

Computational Analysis of China-Pakistan FTA in a GTAP Modeling Framework: A Disaggregated Approach

Ashfaq Khan*, Atta ur Rahman†

Abstract

This study attempts to quantify the economy-wide and disaggregated sectoral effects of China-Pakistan Free Trade Agreement. The study used global trade analysis project (GTAP) computable general equilibrium (CGE) model to conduct a numerical simulation. The simulation results reveal that China-Pakistan FTA is mutually beneficial to both the agreement members. The first important finding is that in terms of macroeconomic, trade and welfare indicators China is likely more benefited than Pakistan but the magnitude of Pakistan's regional exports and imports growth is higher than China. The second major finding is that at a disaggregated sector level, Pakistan may experience higher growth in sectoral output and its exports to China in all the capital, labor and land and resource intensive sectors probably improve, whereas, China may experience higher growth in sectoral imports from Pakistan.

Key Words: China-Pakistan FTA, Disaggregated Analysis, Computable General Equilibrium, GTAP Model

Introduction

Free trade agreement (FTA) is mostly considered as an effective international trade policy reform that nations negotiate and implement to boost up their economies. Under the free trade agreement, member nations eliminate or reduce trade barriers amongst them. And such concessions when granted to the member states of the FTAs assist the domestic firms of the exporting country to get a larger access to foreign markets, thus nations can enhance their economic performance viz. improvement in their trade indicators, given that the FTAs are potentially utilized. Likewise, Reduction or elimination of trade restrictions on imports consequently generate competitive environment for domestic firms in the importing country and induces domestic firms to enhance their efficiency level to compete with the potential foreign competitors by producing quality products. On contrary, high tariffs not only deter domestic firms to get an access to export markets thereby deteriorating export growth, but also

* PhD Scholar, Institute of Management Sciences, Peshawar.

Email: ashfaqsikandri@gmail.com

† Associate Professor, Institute of Management Sciences, Peshawar.

Email: attaurrahman@imsciences.edu.pk

support inefficient firms to survive thus impeding the incentives for domestic firms to become competitive. However, the benefits associated with the implementation of FTAs are contingent upon some pre-conditions and policies of the state, and in the absence of such related factors the costs of FTA may outweigh its benefits. FTAs have shown a growing trend during the last two decades. According to world trade organization (WTO), as of January 17, 2020, 698 regional trade agreements have been notified to WTO.

China-Pakistan Trade Relations

China is one of the most important and strategic trade partners of Pakistan and the trade relations between the two partners have been strengthening overtime. As the trade statistics reveal China is the second largest destination for Pakistan's exports with the current exports share of 8% out of the total exports of Pakistan, in the same lines china is the largest source of Pakistan's imports with the current share of 24% out the total imports,(Finance Division of Pakistan, 2019). China-Pakistan signed an FTA on trade in goods on November 24, 2006 and this FTA was implemented on July 1, 2007. FTA on Trade in Services was concluded and signed on February 21, 2009 and in effect from October 10, 2009. The China-Pakistan FTA includes more than 7000 tariff lines of (8 digit level of HS Code). Both sides completed the negotiations rounds of Phase-II of the FTA and has been implemented from January 2, 2020.

Review of Literature

Change in Pakistan's trade policy stance toward free trade agreements during the previous decade has motivated researchers and has created interest amongst them to conduct research in the area of economy-wide effects of Pakistan's FTAs with trade partners. This section reviews the literature related to Pakistan's bilateral FTAs.

In a study which set out to quantify the impact of Pakistan-china free trade agreement (FTA) on the member states, Hussain, Shah, and Zulfiquar (2017) found that china receives benefits in terms of real gross domestic product (GDP), welfare and trade balance, whereas Pakistan's real GDP, terms of trade and welfare may decline.

