Please, do not quote! Not published yet!

How Central Asia to escape from trade isolation? Policy Targeted Scenarios by CGE Modeling

Inkyo Cheong*
Valijon Turakulov**

Abstract

It has been 30 years since Central Asian '-stan' countries, namely, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan declared their independence in 1991. The Republics have chosen various transition paths from centrally planned to the market-based economic system. Today, it is time to assess their transition journey.

The research found that the protectionist policy by Central Asian governors, on top of the land-locked geographical environment, made trade costly. Consequently, economic development slows down, unemployment increases, and poverty rate extremes. Eventually, the isolated region (relatively, excluding Kazakhstan) is imprisoned in a low-income trap and framed into a vicious circle.

As a solution for tackling high-trade costs in the region, the research utilizes the GTAP CGE economic modeling to draw policy targeted scenarios. The study summarizes that tariff reduction/elimination and trade facilitation policies flourish the region by bringing significant economic welfare, robust GDP growth, sizable job creation, and considerable poverty reduction. The trade facilitation scenarios impact the region's economy much more positively than do tariff liberalization scenarios.

Keywords: *Central Asia, land-locked countries, trade liberalization, trade facilitation*

*Prof. of International Trade (PhD), Inha University, South Korea [inkyoc@gmail.com]
**PhD in International Trade, Inha University, South Korea [valiy.uz@gmail.com]

I. INTRODUCTION

Central Asia (CA) is located in the center of the world's largest landmass – Eurasia. The region stretches from the Caspian Sea in the west to China and Mongolia in the east, and from Afghanistan and Iran in the south to Russia in the north. The region is 'known' for not only its massive amount of natural resources but also its protectionist trade policy. Central Asian '-stan' countries, namely, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan, declared their independence in the same year, 1991. Since then, the countries chose numerous ways of transition from centrally planned to the market-based economic system. Today, after almost 30 years, it is time to assess landlocked CA's economy and explore trade-related problems and existing opportunities.

Central Asia today

Today, even though CA is located in the center *geographically*, it stays on the periphery, *economically*. Table 1 compares Central Asian countries' GDP, per capita and economic growth with those of the world average and landlocked countries average as for 2019. In terms of real GDP, only Kazakhstan's GDP exceeds the world average GDP while Uzbekistan joins Kazakhstan if compared to the average GDP of landlocked countries worldwide. As for the per capita, no Central Asian

Table 1: The real GDP, per capita, and growth in Central Asia compared to those of the world and landlocked countries (2019)

Country/region	Real GDP (billion)	Real GDP growth (%)	Per capita (USD)	Per capita growth (%)
Kazakhstan	180.1	4.5	9,731	3.2
Uzbekistan	57.9	5.5	1,725	3.6
Turkmenistan	40.7	6.2	6,967	1.1
Kyrgyzstan	8.4	4.5	1,309	2.3
Tajikistan	8.1	7.0	871	4.5
World average	82.8	2.4	11,441	1.3
Landlocked average	44.9	3.4	15,384	1.8

