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Trade Liberalization and Income Inequality: The Case for Pakistan

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Abstract

Trade liberalization policies have been adopted by many developing countries to increase economic growth and reduce poverty. While the positive relationship between trade liberalization and economic growth is generally well accepted, the impact of trade liberalization on poverty and income inequality is still unclear. The objective of this paper is to use real data and real trade agreements of the state of Pakistan, to examine the predictions made by trade models about the impact of trade liberalization on income inequality. To illustrate, the impacts of several alternative bilateral and regional free trade agreements are simulated on household income and income inequality in Pakistan. The results show that trade liberalization does not always lead to a decline in income inequality in the short run. Trade agreements that do improve income equality, favor agriculture and often hinge on a decline in urban and non-farm household income. In the long run, changes in income equality are more positive, suggesting that efforts might best be applied towards improving the mobility of labor and capital.

Keywords: Income Inequality, trade liberalization, CGE modeling, Pakistan

JEL classification: F11, F17, O19, C68

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1 Introduction

In the present era of globalization, developing countries continue to seek policies that will enhance their economic growth and reduce poverty and income inequality. While the empirical evidence broadly supports a positive relationship between trade and growth, Winters, McCulloch and McKay (2004) note that there are occasions where growth is accompanied by worsening poverty (p. 80). The impact of trade on income inequality is even more ambiguous, considering the recent evidence from Latin American countries (Wood, 1997) contradicting earlier evidence, based on Asian economies, that trade narrows the gap between the wages of skilled and unskilled workers. Winters et al. (2004) conclude that the impact of trade on poverty is likely to depend on "the trade reform measures being undertaken, who the poor are and how they sustain themselves" (p. 107). Similarly, income inequality is also likely to depend on these factors, suggesting that we need to look more deeply into the role of trade on the economy. The purpose of this paper is to contribute to our understanding of the impact of trade agreements on household income and income inequality by examining what our trade models reveal about the impact of a trade agreement on income inequality.

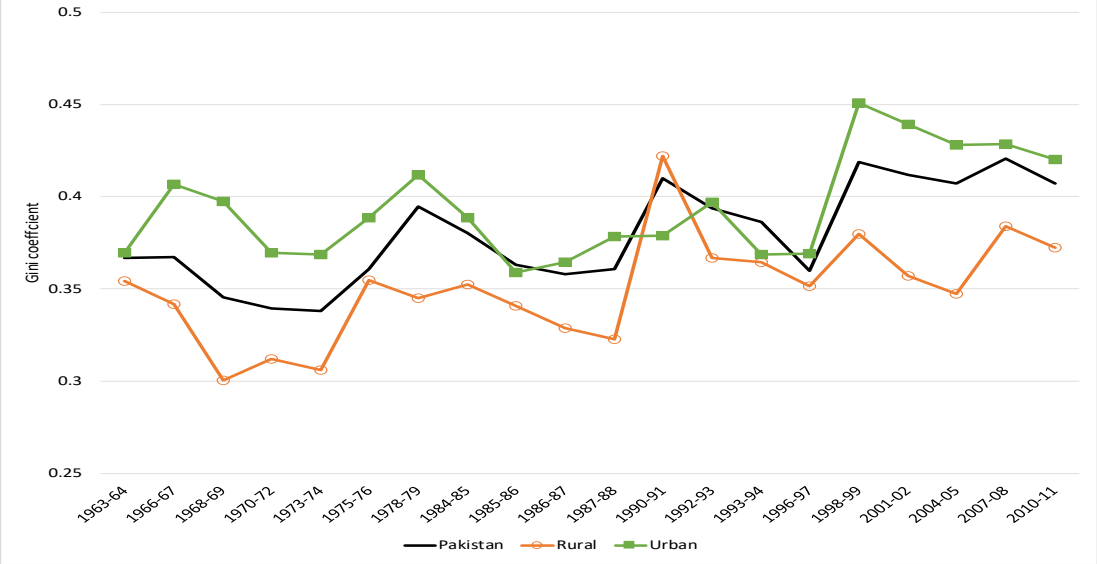
Pakistan has embraced trade liberalization as a means of increasing growth, following the trend of many developing countries. In 1988 the government of Pakistan implemented the first International Monetary Fund's (IMF) Structural Adjustment Program (SAP); and then in 1995, trade liberalization received a further boost with Pakistan's accession to the World Trade Organization (WTO). Pakistan has engaged in many bilateral and preferential trading agreements, including free trade agreements with China, Sri Lanka, Malaysia, and South Asia, and preferential trading arrangements with Iran, Indonesia, Mauritius and the developing 8 (PTA-D8)[4]. Pakistan also has a preferential arrangement with the European Union (EU), the European Generalized

[4] The 8 African and Asian developing countries include Pakistan, Egypt, Nigeria, Bangladesh, Turkey, Malaysia, Iran, and Indonesia.

System of Preferences (GSP) Plus, and is actively pursuing free trade agreements with Turkey, Thailand and Korea.

Income inequality in Pakistan is traditionally estimated from the Household Income and Expenditure Survey (HIES) and Pakistan Integrated Household Survey (PIHS). There are many widely used measures of income inequality, but in Pakistan the Lorenz curve and Gini coefficients are most common. Anwar (2005) used grouped household income data[5] to develop a consistent series of Gini coefficients in Pakistan over time, and Kemal (2006) examined the Gini coefficients for rural and urban workers[6]. Figure 1 illustrates that income inequality has increased marginally in Pakistan over the last 4 decades, despite modest economic growth and recent trade liberalization efforts.

Figure 1: Trends in Gini Coefficients in Pakistan



Source: Anwar (2005) and Jamal (2014)

[5] Grouped data assumes away the inequalities within each group.

[6] The urban labor force is more diversified in terms of skill, education, union membership, coverage by the minimum wage legislation and therefore the wage incomes are more unevenly distributed than in rural areas.

In this backdrop, this paper examines the impact of the various trade agreements on household income and income inequality in Pakistan, along with several other regional trade initiatives, using a global trade model with multiple households. The rest of the paper is organized as follows. Section 2 presents the methodological framework, data sets and measure of income inequality used in this study. Results are then discussed in Section 3, including a section on sensitivity analysis, followed by concluding remarks in Section 4.

2 Methodological Framework

The general equilibrium nature and reliance on real data of computable general equilibrium (CGE) models make them an ideal tool for analyzing the impact of trade policies on income distribution. In order to capture income distribution and income inequality a CGE model with multiple households is needed.

The MyGTAP model, developed by Walmsley and Minor (2013), is an extended version of the GTAP model (Hertel and Tsigas 1997)[7] which facilitates analysis of multiple households. The GTAP database (Aguiar, Narayanan, and McDougall, 2016), upon which the model is based, contains input-output tables for 141 countries/regions and 57 sectors, linked through bilateral trade data. Each country in the GTAP model has a regional household that collects all income (from factors of production and taxes) and then maximizes a Cobb Douglas utility by allocating this income across consumption (private and public) and savings. This regional household then determines whether to consume domestic or imported goods, and if imported chooses between the various sources of imports, using a series of nested constant elasticity of substitution (CES) functions. Producers then meet domestic and foreign (exports) demand for their goods by combining value added (8 factors of production) and intermediate inputs using a Leontief production function. Like final demand, firms may purchase domestic or foreign (imports)

[7] The model is solved using the software GEMPACK (Harrison and Pearson 1996).

intermediate inputs, again this is implemented through a series of nested CES functions. Markets are assumed to be perfectly competitive and prices adjust to ensure all markets are in equilibrium.