In this study authors use global trade analysis project (GTAP) model developed by (Hertel, 1997) with the updated version 9 of the GTAP database and conducted the analysis by using 2011 as a reference

year. In this useful study, authors highlight the export potential sectors that Pakistan can exploit to improve its trade balance with china. But, the study would have been more relevant if the authors had analyzed the effect of China Pakistan economic corridor (CPEC-led) connectivity on trade and economic indicators of Pakistan and China.

(Pohit & Saini, 2015) analyzed the potential economic benefits of India-Pakistan trade liberalization along with improvement in logistic services involved in trade between the two partners. Authors concluded that India-Pakistan FTA would benefit the members significantly if the two trade partners enter into the agreement, given the enhancement in the transportation services between these two nations. This study signifies the importance of FTA along with trade related infrastructure development between the two strategic trade partners, Pakistan and India.

(Syed, Shaikh, & Ahmadani, 2016) examined the prospective economic implications of Pakistan-India trade liberalization agreement and showed that agreement has the potential economic benefits to both trade partners as revealed by the improvement in GDP, trade volume, and welfare gain. However, the scope of this study was narrow as it focused on trade liberalization only in textile sector between India and Pakistan, whereas, the authors do not include other trading sectors in their analysis. Furthermore, the GTAP simulation of this study are based on reference year 2004, this has an outdated data sources, representing the economies of these states, which become irrelevant with respect to current economic situation and the implications of the research may be inapplicable.

(Zada & Khan, 2017) studied Pakistan's existing FTAs with China, Malaysia, and Sri Lanka and potential FTAs with Korea, Turkey, and Thailand. In this study the authors showed that most of these free trade agreements are beneficial to Pakistan and its agreements' partners. Additionally, Pakistan's FTAs with China, Malaysia, Thailand, and Korea, are more beneficial in terms of its economic benefits to the member nations. Whereas, based on their results, Pakistan-Sri Lanka and Pakistan-Turkey FTAs may be less important to the member states.

This is relatively a comprehensive study of Pakistan's FTAs, in which authors quantify the economy-wide effects of Pakistan's three existing and three potential FTAs by using a global computable general equilibrium (CGE) model with the version 9 of GTAP database. Nevertheless, Pakistan has been involved in many signed, under negotiation and proposed/strategic FTAs. This paper does not address the effects of the other in force, proposed and potential FTAs. A more comprehensive study would include most of the Pakistan's FTAs, and will

infer more detailed results in terms of its impact on Pakistan's macroeconomic, welfare and trade variables.

One study about the evaluation of Pakistan-Sri Lanka FTA by (Hussain & Shah, 2018) reported that the agreement has positive implications for Pakistan as indicated by the increase in real GDP, welfare, and trade indicators, where the authors' findings are; that the effects of FTA are not beneficial to Sri Lanka, because the results show a decline in its GDP, trade, and welfare indicators. The authors use GTAP model to quantify the effects of bilateral FTA between Pakistan and Sri Lanka. Sri Lanka is a strategic trade and FTA partner of Pakistan, since it is the third largest country in south Asia, and the implications of Pakistan-Sri Lanka FTA are important to the members of this FTA.

(Khan, Mehmood, Zakaria, & Husnain, 2018) performed impact assessment study of the existing FTA between Pakistan and Malaysia. According to authors the trade agreement is mutually beneficial to both members if the states revise their current FTA and bring the tariffs to the level, they have granted to their other FTAs partners. Authors in this study focus on the strategic Malaysia-Pakistan FTA and employ MyGTAP model to draw inferences from this FTA for the partners of the agreement.

The significance of this study is that the authors highlighted that benefits of the FTA can be exploited at potential level if the agreement partners revise the terms of this existing FTA.

In general, most of the existing studies on FTAs analysis in a CGE framework use aggregated approach to perform the economy-wide and sectoral analysis where the sectors are aggregated to 10 or mostly to 15 sectors out of the total 57 GTAP sectors. However, a more detailed and disaggregated sectoral output, exports and imports analysis may infer more insights on the implications of an FTA to the member states. Therefore, the present study attempts to conduct CGE analysis of China-Pakistan FTA at a disaggregated sectoral level in order to draw a more detailed picture of Pakistan's free trade agreement with China.