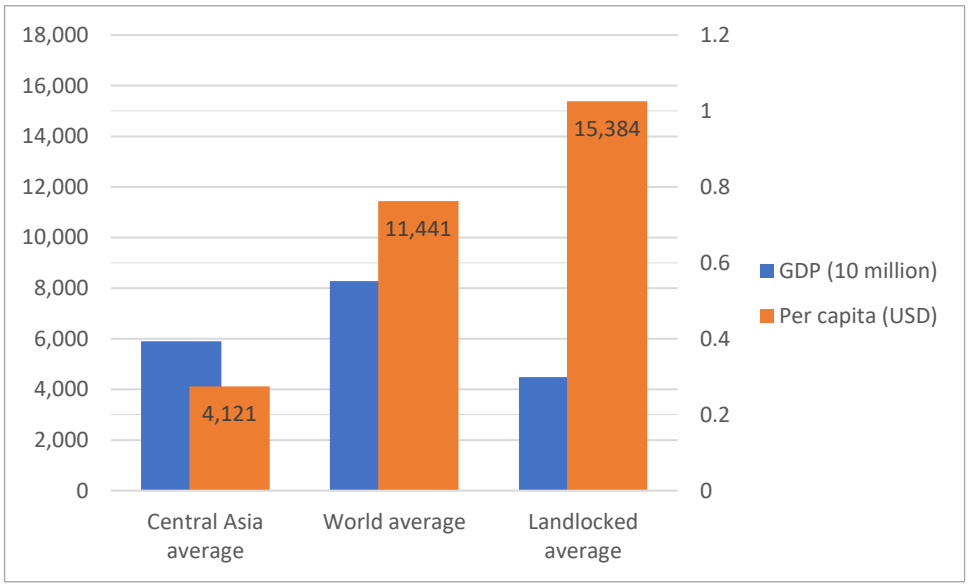
Source: World Bank's World Development Indicators

Republics surpass the world and landlocked countries' average. However, when it comes to growth, due to the relatively small economic size, the Central Asian

economies show a faster rate. Their growth rates are faster in both real GDP and per capita growth.

In Figure 1, you can see the comparison of the average real GDP, per capita, and the growth across three aggregated groups: Central Asia, the world, and landlocked states worldwide. It is easily seen that Central Asian states significantly lag behind their landlocked counterparts in GDP per capita although they surpass in real GDP. Overall, the region is considered much less economically flourished compared to the world average.

Figure 1: The average real GDP, per capita and growth of Central Asia in comparision with those of the world and landlocked countries (2019)



Source: World Bank's World Development Indicators

We can see the consequences of this economic passiveness by looking at other statistical data such as poverty and unemployment level. For example, the poverty level in the region is quite intense compared to the world average poverty level.[1] This particularly holds for Tajikistan – 26.3%, Kyrgyzstan – 22.4%, and Uzbekistan

[1] The national poverty line rates are based on population-weighted subgroup estimates from household surveys. That is why these measures cannot be used for comparison but just overall estimation.

– 14%. Despite there is no data available for Turkmenistan, poverty is most likely much higher than the world average according to anecdotal evidences.

Table 2: Poverty and unemployment rate (%) in Central Asian countries compared to those of world average and landlocked countries average

	National poverty line		Unemployment rate, %	
Country/regions	%	Year	ILO, 2020	CIA
Kazakhstan	2.5	2017	4.6	5.0
Uzbekistan	14	2016	6.1	20
Turkmenistan	-	-	4.1	11
Kyrgyzstan	22.4	2018	6.6	7.1
Tajikistan	26.3	2019	11	2.4
World average*	9.2	2017	7.1	7.7
Landlocked average	-	-	7.1	-

Source: World Bank's World Development Indicators & CIA's The World Factbook
*The global extreme poverty rate that shows living on less than $1.90 a day.

As for the unemployment rate, the authors use the unemployment percentage of total labor modeled by the International Labor Organization (ILO) for 2020 and, alternatively, the Central Intelligence Agency's data for the latest year available. On average, unemployment rates in the world and landlocked countries range from 7.1% to 7.7%. Except for Tajikistan with an 11% unemployment rate, the remaining Central Asian nations seem to belove the average line, according to the ILO's modeling. However, when we look at the data from the CIA, we see a different picture. The good thing about CIA data is that it also notes each country's real condition in addition to their estimated figure. For example, despite the unemployment rate in Tajikistan is shown as 2.4%, the CIA's note says it is much higher in reality. This is also true for other Central Asian economies. Particularly, despite the unemployment rate in Uzbekistan is estimated at 6.1% by the ILO, the CIA claims that the actual rate could be up to 20%. In this case, the average unemployment rate in the region could exceed the world or landlocked countries' rate.