The MyGTAP model extensions include several new characteristics that are helpful in examining the behavior of multiple households using the representative household approach. First, it allows more flexibility in the treatment of government savings and spending by removing the regional household from the standard GTAP model and replacing it with a separate government and private household. Second, the model allows for additional factors of production and multiple private households; and third, the model also includes transfers between government and households and among household groups, as well as foreign aid, remittances and capital income. These additions allow for the assessment of policy impacts on different household groups.

While many of these additional features are standard in the MyGTAP framework, the inclusion of multiple households and additional factors requires additional data to be supplied from a social accounting matrix (SAM) or household survey. These data are incorporated into the augmented MyGTAP framework using a facility developed by Minor and Walmsley (2013). In this paper, we incorporate additional data on Pakistani households and factors of production in order to examine the impact of trade liberalization on these Pakistani households.

The MyGTAP model is then further extended in this paper to include income inequality, as measured by the Gini coefficient, so that we can examine the impact of trade liberalization on income inequality between the representative household groups.

2.1 Incorporating Multiple Household and Factors for Pakistan

To study the impact of trade liberalization on income inequality in Pakistan additional information on factors of production and the incomes and consumption patterns of Pakistani households must be incorporated into the GTAP database.

The GTAP 9a 2011 Database (Aguiar, Narayanan, and McDougall, 2016), aggregated from 140 to 30 regions and the number of commodities/sectors from 57 to 11, is used for this purpose. Data

for 16 household types (or representative households)[8] and 12 factors of production are incorporated into this database using data obtained from the 2010-11 Pakistani SAM (IFPRI 2016).[9] The framework, developed by Minor and Walmsley (2013), incorporates the household data into GTAP, ensuring that the household data are consistent with the original GTAP data.

The 16 types of household provided in the Pakistani SAM classify households by geographical zone[10] and type of settlement (i.e., rural or urban) (Table 1). Household types are based on land ownership and the size of the land owned. For instance, medium rural farms are greater than 12.5 acres, and small farms are those less than 12.5 acres. Landless farmers own no land, but may operate land on an owners behalf, thereby receiving rents from land (IFPRI, 2016).

The households in Table 1 are ordered by per capita income. Rural farm worker (quartile 1) and rural non-farm worker (quartile 1) households account for 14 percent of the population and have the lowest per capita incomes – when converted to US Dollars their annual per capita income is just US$ 240 and US$ 332 respectively. Urban (quartile 4) households have the highest per capita incomes, over US$ 4,423. An examination of the data reveals that 89 percent of the poor households (defined as earning less than $2 per day) are rural, split (roughly) equally between farm and non-farm households. The three richest household categories are primarily (65 percent) urban households, followed by rural non-farm households (24 percent).

[8] The approach relies on the 'household' being disaggregated into multiple household groups, with one 'representative' household representing the economic behavior of the whole household group. The MyGTAP model is based on this representative household approach, hence only the inequality between the defined groups can be calculated using each of the methods outlined above.

[9] The link between the sectors in the Pakistan SAM and GTAP is available from the authors.

[10] Quartile 1 represents the largest province in Pakistan, Punjab; while Quartile 234 represents Sindh, Khyber Pakhtunkhwa and Baluchistan provinces.

Table 1: Pakistan households identified in this study

Household Types[a]	Short code	Members per group (millions of people)	Total Income per group (PKR billions of rupees)	Income per capita (PKR rupees)	Income (US dollars per day)
Rural farm worker[b] (quartile 1)	hhd_rw1	6.3	131.0	20,682	0.66
Rural non-farm worker (quartile 1)[c]	hhd_rn1	12.6	359.8	28,571	0.91
Urban worker (quartile 1)	hhd_u1	5.9	229.6	38,720	1.23
Rural farm worker[b] (quartile 234)	hhd_rw234	8.3	352.0	42,379	1.35
Rural small farm owner[e] (quartile 1)	hhd_rs1	4.2	180.6	43,075	1.37
Rural farmer operating land[d] (quartile 1)	hhd_rl1	3.3	154.8	46,231	1.47
Rural non-farm worker (quartile 2)[b]	hhd_rn2	10.9	539.9	49,587	1.58
Urban worker (quartile 2)	hhd_u2	8.8	574.7	65,159	2.08
Rural non-farm worker[c] (quartile 3)	hhd_rn3	9.1	757.2	83,320	2.65
Rural small farm owner[e] (quartile 234)	hhd_rs234	15.6	1321.2	84,887	2.70
Rural medium-large farm ownerf (quartile 1)	hhd_rm1	0.2	18.3	88,147	2.81
Rural farmer operating land[d] (quartile 234)	hhd_rl234	7.3	724.1	99,296	3.16
Urban worker (quartile 3)	hhd_u3	11.5	1278.2	111,089	3.54
Rural non-farm worker[c] (quartile 4)	hhd_rn4	6.3	1309.5	207,343	6.61
Rural medium-large farm owner[f] (quartile 234)	hhd_rm234	2.9	643.4	220,813	7.03
Urban worker (quartile 4)	hhd_u4	17.1	7085.9	414,874	13.22

a. Quartiles also represent ecological zones. Quartile 1 represents the largest province in Pakistan, Punjab; while Quartile 234 represents Sindh, Khyber Pakhtunkhwa and Baluchistan provinces.

b. Rural non-farm workers work in rural areas, but in non-farm occupations.

c. Rural farm workers work on farms owned and operated by others.

d. Rural farmer operating land do not own land, but they operate farms for owners and hence earn returns on that land.

e. Small farms are between less than 12.5 acres.

f. Medium-large rural farms are greater than 12.5 acres

Source: Pakistan Social Accounting Matrix 2010-11, Household Income and Expenditure Survey (HIES) 2011.

In order to examine the impact of trade liberalization on these 16 household groups, the supply and use of 13 factors of production are distinguished (12 obtained from the SAM plus natural

resources, Table 2), with the Pakistani SAM providing data on the ownership of these factors by each household and their use by each sector, as well as consumption by each household.

Table 2: Share of factor in sectoral value added, percent

	Grain Crops	Vege & Fruit	Meat & Live-stock	Ext-ract.	Proc. Food	Textiles & Apparel	Light Mnfcs	Heavy Mnfcs	Util & Const	Transp & Comm	Other Serv-ices
Labor - farm worker	4	6	5	7	-	-	-	-	-	-	-
Livestock	-	-	66	-	-	-	-	-	-	-	-
Labor - non-farm low skilled	-	1	4	25	5	28	12	17	15	6	6
Land – small	18	36	-	-	-	-	-	-	-	-	-
Capital – agriculture	46	6	-	3	-	-	-	-	-	-	-
Labor - small farmer	14	23	13	1	-	-	-	-	-	-	-
Land – medium	8	8	-	-	-	-	-	-	-	-	-
Labor - medium farmer	8	6	8	-	-	-	-	-	-	-	-
Land – large	3	-	-	-	-	-	-	-	-	-	-
Labor - non-farm high skilled	-	1	1	2	2	11	5	7	11	11	36
Capital – informal	-	4	1	0	18	9	16	4	5	58	31
Capital – formal	-	8	2	32	75	51	67	71	68	25	27
Natural Resources	-	-	-	29	-	-	-	-	-	-	-
Total	100	100	100	100	100	100	100	100	100	100	100