A Simulation Problem

A CGE model can be represented as finite number of N simultaneous equations, such as:

$$g_i(z_1, \dots, z_{n+m}) = 0 \quad i = 1, \dots, m \quad (1)$$

The solution of this CGE model, requires the specification of exogenous and endogenous variables.

Here we split the variable z into exogenous variables (x) and the endogenous variables (y). Thus, the model (1) can be rewritten as:

$$g_i(y_1, \dots, y_m, x_1, \dots, x_n) = 0 \quad i = 1, \dots, m \quad (2)$$

Using vector notation:

$$\mathbf{y} = (y_1, \dots, y_m)$$

$$\mathbf{x} = (x_1, \dots, x_n)$$

We may also write it as:

$$\mathbf{g}(\mathbf{X}, \mathbf{Y}) = 0. \quad (3)$$

A simulation problem here means that, initial solution is given, that is, $\mathbf{y} = \mathbf{y}^0$ when $\mathbf{x} = \mathbf{x}^0$, also given is $\mathbf{x} = \mathbf{x}^1$. The problem here is to compute the value \mathbf{y}^1 of \mathbf{y} when $\mathbf{x} = \mathbf{x}^1$.

Using the above notation

$$\mathbf{g}(\mathbf{Y}^0, \mathbf{X}^0) = 0 \quad (4)$$

And the simulation problem is to find \mathbf{y}^1 such that:

$$\mathbf{g}(\mathbf{Y}^1, \mathbf{X}^1) = 0 \quad (5)$$

And the differences between \mathbf{y}^1 and \mathbf{Y}^0 are reported in terms of percentage changes.

In order to conduct CGE-simulation the present study uses GTAP model developed by (Hertel, 1997) and version 9 of the GTAP database[‡] with reference year 2011. General equilibrium modeling package (GEMPACK)[§] software is used to run the simulation.

Simulation Results and Analysis

Changes in Macroeconomic, Regional Trade and Welfare Indicators

Table 1 provides the results obtained from the simulation experiment of China-Pakistan FTA. It is apparent from the table that Pakistan's regional exports, regional imports and trade balance improve significantly. However, Pakistan's GDP, terms of trade, employment and welfare decline. In case of China, the FTA has positive impact on its GDP, exports, imports, terms of trade, employment and welfare, while china experiences decrease in trade balance only. Furthermore, the magnitude of Pakistan's growth in regional exports and imports is significantly larger than the China's growth in these two international trade indicators. Previous studies also show that Pakistan's external sector has potential with regard to exports growth with China, see for example (Hussain et al., 2017)

[‡]GTAP database is the creation of the GTAP at Purdue University, USA: <https://www.gtap.agecon.purdue.edu>

[§]The simulation results reported in this study were obtained using the GEMPACK software [Horridge et al. (2018)].

Table 1 Macroeconomic, Regional Trade and Welfare Indicators (Simulation Results)

Indicators	Simulation Results
GDP (% Change)	
Pakistan	-0.039
China	0.003
Regional Exports (% Change)	
Pakistan	9.216
China	0.042
Regional Imports (% Change)	
Pakistan	3.924
China	0.111
Terms of Trade (% Change)	
Pakistan	-1.283
China	0.043
Employment (% Change)	
Pakistan	-55.2
China	0.18
Regional Welfare (Change in US\$m)	
Pakistan	-1055
China	1145
Trade Balance (Change in US\$m)	
Pakistan	184.525
China	-191.221