In fact, the unemployment issue in the region, especially, in Tajikistan, Kyrgyzstan, and Uzbekistan is considered critical. The people who desperately seek

a job to put food on their table have been flown into the Russian unskilled-labor market so far. Even in 2014, Kyrgyz workers' remittances to GDP ratio was the third highest in the world while Tajikistan has once become the most-remittance-dependent country in the world (Pomfret, 2019). Currently, personal remittances received as a percentage of GDP for Tajikistan and Kyrgyzstan is around 30% while 14% for Uzbekistan, according to the World Bank's WDI.

Problem statement

The Central Asian region, after the Soviet collapse, was left with a lack of trade-favorable infrastructure. The land-locked feature along with inefficient infrastructure has increased trade costs due to the higher logistics expenses. On top of these existing issues, the Central Asian governors, except the Kyrgyz Republic, postponed **trade-liberalizing reforms** after their independence, i.e., Uzbekistan and Turkmenistan have not been members of the WTO so far (Table 3).[2] Tajikistan and Kazakhstan entered the Organization late (2013 and 2015, respectively). Even so far, there have not existed any exclusive trade agreements among Central Asian countries. Some of the previous attempts in forming trade agreements among the five nations have failed (see more on Appendix A Central Asian countries involved trade agreements).

Besides, the region lags appropriate policy toward **trade facilitation**.[3] Table 4 presents trade-related indicators, namely, trade openness, trade facilitation, and

[2] Pomfret (2019) points out that one of the main reasons for such delay in the membership is that Central Asian governments were cautious in accepting world trade law by joining the WTO and abjuring the non-tariff barriers formally. WTO accession negotiations have been WTO members' reservations regarding the applicants' commitment to a market-based economy and Kazakhstan's reluctance, Uzbekistan, and Tajikistan to compromise the non-market and discretionary elements of their economic systems. After joining the Organization, the Kyrgyz Republics' unsatisfactory economic performance became a disputed element in trade-policy debates in Central Asia. A cynical interpretation was used by rivals of WTO membership in Kazakhstan and Azerbaijan to stall those republics' accession discussions.

[3] Trade facilitation measures are undertaken along two dimensions: a 'hard' dimension related to tangible infrastructures such as roads, highways, ports, telecommunications, as well as a 'soft' dimension related to transparency, customs management, the business environment, and other institutional aspects that are intangible (Portugal-Perez & Wilson, 2012).

logistics performance indexes and rankings in comparison with the world and landlocked countries' average. The Central Asian economies, except for the Kyrgyz Republic, fall behind in trade openness.[4] This holds for the openness ratio in trade in services. As for the Trade Facilitation Index by the OECD, Kazakhstan and Kyrgyzstan show better performance than the average performance of landlocked countries. However, the world average exceeds all Central Asian nations. In the overall Logistics Performance Index by World Bank, Central Asian economies rank behind both the world and landlocked countries' average.

Table 3 Status of WTO accession negotiations of Central Asian states

	Applied	Member
Kazakhstan	January 1996	November 2015
Kyrgyzstan	February 1996	December 1998
Tajikistan	May 2001	March 2013
Turkmenistan	July 2020	Observer
Uzbekistan	December 1994	Negotiating

Source: www.wto.org

Table 4: Trade-related indicators in Central Asia

	Trade Openness (2019)	Trade in Services Openness (2019)	Trade Facilitation (2019)		Logistics Performance (2018)	
	Trade (% of GDP)	*Trade in services (% of GDP)*	*out of 2.0*	*ranking*	*out of 5.0*	*ranking*
Kazakhstan	64	10	1.1	91	2.81	71
Uzbekistan	73	14	0.7	138	2.58	99
Turkmenistan	35	-	-	-	2.41	126
Kyrgyzstan	103	25	1.0	102	2.55	108
Tajikistan	57	9	0.9	111	2.34	134
World average	94	31	1.2	≈85	2.8	≈70
Landlocked average	94	29	0.9	≈103	2.7	≈82