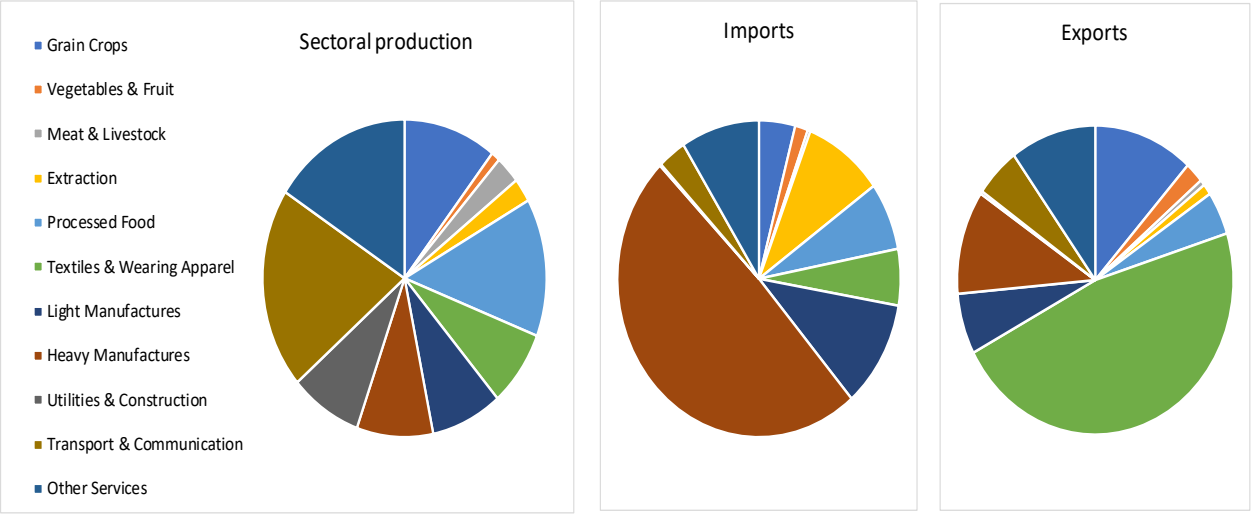
a. Labor - farm worker: work on farms owned by others or as operators of land owned by others.

Source: Pakistan SAM 2010-11 and GTAP Database (Aguiar, Narayanan, and McDougall 2016)

Table 2 depicts the allocation of these 12 factors of production to the 11 sectors used in this study. Of the 12 factors of production, 8 of them relate to agricultural production, including 5 types of labor, 3 types of land, 1 livestock and 3 types of capital. The table shows that most of the agricultural factors are used exclusively in the production of the three agricultural commodities (grain crops, vegetables & fruit, and meat & livestock), while the non-agricultural factors (skilled and low skilled non-farm labor, formal and informal capital) are used across all sectors, except grain crops. The final factor of production, natural resources, is used exclusively by the extraction sector.

Figure 2 illustrates that most (73 percent) of Pakistan's agricultural production is of grain crops, which also represent its most important agricultural export. According to Table 2, grain crops tend to be produced by larger farms, while vegetables & fruit and meat & livestock are produced by smaller farms. Textiles & wearing apparel are Pakistan's largest export, while heavy manufactures are the largest import; both of which are produced using low skilled non-farm labor and formal capital. This figure clearly shows the reliance of Pakistan on a few key export sectors. Processed food and transport & communications are also important for domestic production, although primarily for domestic demand rather than for export.

Figure 2: Sectoral production, imports and exports in Pakistan



Source: GTAP Database (Aguiar, Narayanan, and McDougall 2016)

It is assumed that a factor is mobile across the sectors that use the factor of production (Table 2), hence the 8 factors specific to agricultural production are mobile, but only across the agricultural

sectors. For this reason, the results should be considered short run, since farm workers, for instance, cannot find employment in non-agricultural sectors as non-farm low skilled workers. We therefore do not capture the possible movement of workers from rural to urban areas or from farm to non-farm work. This will be discussed further in the sensitivity analysis section.

The Pakistani SAM is also used to provide data on the ownership of these 13 factors by each of the 16 households. Table 3 shows the link between household income and their ownership of factors or the differences in the sources of income between rural farm, rural non-farm and urban households.

The table shows that farm households rely primarily on agricultural factors of production for their income, while non-farm and urban households rely on non-farm labor and their ownership of capital. Poorer farm households tend to rely on income from farm work and livestock, while richer farm households earn more income from the ownership of larger plots of land and agricultural capital. Urban or non-farm households, on the other hand, rely on more mobile factors of production – labor and capital – with poor households supplying low skilled non-farm, labor and informal capital, and richer households obtaining more of their income from the ownership of formal capital and their supply of skilled non-farm labor.

Combining these details with those in Table 2, therefore suggests that poorer farm household incomes are more reliant on the success of the smaller meat & livestock and vegetables & fruit sectors, while richer farm households depend on the success of the larger grain crops sector for their income. Urban or non-farm households, on the other hand, rely on manufactures and services, with extraction, and textiles & wearing apparel using the low skilled non-farm labor supplied by poorer households; and the other sectors using more skilled labor and formal capital, supplied by the richer urban and non-farm households. Understanding the links between households and sectors in the data will assist us later when we examine the impacts of Pakistan's trade liberalization efforts on income inequality. The relevant shares from the Pakistani SAM are then used to disaggregate factor use, and the income and consumption of each household using the facility developed by (Minor and Walmsley, 2013). These modifications are made in such a way that the total returns to factors and consumption are consistent with the original GTAP Database. By linking each of the 16 household's income to the 13 individual factors of production, the

differential impact of trade policy on sectoral production and factor use leads to differential impacts on household incomes that can then be used to identify the impact of trade policies on the incomes of poor households separately from those on rich households. Moreover, differences in consumption patterns between these households can also lead to differential impacts on household consumption, real incomes and welfare.

Table 3: Share of household income attributable to ownership of each factor of production for selected households, percent

	Rural farm				Rural non-farm		Urban	
	Farm worker[a]	**Small farmer[a]**	**Landless farmer[a]**	**Medium+ farmer[a]**	**Region 1[b]**	**Region 4[c]**	**Region 1[d]**	**Region 4[e]**
Labor - farm worker	23.7	-	-	-	-	-	1.5	0.2
Livestock	14.7	10.3	4.4	5.5	-	-	0.2	-
Labor - non-farm low skilled	20.7	3.1	5.8	0.5	38.9	23.0	28.2	2.1
Land – small	-	19.7	15.3	-	-	-	1.7	0.1
Capital – agriculture	-	27.6	30.8	37.3	-	-	1.3	0.5
Labor - small farmer	-	20.7	9.0	-	-	-	1.3	0.1
Land – medium	-	-	2.9	21.0	-	-	0.2	0.1
Labor - medium farmer	-	-	6.5	22.7	-	-	0.1	0.2
Land – large	-	-	2.6	7.3	-	-	-	-
Labor - non-farm high skilled	12.1	3.6	4.8	3.4	9.1	13.3	9.2	15.6
Capital – informal	28.5	14.7	17.6	1.9	51.6	61.6	55.7	21.3
Capital – formal	-	-	-	-	-	1.5	-	59.0
Natural resources[f]	0.3	0.3	0.4	0.3	0.5	0.6	0.5	0.8
Total	100	100	100	100	100	100	100	100

a. Includes quartiles 1-4
b. Non-farm Household with the lowest income
c. Non-farm Household with the highest income
d. Urban Household with the lowest income
e. Urban Household with the highest income
f. No data available, allocation based on capital ownership (agricultural, informal and formal)