Source: Present study's simulation results

Sectoral Analysis

Capital Intensive Industries

Pakistan and china both are labor abundant nations, but China is being transformed from a labor abundant to capital abundant nation. In these

lines China's revealed comparative advantage (RCA) in capital intensive sectors is higher than Pakistan that is, out of five product groups China has a larger RCA in four product groups such as Chemicals, Mach and Elec, Plastic or Rubber and Transportation while Pakistan has a higher RCA than China only in Metals sector based on 2018 estimates (World Integrated Trade Solution, 2019). The FTA's simulation results for capital intensive industries are provided in table 2. The data shows that Pakistan's sectoral output growth is positive in seven sectors, whereas, it is negative in 13 sectors. In case of China 10 capital intensive sectors record positive growth and the remaining 10 sectors show negative growth. In case of exports, interestingly all the capital-intensive sectors of Pakistan show positive export growth, while, Chinese industries exhibit improvement in seven export sectors. In terms of imports, 10 sectors of Pakistan show positive import growth while 10 sectors have negative growth. In case of China all the industries' import growth enhances.

Table 2 *Capital Intensive Industries (Simulation Results)*

Sectors	Output		Exports		Imports	
	Pakistan	China	Pakistan	China	Pakistan	China
Petroleum, coal products	-0.162	0.018	1.313	0.171	-0.244	0.038
Chemical, rubber, plastic prods	0.690	0.001	12.754	0.166	1.033	0.125
Mineral products nec	-3.607	0.033	4.538	0.381	36.551	0.151
Ferrous metals	-0.358	0.030	6.152	0.326	2.157	0.129
Metals nec	6.057	-0.045	9.892	-0.046	0.667	0.121
Metal products	-3.918	0.025	11.016	0.191	27.677	0.163
Motor vehicles and parts	-2.939	0.098	8.182	1.176	15.845	0.148
Transport Equipment nec	-2.874	0.071	12.210	0.391	7.250	0.188
Electronic equipment	-1.293	-0.142	12.312	-0.170	6.956	0.041

Machinery and equipment nec	-1.509	-0.019	11.655	-0.004	6.986	0.146
Manufactures nec	0.826	-0.027	10.348	-0.113	15.547	0.185
Electricity	-0.251	0.006	5.647	-0.228	-3.151	0.123
Gas manufacture, distribution	-0.274	-0.001	8.479	-0.120	-4.385	0.068
Water	-0.109	0.005	8.058	-0.295	-1.286	0.150
Construction	1.040	0.022	8.590	-0.180	-2.185	0.116
Trade	-0.123	-0.006	6.024	-0.202	-3.023	0.105
Transport nec	-0.069	0.000	5.410	-0.176	-2.801	0.098
Sea transport	2.959	-0.004	4.160	-0.021	-0.966	0.080
Air transport	2.301	-0.023	4.490	-0.074	-1.919	0.069
Communication	0.703	-0.004	5.916	-0.208	-2.942	0.102

Source: Present study's simulation results

Labor Intensive Industries

Pakistan's RCA in labor intensive industries is higher than China in three product groups such as Food Products, Hides and Skins and Textiles and Clothing whereas china RCA is higher than Pakistan in two product groups that is, Footwear and Wood, based on 2018 estimates (WITS, 2019)

Labor intensive industries simulation results are reported in table 3. The numbers in the table indicate that Pakistan's sectoral production in seven industries enhances whereas it declines in other nine industries. Amongst the labor-intensive sectors China experiences growth in five sectors whereas 11 sectors exhibit negative growth. Pakistan's exports growth is positive in all the labor-intensive sectors. China's exports growth is positive only in five sectors. Out of the total 16 labor intensive sectors Pakistan's six sectors record positive import growth and the remaining 10 sectors show negative growth. China's import growth improves in all the labor-intensive sectors.