Source: Trade (% of GDP) and Trade in services (% of GDP) - https://databank.worldbank.org
Trade Facilitation - OECD. (2019) - http://www.oecd.org/trade/topics/trade-facilitation/
Logistics Performance Index. (2018) - https://lpi.worldbank.org/

[4] Al-Atrash and Havrylyshym (1998) point out the definite link between openness, reform, and trade in the case of economies in transition. According to them, transition states which have made the most progress in structural reforms have also gone farthest in diversifying the exports to new destinations (Al-Atrash & Havrylyshym, 1998). It is also said that trade openness brings many economic benefits, including improved technology transfer, increased labor, transfer of skills, and total factor productivity and economic growth as well as development.

In short, high trade costs in Central Asia are directly related to a less liberalized and facilitated trade environment. Stagnancy in trade hinders economic growth and productivity (relatively, except Kazakhstan). This, in turn, led to a rise in the unemployment rate and its consequence, which is poverty.

Research objective

This research underscores the main problems mentioned above for high trade costs in the region and aims to give practical suggestions to tackle them. In doing so, the study first delves into the problems comprehensively by extensive theoretical and empirical literature review. Policy targeted scenarios regarding tariff liberalization and trade facilitation are backed up using the GTAP CGE model with the GTAP database. Note that tariff liberalization indicates a tariff elimination and/or reduction while trade facilitation implies easing the trade. The specific viable solutions and ideas within the framework of this research attempt to reduce trade costs transforming the region from land-lockedness to land-linkedness by forming Customs Union among the Central Asian Republics; shows the economic benefits of the Customs Union among Central Asian nations in both the short and long-term.

Also, it should be highlighted that the work's novelty that contributes to the existing literature regarding Central Asia's trade policy as it uses the GTAP database and GTAP model to quantify comparative static economy-wide effects of WTO membership of five Central Asia countries first time.

II. RESEARCH METHODOLOGY

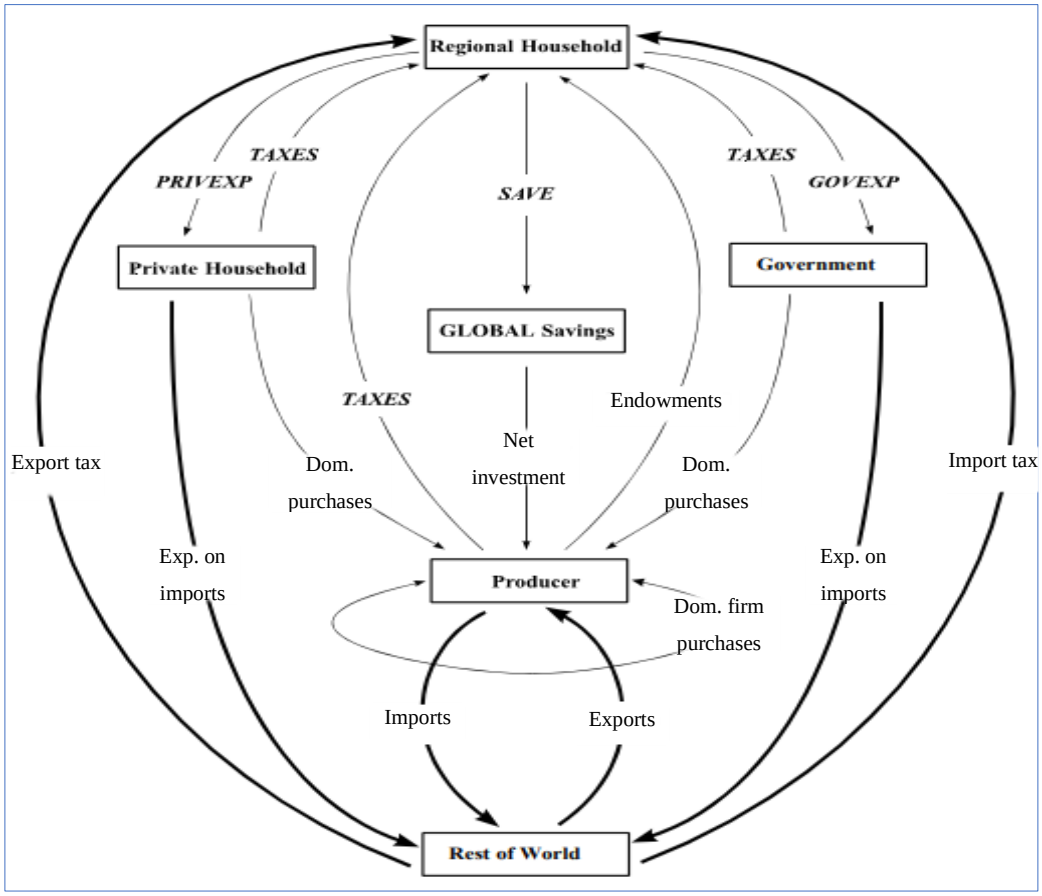
This research uses a static multi-regional, multisector, standard GTAP CGE model. The Computable General Equilibrium (CGE) model is a system of equations that describes an economy as a whole. The CGE model recognizes the interactions among many markets and their complex ways to link each other, producing the *"everything depends on everything else"* environment. "CGE modeling is a potent tool, allowing economists to explore numerically a vast range of issues on which econometric estimation would be impossible, in particular, to forecast the effects of future policy changes" (Hertel et al., 2007).