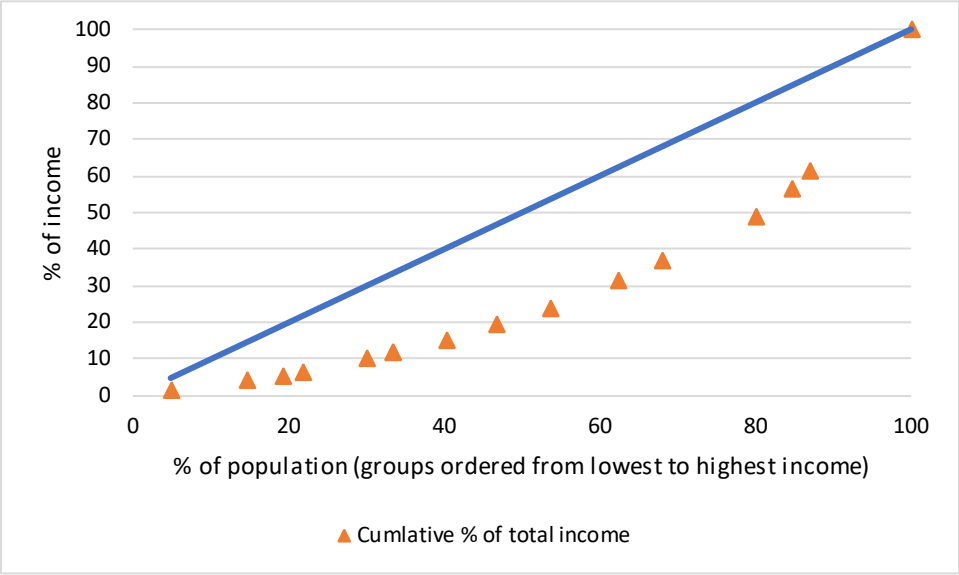
Source: Authors' calculations

2.2 Income Inequality Estimation

The MyGTAP model is further modified to incorporate income inequality. Inequality is the dispersion of the distribution of income or some other welfare indicator (Litchfield, 1999) and is related to a number of mathematical concepts, including dispersion, skewness, and variance. There are several ways to measure inequality, which itself arises from various social and physical phenomena. In this paper we use the Gini coefficient.

The Gini coefficient is the most commonly used measure of inequality. The base of the Gini coefficient is a cumulative frequency curve – the Lorenz curve – that compares the distribution of a specific variable (e.g. income, expenditure, etc.) with the uniform distribution that represents equality. In this case, the Lorenz curve is broken up into the 16 household groups, illustrated in Figure 3. We calculate the area between the share of actual income (shown by orange triangles in Figure 3) and the 45-degree line (blue line in figure 3), representing the equitable share of income based on the population shares of each of the 16 household groups. These differences are then aggregated across the household groups and measured relative to the total area under the 45-degree line, for the 16 household groups, to obtain the Gini coefficient before and after the trade liberalization.

Figure 3: Lorenz curve for 16 households in Pakistan



Source: Based on Pakistan SAM 2010-11 supplied by IFPRI (2016).

The coefficient value ranges between 0 and 1. A Gini value of 0 indicates perfect equality and 1 (or 100%) indicates maximum inequality. The closer a Gini coefficient is to one, the more unequal is the income distribution. The Gini index is the most frequently used inequality index. The reason for its popularity is that it is easy to compute the Gini index as a ratio of two areas in Lorenz curve diagrams. The disadvantage of the Gini index is that it only maps a number to the properties of a diagram, but the diagram itself is not based on any model of a distribution process. The "meaning" of the Gini index can therefore only be understood empirically. Additionally, the Gini does not capture the location in the distribution where the inequality occurs. Thus, two very different distributions of income can have the same Gini index.

According to Litchfield (1999) the Gini coefficient is a good measure of income inequality because it meets four of the five criteria set out by Litchfield: mean independence, population size independence[11], symmetry[12], and the Pigou-Dalton Transfer sensitivity[13].[14]

In order to understand the determinants of inequality, households are grouped according to certain characteristics, in this case the 16 groups provided in Table 1. At least part of the value of any given inequality measure is expected to reflect the fact that people have different levels of educational, gender, occupations, or live in certain regions. This part of the inequality measure is referred to as the "between-group" component of inequality. Inequality may also exist among households with the same characteristics, this is referred to as the "within-group" component of inequality. The Gini coefficient measured here represents between-group inequality.

2.3 Simulations and Assumptions

To illustrate the impact of trade liberalization on incomes and income inequality, we first investigate the impact of removing all remaining barriers in several existing (China and Malaysia)

[11] If income or populations size are doubled, the measure would not be changed.
[12] If individuals exchange their income still no change in the inequality measure.
[13] If Income transferred from rich to poor (or vice versa) would reduce (raise) income inequality.
[14] The fifth criteria, decomposability, is the ability to decompose inequality by population / income or in some other way in such a way that the total is the sum of the decomposed parts.

and potential (Turkey, Thailand and Korea) bilateral and regional, trade agreements on income inequality in Pakistan (Table 4). Pakistan is also involved in a regional initiative, the South Asia Free Trade Agreement (SAFTA)[15], and has been granted preferential access to the European Union through EU GSP Plus through which EU provides market access to developing countries, which we also investigate.

Table 4: List of trade agreements examined and the share of Pakistan's export and import with member countries (2015)

	Share of world GDP (%)	Share of Pakistan's imports (%)	Share of Pakistan's exports (%)
Pakistan's Existing Bilateral Free Trade Agreements			
China	14.9	26.8	8.7
Malaysia	0.4	0.45	0.84
Pakistan's Potential Free Trade Agreements			
Turkey	1.14	0.92	1.1
Thailand	0.54	1.9	0.54
Korea	1.87	1.5	1.3
Regional Free Trade Agreements			
SAFTA[a]	3.3	4.9	13.6
EU- GSP Plus			
EU-28	24.6	9.7	30.0
Mega Trade Agreements			
RCEP[b]	28.9	41	17.5
CPTPP[c]	14	9	6
TTIP[d]	46	14	45.5

a. Pakistan, India, Bangladesh, Sri Lanka, Maldives, Bhutan, Nepal and Afghanistan.

b. ASEAN and its 6 FTA Partners i.e. China, India, Korea, Japan, New Zealand and Australia.

c. Australia, Brunei, Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore and Vietnam. (Excludes the USA)

d. EU 28 and USA

Source: World Bank national accounts data (https://en.wikipedia.org/wiki/List_of_countries_by_GDP_(nominal)) and Trademap

We examine the impact of several large regional initiatives that Pakistan is not a member of, but is impacted by, to examine the impact of the proliferation of large agreements on income inequality

[15] Involving Pakistan, India, Bangladesh, Sri Lanka, Maldives, Bhutan, Nepal and Afghanistan

of non-member countries. These include Regional Comprehensive Economic Partnership (RCEP) and the Comprehensive and Progressive Agreement for Trans-pacific Partnership (CPTPP)[16] that operate within its region, and other large agreements, such as the Transatlantic Trade Investment Partnership (TTIP), that involve important trading partners. While the proposed RCEP, CPTPP and TTIP agreements are expected to facilitate trade among the member economies, other countries in the region that are left out of the agreements are likely to be adversely affected due to significant trade diversion. We then compare these results to the alternative scenario, where Pakistan is accepted as a member of the RCEP and CPTPP agreements. This allows us to examine both the impact of membership and non-membership in these mega trade deals on income inequality. Table 4 lists the various trade agreements examined.

As can be seen from Table 4 several large and small agreements, in terms of share of world GDP and share of Pakistan's exports and imports, are covered. It is assumed that all parties to the agreement remove all import duties on all imported commodities. The exception is the EU-GSP plus which is not bilateral, although the EU is assumed to remove tariffs on all commodities imported from Pakistan.[17] No changes are assumed to be made to non-tariff barriers (NTBs)[18] and

[16] Formerly known as the Transpacific Partnership which included the USA; this new agreement excludes the USA.