Table 3 *Labor Intensive Industries (Simulation Results)*

Sectors	Output		Exports		Imports	
	Pakistan	China	Pakistan	China	Pakistan	China
Raw milk	-0.893	-0.007	6.135	-0.454	-3.965	0.215
Dairy	-0.633	-0.009	10.971	0.023	-5.37	0.186

products						
Processed						
rice	0.104	-0.008	6.009	-0.675	-3.835	0.242
Sugar	-0.395	-0.024	6.545	-0.253	-3.847	0.102
Food						
products nec	-0.358	0	5.63	0.01	8.485	0.149
Beverages						
and tobacco	-0.012	0.001	2.819	-0.069	-0.896	0.061
Textiles	2.924	0.068	10.742	0.428	23.886	0.964
Wearing						
apparel	1.613	-0.07	14.254	-0.199	67.369	0.21
Leather						
products	-1.159	0.038	21.078	0.138	76.859	0.907
Wood						
products	-1.539	-0.039	9.637	-0.086	16.191	0.123
Paper						
products	-1.415	0.038	8.286	0.735	8.931	0.132
Financial						
services nec	0.181	-0.006	5.811	-0.222	-1.641	0.108
Insurance	0.352	-0.01	5.777	-0.203	-1.561	0.095
Business						
services nec	0.605	-0.005	5.515	-0.204	-2.14	0.102
Recreation						
and other servs	-0.512	0	5.799	-0.205	-3.328	0.107
PubAdmin/ Defence/Health/ Educat	0.009	0.007	5.996	-0.238	-3.297	0.116

Source: Present study's simulation results

Land and Natural Resource Intensive Industries

With regard to land and resource intensive industries, Pakistan being a natural resource rich country its RCA is higher than China in these product groups namely Animal, Minerals and Vegetable, as per 2018 calculations (WITS, 2019).

Table 4 shows the data on simulation results for land and resource intensive industries. Amongst the land and resource intensive industries of Pakistan, 10 sectors are benefited in terms of output growth whereas 10 sectors exhibit negative output growth. China's five sectors record positive growth. In terms of exports growth Pakistan experiences improvement in all the land and resource intensive sectors. In case of China only two land and resource intensive sectors show rise in exports growth while 18 sectors exhibit a decline in exports growth. Respecting the import growth, four sectors of Pakistan exhibit improvement while 16 sectors demonstrate

decline in imports growth. All the china's land and resource intensive industries show positive import growth.

Table 4 *Land and resource Intensive Industries (Simulation Results)*

Sectors	Output		Exports		Imports	
	Pakistan	China	Pakistan	China	Pakistan	China
Paddy rice	0.164	0.02	8.087	4.744	17.505	0.434
Wheat	0.196	-0.002	5.614	-0.599	-3.331	0.253
Cereal grains nec	0.609	0.004	2.677	-0.148	-0.508	0.07
Vegetables, fruit, nuts	0.243	-0.004	2.756	-0.199	-1.563	0.121
Oil seeds	0.16	-0.063	9.059	-0.25	-0.597	0.03
Sugar cane, sugar beet	-0.409	-0.022	4.969	-0.314	-0.916	0.117
Plant-based fibers	2.97	-0.023	8.572	-0.318	2.404	0.202
Crops nec	-0.086	0.32	4.027	0.604	0.495	0.111
Cattle, sheep, goats, horses	-0.92	0.001	3.364	-0.245	-2.426	0.135
Animal products nec	-0.304	0.004	1.974	-0.148	-1.315	0.082
Wool, silk-worm cocoons	3.466	-0.019	24.873	-0.681	-1.246	0.27
Forestry	-0.45	-0.03	7.942	-0.068	-3.122	0.07
Fishing	-0.182	-0.002	13.946	-0.101	-2.259	0.252
Coal	-0.185	-0.006	10.456	-0.207	-5.186	0.109
Oil	0.584	-0.02	2.044	-0.121	-0.463	0.041
Gas	0.167	-0.016	44.545	-0.045	-17.025	0.005
Minerals nec	-0.025	-0.009	1.936	-0.051	-1.111	0.028
Meat: cattle, sheep, goats, horse	-0.456	-0.013	11.472	-0.378	-6.289	0.185

Meat products nec	-0.426	-0.002	13.801	-0.273	6.729	0.25
Vegetable oils and fats	2.102	-0.022	11.217	-0.234	-4.443	0.136

Source: Present study's simulation results

China is one of the largest trade partners of Pakistan and apart from this China has been the fast-growing economy thus the lesson to Pakistan is to strengthen and speed up its economic relations with China. This will empower Pakistan in the process of economic growth and development through an improvement in international trade indicators. Existing literature also suggests that in terms of advantages to Pakistan, China-Pakistan FTA is one of the significant FTAs (Zada & Khan, 2017).