Overview of the GTAP CGE modeling

The Global Trade Analysis Project (GTAP) is a CGE model that allows major economic factors such as production, consumption, price, and others to interact which each other, which finally determines the final balance (Cheong, 2012). In this paper, we use a static GTAP CGE modeling that provides a before- and after comparison of economies of Central Asia in our simulations. Static models simulate a compelling story about the ultimate winners and losers after the economic shocks.[5] The GTAP model has been broadly employed in a wide range of policy analyses. For example, it includes issues such as a reduction in trade costs, economic integration, and liberalization policies in various economic sectors and beyond. Most of the studies using this model have focused on the liberalization of trade. Notably, the analysis of numerous FTAs is quite common. For example, because of the increase in the number of EU GTAP database is applied widely. The GTAP model has been recently extended to examine in detail energy, land, environmental, migration, water, and poverty issues (Hertel, 2012).

[5] *Static models* analyze the effects of a policy change at one period of time, whereas *dynamic models* consider the more extended time series. *Single-country models* concentrate on the effects of policy changes in one country, while *multi-regional models* focus on the inter-regional impacts.

Figure 2: Graphical overview of the GTAP model



Source: Adapted from Brockmeier, 1996
Note: Detailed graphical illustration can be found in Brockmeier (1996) in where the GTAP model is explained piece by piece using one country model. In this graph, transportation sector is neglected in order to provide a simpler explanation.

In principle, the standard GTAP model is considered as a static, multisector, and multi-regional model. A competitive economic environment in the model defines a profit and utility-maximizing behavior of consumers and producers, respectively. Two sets of *accounting relationships* and *non-linear behavioral equations* serve as a base for the model. Accounting relationship equations ensure that receipts and expenditures of each agent are balanced. Furthermore, behavioral equations are built on microeconomic theory. These equations describe the behavior of optimizing agents in the economy, such as demand functions (Brockmeier, 1996). Figure 2 illustrates a graphical overview of the GTAP model by focusing on accounting relationships in the multi-country model. It also illustrates the linkages

between various agents in the model (Brockmeier, 1996).

Regional household: The regional household is a macroeconomic account and remarkably similar (but not the same) to the concept of GDP from the income side and the expenditure side (Burfisher, 2017). Overall, aggregate regional expenditure (such as private and government expenditure) along with regional savings should equal aggregate regional income. The unitary regional utility function provides a rigorous *welfare decomposition*, technological and allocative efficiency effects, distinguishing endowment (Corong et al., 2017).