[17] In general, the GSP plus agreements over 66 percent of tariff lines, including textiles.

[18] In most of the agreements considered here there is unlikely to be significant liberalization of NTBs; only the larger mega trade agreements (RCEP, TPP and TTiP) are we likely to result in the removal of NTBs. Moreover, the mechanism through which NTBs impact an economy are less clear than tariffs. For instance, NTBs may raise a consumer's willingness to pay for goods that meet certain health and safety standards while also raising the costs of production costs (Walmsley and Minor, 2019). The impact of the removal of NTBs on income inequality is therefore likely to be more nuanced and modelling efforts in this area are still in their infancy. Rather than further complicate the current analysis, we have therefore chosen to concentrate on the implications of tariffs and leave the analysis of NTMs on income inequality for future research.

no account is taken of sensitive products.[19] Our aim is to examine the impact of agreements in general on income inequality in Pakistan, rather than provide a full analysis of the agreements.[20]

The standard GTAP closure is taken as the starting point for our analysis. This assumes that factors capital and labor are fully mobile between the sectors that use them,[21] whereas land and natural resources are assumed to be sluggish to move. Full employment is assumed, although we consider the consequences of relaxing this assumption in the sensitivity analysis section. Real government spending is assumed to fixed and there is no tax replacement; hence as tariff revenue falls, the government deficit (savings) rises (falls). We investigate the implications of tax replacement in the section on sensitivity analysis. Foreign income flows are assumed to rise or fall with factor prices in the country in which they are located, and investment is driven by the expected rate of return as in the standard GTAP model. Total savings depends on private household savings and the government budget deficit, as well as foreign savings. Hence the trade balance is endogenous; although again we examine the consequences of this assumption in the sensitivity analysis section.

3 Results

The analysis in this paper focusses on the impact of trade liberalization on sectoral production and income inequality in Pakistan.

[19] Some sensitivity analysis was performed to examine the impact of excluding the liberalization of tariffs on agriculture. The impacts of this are discussed in footnote 24.

[20] Those interested in an analysis of the impacts of these trade agreements on the Pakistan economy are refer to Khan (2015) and Khan, Zada and Mukhopadhyay (2018), Khan, Mehmood, Husnain and Zakarias (2018).

[21] As noted previously, not all capital and labor factors are used in all sectors, hence there is some limit to the mobility of capital and labor. We examine the implications of this in the sensitivity analysis section.

3.1 Macroeconomic Impact of Pakistan's trade agreements

Table 5 illustrates the impact of the various bilateral and regional trade agreements on the standard macroeconomic measures used in CGE models, namely real GDP and welfare[22]. The impact of Pakistan's involvement in trade agreements on Pakistan's real GDP is positive, with the exception of the extension of Pakistan's FTA with China.[23] Where Pakistan is excluded, RCEP, CPTPP and TTIP, Pakistan's real GDP also declines as expected. While the impact on real GDP and welfare are related, a positive change in real GDP does not necessarily imply a positive change in welfare. For Pakistan the negative welfare impacts are usually driven by a decline in the terms of trade, due to a decline in the export price of textiles and wearing apparel caused mostly by their own liberalization of tariffs.

The impact of the trade agreements on income inequality (Gini coefficient) is also illustrated in Table 5. The results show that the Gini coefficient, and hence inequality, does not always fall as a result of the liberalization of tariffs, with several bilateral FTAs and Pakistan's admission into GSP+ and CPTPP causing income inequality to increase. Neither the changes in real GDP nor welfare appear to be a good indicator of the potential impact of a trade agreement on income inequality.

In the case of Pakistan's extension of its current bilateral trade agreement with Malaysia, the Gini coefficient decreases, indicating that inequality falls as a result of this agreement. The result for the trade agreement with China is positive and small, suggesting that income inequality may rise slightly. In the three potential trade agreements with Turkey, Thailand and Korea, only the trade

[22] In GTAP, welfare is a measured in terms of equivalent variation (EV). This measure captures improvements in allocative efficiency due to the removal of trade taxes, increased trade and the reallocation of resources; as well as any gains or losses in the country's terms of trade. When unemployment is assumed it also captures welfare gains from increased employment of workers.

[23] The negative impact on real GDP of the China-Pakistan agreement stems from the fact that all countries have some market power in GTAP and hence optimal tariffs are present for all countries. This is especially true for the Pakistan-China free trade agreement where tariffs have been already been significantly reduced.

agreement with Turkey results in a decline in income inequality. Pakistan's regional trade agreement with six other countries in South Asia, the South Asia Free Trade Agreement (SAFTA) also results in a decrease in income inequality.

Table 5: Impact of trade liberalization on Pakistan's real GDP, welfare and income inequality

	I Real GDP (% change)	II Welfare (US$ Millions)	III Gini (% change)
Pakistan Bilateral Free Trade Agreements			
China	-0.039	-459	0.007
Malaysia	0.004	-25	-0.312
Pakistan Potential Trade Agreements			
Turkey	0.010	131	-0.128
Thailand	0.001	-182	0.075
Korea	0.014	224	0.068
Regional Free Trade Agreements			
SAFTA	0.041	487	-0.124
GSP-Plus			
EU-28	0.089	840	0.147
Other			
All above agreements simultaneously	0.165	948	-0.231
Mega Trade Agreements			
RCEP	-0.057	-406	-0.101
RCEP + Pakistan	0.261	-736	-0.124
CPTPP	-0.009	-65	-0.031
CPTPP + Pakistan	0.167	-140	0.016
TTIP	-0.003	-23	-0.008

Source: Authors' calculations

One surprising result in Table 5 is the considerable rise in income inequality resulting from the EU-GSP plus preferences, despite the rise in real GDP and welfare. The large increase in income inequality resulting from the GSP plus program is particularly concerning, given the aim of the program is to assist developing countries that meet certain labor and environmental standards. Since the EU's GSP plus program does not require Pakistan to reduce its tariffs on EU goods, it raises the question of whether the impact on income inequality depends on whether it is Pakistan or the partner country that is reducing tariffs. Decomposition of the results from all the trade agreements into those due to Pakistan's liberalization efforts and the partners' liberalization

efforts, however, did not indicate that the impact on inequality depended on which party reduced its tariffs.

Finally, the larger regional agreements to which Pakistan is not a member, RCEP, CPTPP and TTIP, tend to reduce income inequality in Pakistan, albeit they also reduce real GDP, suggesting that these agreements hurt richer households in Pakistan relatively more than poorer ones as members trade is diverted from Pakistan to members of the agreements. Pakistan's inclusion in the two large regional agreements (RCEP and CPTPP) raises real GDP, although only its inclusion in RCEP reduces income inequality relative to its non-inclusion.

Like the econometric evidence, our trade models also fail to predict a positive relationship between trade liberalization and income inequality. The impact of trade liberalization on real GDP and welfare depends on macro-economic factors, while the impact on income inequality depends on micro-economic factors. In the case of real GDP, allocative efficiency gains and changes in aggregate production drive the changes, while the change in welfare depends on these allocative efficiency gains, as well as the terms of trade effects. The impact of trade liberalization on income inequality, on the other hand, depends on the relative changes in incomes of the 16 household groups within Pakistan and the wages of the factors owned by these households, which in turn depend on the gains and losses of the particular sectors that use them. Since trade theory tells us there are winners and losers from trade, it is not surprising that the trade liberalization can raise or lower income inequality. Moreover, income inequality is a relative measure which means that a reduction in income inequality may occur with a rise or fall in incomes and poverty in general. To explore what drives these changes in income inequality, we begin by looking at the sectoral gains and losses.