Some Special Economic and Political-Economic Considerations

Free trade agreements have both costs and benefits to the member countries because with the implementation of an FTA some sectors of the economy may expand while others may contract, in the same lines some macroeconomic, microeconomic and trade indicators may boost up while other economic indicators may get worse off, when the FTA is materialized. The positive and negative effects of the free trade agreement are contingent to the factors such as macroeconomic stability, structural adjustment policies and political setup of the nations. First, macroeconomic stability is a pre-condition for a policy change to be successfully and potentially materialized because frequent fluctuations in a macroeconomic activity impede the efficient implementation of a policy change and the policy' objectives are less likely achieved. Second, readiness toward adjustment policies that are essential in the presence of structural changes is also a vital factor behind the success of policy reform such as trade policy reform in the present study. In this regard those sectors which are contracted in terms of output, exports and imports need special consideration on the part of the state authorities and the private sector stakeholders. In this respect trade adjustment assistance programs can be helpful to mitigate the FTAs adverse effects on firms and workers. Third, political determination is the key driver behind a successful policy.

Conclusion

Present study was designed to determine the effect of China-Pakistan FTA at a disaggregated sectoral level. This study has found that in terms of macroeconomic, trade and welfare indicators China is likely more benefited than Pakistan but the magnitude of Pakistan's regional

exports and import growth is higher than China. The second major finding was that at a disaggregated sectoral level Pakistan may experience higher growth in sectoral output and exports in all the capital, labor and land and resource intensive sectors, whereas, China may get higher growth in sectoral imports from Pakistan which may also benefit Pakistan's economy. Finally, the benefits that are embodied in this China-Pakistan FTA can be maximized and the associated costs can be minimized only when macroeconomic conditions are stable, appropriate structural adjustment policies are implemented and political-economic constraints are controlled.

References

- Finance Division of Pakistan. (2019). *Pakistan Economic Survey 2018-19*. Islamabad Retrieved from: http://www.finance.gov.pk/survey_1819.html
- Hertel, T. W. (1997). *Global trade analysis: modeling and applications*: Cambridge university press.
- Horridge, J., Jerie, M., Mustakinov, D., & Schiffmann, F. J. G. s. (2018). GEMPACK manual, GEMPACK software, ISBN 978-1-921654-34-3.
- Hussain, C. M., & Shah, S. Z. A. (2018). Pre and post evaluation of Pakistan-Sri lanka free trade agreement. *The Business and Management Review*, 9(4).
- Hussain, C. M., Shah, S. Z. A., & Zulfiquar, A. (2017). Quantitative Assessment of Pakistan and China Free Trade Agreement. *Pakistan Journal of Commerce and Social Sciences*, 11(1), 293-308.
- Khan, M. A., Mehmood, Q., Zakaria, M., & Husnain, M. I. u. (2018). A Household Level Analysis of the Pakistan–Malaysia Free Trade Agreement. *Journal of Asian and African Studies*, 0021909618762568.
- Pohit, S., & Saini, R. (2015). India-Pakistan trade liberalization: A CGE modeling approach. In *India-Pakistan Trade* (pp. 127-146): Springer.
- Syed, A. A. S. G., Shaikh, F. M., & Ahmadani, M. M. (2016). Impact of SAFTA On Textile Export On Economy Of Pakistan By Using Computable General Equilibrium Model (CGE). *International Journal of Management & Information Technology*, 11(1), 2641-2655.

WITS. (2019). *World Integrated Trade Solution*, World Bank

Zada, N., & Khan, K. (2017). *General Equilibrium Analysis of Pakistan's Free Trade Agreements 'A Global CGE Approach'*. Paper presented at the 33rd AGM, PIDE, Islamabad, Pakistan.