The income distribution impact on the households varies depending on the households sources of income and price level. The rural household relying more on capital income have been relatively in better position though income decline in the short run (Table 12).

Complete liberalisation of agriculture sector increases income earned by both represented households in the long run. The gains are higher for urban household in the long run. The results show that income distribution improves in the short run but worsened in the long run. On the other hand, in the short run rural household reduce consumption less than urban households, whereas in the long run consumption of rural household rises more than consumption of urban households. This implies that global liberalisation benefits more to urban households in terms of income but

benefits more to rural households in terms of consumption. Results show that increase output is absorbed domestically as household consumption increases more than 4 times the short run increase. However, on average prices increase decline more than income as well as consumption of households, therefore we may conclude that this shock generate welfare improving and poverty reducing impact. On the other hand price rise more than income and consumption, thus may have welfare worsening and poverty increasing impact. However, it require in depth analysis, which may be added latter.

A comparison of growth effect of agriculture trade liberalisation in domestic economy in isolation and in conjunction with changes in the world economy is presented in Table 13. The table shows that growth increase by 0.03 percentage points when agriculture trade liberalisation increases from domestic to global liberalisation. In the long run, growth accelerates from 0.21 to 0.74 in two exercises respectively. The table shows that in absolute term country gains by Rs 34 billion in the long run (ten years) through liberalisation of agriculture trade in the domestic economy. While in the short run gains are less than one billion.

Table 13

Growth Effect of Trade Policies

	Domestic Liberalisation	
	Short-run	Long-run
Growth	0.03	0.21
Gain in Rs (mln)	0.94	34.2
	Global Liberalisation	
Growth	0.06	0.74
Gain in Rs (mln)	2.4	46.9

A comparison of the gains in terms of GDP in the short and long run when agriculture trade is liberalised in the domestic economy only with the result of the global liberalisation exercise shows that gains increases from one billion to two billion in the short run and from 34 billion to 47 billion in the long run in two exercises respectively. Thus global liberalisation benefits more to Pakistan in terms of growth compared to liberalisation in the domestic economy only.

7. CONCLUSION

The recent empirical debate on the links between global and domestic agriculture trade policy and growth is empirically analysed in static and dynamic CGE framework for Pakistan. The results reveal that agriculture trade liberalisation generates favourable results in terms of growth. GDP growth rate increases in all exercises whether it is short or long run. Growth accelerates when agriculture trade is liberalised in the world economy. A comparison of growth effect of agriculture trade liberalisation in domestic economy in isolation and in conjunction with

changes in the world economy shows that growth is higher when trade is liberalised in the world economy compared to growth with domestic liberalisation. There are several potential explanations for the existence of positive relationship between trade barriers and growth. Agriculture output and employment grow in developing countries in response to agriculture liberalisation in the world economy.

1. Tariffs cause a reallocation of productive resources to the goods in which a country has comparative advantage from the goods in which a country has no advantage, generate positive impact on growth.
2. If higher tariff rates cause a switch of resources towards sectors that have strong linkages with other sectors through intermediate demand that enhance growth effects for instance manufacturing sector textile use large intermediate from agriculture sector.
3. Increase market access due to liberalisation of agriculture trade in the world economy benefit more to Pakistan.

However, the results show that global liberalisation of agriculture trade reduce trade in Pakistan despite growth enhancing impact.

The analysis in the static frame work shows positive aggregate effects on macro aggregates as well as welfare and poverty. In dynamic framework, liberalisation after one year generates positive but in the long run effects turns out to be negative. However this have to be analysed further.

The future research should focus on the issue of technological advancement of trade with developed countries. This hypothesis can be tested using GTAP data to see the difference in impact of trade on domestic economy with developed and developing countries.

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