3.2 Sectoral effects

Table 6 shows the impact of the agreements on sectoral production. The agreements have been re-ordered according to the change in the Gini coefficient from lowest (i.e., falls in income inequality) to highest (i.e., rises in income inequality) change. Those agreements that lower income inequality do so primarily by raising the production of agriculture. In the case of the extension of the Pakistan-Malaysia and the new Pakistan-Turkey agreements, this increase in agricultural production is the result of an increase in the production of grain crops – the largest agricultural sector (Figure 2).

While improvements in grain crops primarily benefit the richer rural households, poorer farm workers also benefit as new farm worker jobs in grain crops become available, offsetting any losses they may have made from the declines in vegetables & fruit production or meat & livestock. In the case of SAFTA, the improvement in agriculture stems from the increase in production of vegetables & fruit, a commodity produced by smaller (poorer) farms, and which is subject to high tariffs in the rest of South Asia.

Meat & livestock is also particularly important because many poor households' own livestock and hence derive a share of their incomes from livestock, which impacts them more than richer households. Moreover, livestock is sector specific and hence returns rise or fall significantly with the success or failure of the meat & livestock sector. Loses in the returns to livestock can offset the gains to poor households from higher wages in grain crops or vegetables & fruit, lowering their incomes (e.g., the agreements with China, Thailand and Korea) and raising income inequality.

While the rural farm households gain with increased production of agriculture, poor households can also gain from increased production of textiles & wearing apparel – Pakistan's largest export commodity, which is produced primarily by rural non-farm and urban unskilled workers. This occurs even when we see declines in the production of light manufactures overall (e.g., Pakistan-Malaysia agreement, Table 6). The reason for this is that even though the production of textiles & wearing apparel, processed food and other light manufactures all require the use of unskilled workers and capital. Textile & wearing apparel use unskilled workers more intensely, while processed food and other light manufactures use capital more intensely (Table 2). Hence an increase in production of textiles & wearing apparel raises the wages of poorer unskilled workers more, while a decrease in production of processed food and other light manufactures reduces the returns to capital owned by richer households further – leading to an overall improvement in income equality as the incomes of the poorer households rise and the incomes of the richer households fall.

The impact of the decline in services is similar to that of processed food and other light manufactures, since services also use a higher proportion of capital to unskilled labor. The non-farm or urban factors used by these manufacturing and service sectors are also more mobile across

these sectors, hence returns are likely to increase or decrease in line with the sectors that use them most intensely in their production.

Table 6: Sectoral impacts of Pakistan's trade liberalization, percent (agreements ordered according to the changes in income inequality, followed by total)

	Pakistan-Malaysia	Pakistan-Turkey	SAFTA	Pakistan-China	Pakistan-Korea	Pakistan-Thailand	EU GSP+		All FTAs
Agriculture	**0.02**	**0.01**	**0.02**	**-0.05**	**0.00**	**-0.06**	**-0.01**		**-0.07**
Grain Crops	0.11	0.09	-0.24	0.09	0.04	0.08	0.07		0.19
Vegetables & Fruit	-0.61	-0.41	3.50	0.26	-0.09	0.19	-0.27		2.49
Meat & Livestock	-0.10	-0.14	-0.23	-0.69	-0.11	-0.66	-0.20		-1.94
Extraction	0.21	-0.13	-0.66	0.10	-0.41	0.19	-1.24		-1.82
Light Manufactures	**-0.28**	**0.00**	**0.21**	**-0.29**	**0.15**	**-0.39**	**0.82**		**0.25**
Processed Food	-0.91	0.01	0.30	0.14	0.97	-0.13	0.01		0.31
Textiles & Wearing Apparel	0.55	0.12	0.61	0.54	-0.89	0.70	3.65		5.08
Light Manufactures	0.02	-0.15	-0.34	-1.81	-0.27	-1.89	-0.49		-4.48
Heavy Manufactures	0.55	-0.07	-0.59	-1.24	-0.84	0.24	-1.70		-3.55
Utilities & Construction	0.24	0.18	0.48	0.79	0.29	0.33	0.61		2.75
Transport & Communication	0.04	0.00	-0.01	0.04	0.00	0.04	-0.10		0.00
Other Services	0.25	-0.02	-0.18	0.08	-0.34	0.12	0.05		-0.01

Source: Authors' calculations

It is worth noting however, that while an increase in production of textiles & wearing does help poorer non-farm and urban households, it may not be sufficient to lower income inequality. This is the case in the EU-GSP plus where income inequality rises despite a considerable increase in production of textiles & wearing apparel. In all cases where income equality rose, agricultural production also rose, highlighting the importance of agriculture to income inequality.

The gains and losses in sectoral production stem from the tariff reductions that take place as part of the agreements. Both Malaysia and Turkey have high tariffs on grain crops from Pakistan and

hence the removal results in an increase in imports from Pakistan and hence Pakistani production. India (SAFTA), on the other hand, has very high tariffs on vegetables & fruit and to a lesser extent grains crops from Pakistan. The decline in meat & livestock production in Pakistan stems from the high tariffs imposed by Pakistan on meat & livestock from Malaysia, Thailand and China. The decline in tariffs results in an increase in imports and a decline in domestic production of meat & livestock. Malaysia also has high tariffs on Pakistani textiles & wearing apparel, and many countries (including Korea, India, EU, Turkey and Malaysia) have high tariffs on Pakistani processed food. Pakistan also has high tariffs on processed food; hence results vary depending on the relative size of the tariffs.

As we noted previously, the non-agricultural factors of production are generally used in the production of a wider range of goods and services than the agricultural factors of production, making them more mobile across sectors. Moreover, the manufacturing and services industries can also substitute more easily between these factors as the elasticities of substitution tend to be higher. For these reasons, returns to the agricultural-based factors of production can rise or fall quite dramatically with changes in agricultural production, while factors used in manufactures and services are more mobile and their returns less volatile. For this reason, the incomes of non-farm and urban households tend to increase or decrease together, regardless of whether the household is rich or poor. The main drivers of changes in inequality therefore tend to depend on how a trade agreement impacts agriculture.[24]

[24] The importance of the liberalization of agriculture was further reiterated during the sensitivity analysis. In this case tariffs on agricultural products were assumed not to be eliminated, due to the likely existence of exemptions on sensitive agricultural products. When agriculture was excluded from the agreements, almost all of the gains in income equality, achieved from the liberalization of trade under the various trade agreements examined, were reversed and income inequality rose. Only in the Pakistan-Malaysia free trade agreement, did income inequality fall, even when agriculture was excluded as a sensitive product, albeit the fall was significantly less than when agriculture was included in the agreement.

These results are supported by the impact of the various FTAs on the real income of 16 different types of households shown in Table 7.

Table 7: Impact on real incomes in Pakistan (agreements ordered according to the changes in income inequality, followed by total)

	Pakistan-Malaysia	Pakistan-Turkey	SAFTA	Pakistan-China	Pakistan-Korea	Pakistan-Thailand	EU GSP+		All FTAs
Rural farm worker (quartile 1)	0.70	0.07	0.33	-0.12	-0.15	-0.54	-0.40		-0.04
Rural non-farm (quartile 1)	-0.37	-0.31	-0.03	0.36	0.12	0.21	0.64		0.69
Urban (quartile 1)	0.00	-0.12	0.18	0.51	0.13	0.22	0.54		1.44
Rural farm worker (quartile 234)	0.42	-0.03	0.21	-0.17	-0.10	-0.55	-0.14		-0.23
Rural small farmer (quartile 1)	2.08	0.96	1.41	0.79	0.10	-0.13	-0.23		4.57
Rural landless farmer (quartile 1)	2.41	1.16	1.50	1.16	0.16	0.16	-0.16		5.85
Rural non-farm (quartile 2)	-0.39	-0.30	-0.01	0.42	0.14	0.23	0.66		0.82
Urban (quartile 2)	-0.12	-0.16	0.12	0.52	0.15	0.24	0.59		1.35
Rural non-farm (quartile 3)	-0.35	-0.26	0.04	0.49	0.18	0.26	0.67		1.08
Rural small farmer (quartile 234)	2.18	1.05	1.43	0.86	0.11	-0.13	-0.25		4.82
Rural medium+ farmer (quartile 1)	2.99	1.51	1.20	1.25	0.18	0.08	-0.28		6.25
Rural landless farmer (quartile 234)	2.19	1.09	1.17	1.12	0.17	0.15	-0.08		5.32
Urban (quartile 3)	-0.18	-0.16	0.13	0.55	0.19	0.25	0.63		1.41
Rural non-farm (quartile 4)	-0.34	-0.17	0.17	0.66	0.28	0.36	0.71		1.64
Rural medium+ farmer (quartile 234)	3.02	1.58	1.17	1.39	0.20	0.17	-0.25		6.60
Urban (quartile 4)	-0.25	-0.12	0.21	0.65	0.30	0.30	0.67		1.72

	Pakistan-Malaysia	Pakistan-Turkey	SAFTA	Pakistan-China	Pakistan-Korea	Pakistan-Thailand	EU GSP+		All FTAs
Average income	0.27	0.10	0.39	0.67	0.22	0.21	0.47		2.23

Source: Authors' calculations

Agreements that lead to a decrease in income inequality (Pakistan-Malaysia, Pakistan-Turkey and SAFTA) generally raise the real incomes of the rural farm households, relative to the non-farm and urban households. In the Pakistan-Malaysia and Pakistan-Turkey agreements, the incomes of the richer rural farm households rise faster than those of the poorer rural farm households, but inequality still falls due to the decline in incomes of the rich and poor non-farm and urban households. Most of the other agreements create gains for the urban and rural non-farm households, while farm worker households lose, causing inequality to rise.

Only in the SAFTA agreement do incomes rise across most rural (farm and non-farm) and urban households (Table 7), with the incomes of rural farm households relatively more, causing inequality to fall. The FTA with China also tends to raise incomes (Table 7), although the rural farm workers experience declines, causing income inequality to rise. In Table 5 we noted that the EU-GSP plus agreement raised income inequality considerably. Here in Table 7 we see that this agreement stands in stark contrast to the Pakistan-Malaysia and Pakistan-Turkey agreements – the incomes of non-farm and urban households rise, while those of farm households fall – reiterating our conclusion that income inequality depends crucially on the impact of the agreement on the incomes of farm households.

3.3 Mega agreements

As indicated above, RCEP and CPTPP lower income inequality in Pakistan despite Pakistan's exclusion from the agreements. This is due to the small gains in agricultural production, which benefit the rural poor; and the losses in processed food sector, which result in lower incomes for richer urban households. Pakistan's inclusion in RCEP lowers inequality further, although its inclusion in CPTPP raises income inequality. This is the case, even though the sectoral impacts of the two agreements are for many sectors quite similar. As outlined above the reason for the rise in inequality under the CPTPP relative to RCEP is due to the smaller gain made by the vegetables & fruit sector under the CPTPP. The reason for this difference is that RCEP includes India, a fellow member of SAFTA, which applies a large 24 percent tariff on Pakistan's vegetables & fruit. As

under SAFTA, RCEP also produces gains to the vegetables & fruit sector, which, as mentioned above, uses factors that tend to be owned by poor rural farm households. The CPTPP does not include India, and therefore does not result in the same gains to vegetables & fruit.

3.4 Sensitivity analysis

In this section we conduct sensitivity analysis to examine the impact of some of the key modeling assumptions on the inequality results. The base model and closure discussed above are analogous to a sector specific trade model; in the alternative assumptions we investigate the short run assumption of unemployment, as well as long run assumptions which allow these factors to become more mobile. The following alternative assumptions are considered:

I. Unemployment: The unemployment rate in Pakistan, while improving, was reported to be 6 percent in 2011 (Economic Survey of Pakistan, (2015). With this in mind, we test the assumption of unemployment of unskilled labor by fixing the real wage of unskilled workers, namely farm workers and low skilled non-farm workers.
II. Trade Balance: It is generally argued that developing countries, such as Pakistan, do not have easy access to foreign capital and hence any increases in investment will not occur due to lack of funding through domestic savings. In order to examine the impact of this, we assume a fixed trade balance and that investment will be limited.
III. Tax replacement: In the base closure we have assumed that the loss of tariff revenue does not reduce government spending, causing the government deficit to increase (or surplus to decrease). In this scenario we argue that this position is not sustainable and hence we introduce a consumption tax to replace the lost revenue.
IV. Increased mobility of factors: In the base model and closure, there are a number of factors that are specific to meat & livestock or to agriculture in general. In this case we allow for greater mobility of factors across sectors by merging the factors that are most likely to be

substitutable over time.[25] In this scenario we also assume that lost tariff revenue is replace by a consumption tax, as in alternative scenario 3.

V. Capital accumulation: In this scenario we assume that there is increased mobility of factors and tax replacement (from scenarios 3 and 4), as well as the possibility for capital accumulation. This is achieve using the long run closures developed in Francois and McDonald (1996) and Walmsley (1998).

The impact of the alternative assumptions on the income inequality results under the different trade liberalization scenarios are provided in Table 8. We can see from Table 8 that in the long run, with capital accumulation and increased mobility of the factors across sectors, all of the trade liberalization scenarios result in decreases in the Gini coefficient and hence in income inequality. The three agreements (with Malaysia, Turkey and SAFTA), that reduced inequality in the short run, do not decrease inequality as significantly in the long run, as the short run results suggested, although inequality still declines. Moreover, long run gains in income equality appear to be greatest in agreements with more, larger, trading partners. It is also worth noting that in the long run, the fall in income inequality does not generally occur at the expense of the non-farm and urban household incomes. In most of the agreements, there is a rise in incomes across all households, although rural farm households still experience the larger gains. The exceptions to this are the free trade agreements with Malaysia, China and Thailand where the incomes of non-farm and urban households continue to decline in absolute terms.

Somewhat interesting is that the restriction of foreign savings to fund investment, i.e., fixed trade balance scenario (column II, Table 8), tends to decrease inequality in most scenarios. This is due

[25] The following aggregations are made: 1) farm workers and small farm owners are merged with low skilled non-farm labor allowing workers to move between agricultural and non-agricultural occupations in rural areas; 2) medium farmers are assumed to be more skilled and therefore merged with skilled non-farm labor in rural areas; 3) small farm land is combined with larger plots reflecting the fact that farms may amalgamate; and 4) livestock and agricultural capital are merged with formal or informal capital reflecting the idea that savings may be invested outside of agriculture. This is analogous to the Heckscher-Ohlin trade model where factors of production are more mobile.

to the fact that very few poor households benefit directly from the increase in demand for capital goods, primarily heavy manufactures and utilities & construction, and hence their income rises further when investment is restricted. The long run results, on the other hand, show that poor households do benefit significantly from the resulting accumulation of capital that the new investment creates (column V, Table 8).

Table 8: Impacts of Pakistan's trade liberalization on income inequality under alternative assumptions, percent

	Base Case (standard closure)	Alternative assumption scenarios				
		I	II	III	IV	V
		Unemployment	Fixed Trade balance	Tax replacement	Mobile factors	Capital accumulation
Pakistan Bilateral Free Trade Agreements						
China	0.007	-0.002	-0.183	0.028	-0.030	-0.064
Malaysia	-0.312	-0.265	-0.363	-0.291	-0.086	-0.075
Pakistan Potential Trade Agreements						
Turkey	-0.128	-0.105	-0.138	-0.118	-0.035	-0.047
Thailand	0.075	0.059	0.006	0.079	-0.014	-0.030
Korea	0.068	0.058	0.035	0.070	0.019	-0.014
Regional Free Trade Agreements						
SAFTA	-0.124	-0.112	-0.158	-0.049	-0.035	-0.072
GSP-Plus						
EU-28	0.147	0.092	0.122	0.138	0.023	-0.062
Other						
All above agreements simultaneously	-0.231	-0.244	-0.587	-0.127	-0.144	-0.331
Mega Trade Agreements						
RCEP	-0.101	-0.084	-0.066	-0.057	-0.012	-0.004
RCEP + Pakistan	-0.124	-0.133	-0.499	-0.044	-0.151	-0.253
CPTPP	-0.031	-0.024	-0.025	-0.024	-0.006	-0.005
CPTPP + Pakistan	0.016	-0.012	-0.210	0.044	-0.110	-0.165
TTIP	-0.008	0.131	-0.001	-0.005	-0.001	0.005

Source: Authors' calculations

The impact of unemployment on income inequality is mixed. In three of the agreements where income inequality fell, the trade agreements with Malaysia, Turkey and SAFTA, the fall in income inequality is smaller as a result of unemployment, while in all other trade agreements, income inequality fell relative to the base case. In the former cases employment of farm workers increases,

but employment of low skilled non-farm workers falls. Since there are more low skilled non-farm workers, unemployment has a greater impact on this group causing the incomes of the poor to fall and inequality to rise. Thus, agreements that experienced a fall in income inequality due to wages of farm workers rising and those of non-farm and urban workers falling, now experience a reversal under the assumption of unemployment, as the importance of non-farm workers to income inequality rises.

Tax replacement does not seem to have a significant impact on income inequality according to Table 8 (column III), although there is some indication that income inequality rises slightly relative to the base case. This is not too surprising given that the consumption tax used to replace import duties is placed equally on domestic and imported consumer goods, purchased by all households; tariffs on the other hand affect only imports, which are primarily purchased by richer households.

Greater mobility of factors also has mixed results (column IV, Table 8). In general, increased mobility allows the gains and the loses to be shared across farm and non-farm workers, reducing the absolute size of the gains or losses to poor farm workers and hence limiting any changes (positive or negative) in income inequality. In the three agreements (with Malaysia, Turkey and SAFTA), where we saw decreases in income inequality, the increase in mobility caused the gains made to the returns on agricultural factors to dissipate across other factors as mobility increases, thereby reducing the gains in income made by poor rural households. In other agreements with China, Thailand, Korea and the EU, where the gains were greater in textiles & wearing apparel and processed food, the additional mobility of factors allowed farm workers to move out of agriculture towards the other sectors to obtain greater returns, raising the incomes of the poor rural households and reducing income inequality. In the two mega agreements, RCEP and CPTPP extended to include Pakistan, income inequality fell significantly with greater factor mobility, also due to the gains in textiles & wearing apparel obtained under both these agreements. While not all agreements resulted in decreased income inequality, there were more cases where agreements did cause inequality to fall. In those agreements where income inequality did fall, it was due to farm workers being able to more away from agriculture into other sectors to capture higher wages.

Finally, in the long run, when investment added to the availability of capital (V, Table 8) in Pakistan, this raised wages and lowered returns to capital. Since poorer households rely more on wages (relative to capital rentals), than richer households, income inequality fell in all scenarios.

Turning to the relationship between GDP and inequality, the base simulation we found no relationship between the impact of a trade agreement on real GDP or welfare and income inequality. In the long run, with increased mobility (scenario IV), we find a negative relationship between real GDP and income inequality, and to a less extent between welfare and income inequality. This relationship between real GDP and income inequality impacts is even stronger when capital accumulation (scenario V) is considered.

4 Conclusion

In this paper, a global economic trade model using detailed information on Pakistan's labor and household groups is used undertake a comprehensive analysis of the impact of the various trade agreements on income inequality in Pakistan. The study finds that trade liberalization does not always lead to a reduction in income inequality in the short run. Moreover, no relationship was found between the estimated gains in real GDP or welfare and income inequality, in the short run.

Changes in income inequality were found to be primarily driven by increases in the income of poor rural farm households, who are dependent on gains in agricultural production. In most cases it was grain crops, the largest agricultural export, that rose; while in the SAFTA agreement it was the production of vegetables & fruit. In all cases the liberalization of trade led to a decline in returns to livestock, a specific factor in the production of meat & livestock that was primarily owned by poor rural households. Where these losses in livestock were small, they could be offset by gains in the wages of farm workers, due to increased production of grain crops or vegetables & fruit. In other agreements, such as those with China, Thailand and Korea, this increase in the production of grain crops or vegetables & fruit did not occur, and hence income inequality rose.

In most cases, the improvement in income equality, driven by the rise in incomes of the poor (farm) households, is also assisted by a decline in the incomes of the rich (urban) households. These declines are the result of decreased production of processed food or services – the more urban- and

capital-intensive sectors. This indicates that the improvement in income equality may not be associated with economic growth, but rather the slowdown of certain sectors.

The pattern projected between the income inequality and agricultural production is due to the lack of mobility of rural and agricultural factors, which causes returns to agricultural factors to rise and fall more significantly, as agricultural production rises or falls. It is revealed that greater mobility dissipates the short run gains (or losses) in income equality as the gains and losses get distributed across more factors and households. In the case of the Malaysia-Pakistan, Turkey-Pakistan and SAFTA agreements, this means that the gains obtained by poor agricultural workers fall, as they are shared with non-rural workers, causing income inequality to rise relative to its short run change. On the other hand, the sharing of gains and losses, in the other agreements, leads to a rise in the incomes of agricultural factors, causing income inequality to fall relative to its short run change.

In the long run, the investment in new capital stock, combined with the increased mobility, causes income inequality to fall in all trade liberalization scenarios and the relationship between trade liberalization, growth in real GDP and declining income inequality becomes more predictable. The impact of unemployment, tax replacement and fixing the trade balance on income inequality was also investigated and found to be small. As in the case of greater mobility, unemployment limits the improvements in income equality obtained under the trade agreements with Malaysia, Turkey and SAFTA as unemployment of the unskilled non-farm and urban workers rises. In contrast, income inequality falls in the other agreements due to lower unemployment. Tax replacement led to an increase in income inequality, while fixing the trade balance lowered it.

In summary, the results suggest that trade liberalization may not reduce income inequality in the short run, except when associated with a reallocation of production back towards agriculture in the Pakistani economy. The reallocation of production towards agriculture, that drives the short run gains in income equality in Pakistan, are clearly linked to “the trade reform measures being undertaken, who the poor are and how they sustain themselves” (Winters et al. (2004), p.140) in Pakistan – which may differ between countries. On the other hand, we also found that in the long run, trade liberalization did lead to improvements in income equality, which were associated with increased growth more generally. This suggests that policy makers efforts might be better placed implementing policies that increase the mobility of poor farm household’s labor and capital assets.

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