Government consumption expenditure: Government also participates as a separate economic agent in the GTAP model. It carries domestic and foreign purchases as well as pays taxes to the regional household. The regional household's aggregate demand for government is shown as GOVEXP in the graph above.

Private consumption expenditure: As the GTAP model depicts, the private household is a separate agent that pays taxes to the regional household. At the same time, it receives income from a regional household as a form of PRIVEXP. The private household also consumes domestic and foreign purchases.

Regional investment: Regional investment is equal to regional savings. Savings from the regional household are directed as a net investment to production. Overall, aggregate expenditure with savings together makes up aggregate income in the region. *"…Investment does not come "on-line" next period to affect the productive capacity of industries or regions in the model. However, a reallocation of investment across regions will affect production and trade through its effects on the profile of final demand"* (Hertel, 1997).

Savings affect the demand-side of the economy as households and the government allocates some part of their disposable income to savings, which

decreases the income they otherwise could spend on purchasing goods and services. In turn, investment affects the production-side of the economy since investors buy capital equipment that is manufactured by industries.

Closure in GTAP model

Macroeconomic closure is called 'Closure' in the model and concerns declaring the exogenous and endogenous variables. Modelers determine which variables are exogenous and which of them are endogenous. In the GTAP model, as the choice of closure can directly affect model outputs in a significant way, it is highly required that modelers try to choose the closures that represent best the economy studying (Burfisher, 2016).

Exogenous variables have a constant value, and their value is determined outside the model. *Endogenous variables* are a variable whose value is decided by the model. A change in an endogenous variable occurs due to the change in the exogenous variable. Exogenous change imposed on the model is called *a shock* in the GTAP model. There are many types of variable groups in the model, such as quantity variables, price variables, technical change variables, policy variables, utility variables, etc.

GTAP database

The paper utilizes the 10th version of the standard GTAP database. The Database (GTAP v10) is the latest dataset and has been thoroughly documented by Aguiar *et al.* (2019). The Database reports production, intermediate and final uses, global trade and transport margins, and taxes/subsidies for each country and region.

Many individuals and organizations worldwide contribute to the production of the GTAP Database. Individuals share the best available input-output table of their country, while the macro-economic, trade, protection data are contributed by other experts. The Center for Global Trade Analysis – the home of GTAP –

coordinates these contributions and produces one usable, globally consistent, publicly available, fully documented, and regularly updated database. Note that once produced, the database was rigorously reviewed by data contributors and leading national and international organizations before it is made public. This process is needed as an extra layer of quality-assurance (Aguiar 2016).[6]

Table 5: Central Asian republics' status in the GTAP v10 Database

Country	Included in GTAP Version 10?	IO table year
Kazakhstan	yes	2015
Kyrgyzstan	yes	2002*
Tajikistan	yes	2011
Turkmenistan	no	Considered as the "Rest of Former Soviet Union" region.
Uzbekistan	no	

Source: Author's completion based on (Aguiar, 2019) and GTAP official website.
*Note: For Kyrgyzstan, the year of the IO table is not recorded.

The GTAB v10 describes the world economy for four reference years (2004, 2007, 2011, and 2014) and distinguishes 65 sectors in each of the 141 countries/ and/or regions. In the Database account, the 121 countries make up 98% of the world GDP and 92% of the world population.

Three Central Asian countries, namely Kazakhstan, Kyrgyzstan, and Tajikistan, exist in the GTAP's version 10 Database. Uzbekistan and Turkmenistan, however, are among the missing countries list of the database. So, both economies are aggregated as "Rest of Former Soviet Union" (which does not include any other country except Uzbekistan and Turkmenistan) (Table 5).[7] Therefore, we need to use the SplitReg program to split Uzbekistan and Turkmenistan as a separate region.

The SplitReg program: The SplitReg is a tool to help you split out one or

[6] The GTAP database is based on two primary data sources: (1) Regional input-output tables are usually nationally published IO tables and submitted by researchers worldwide. (2) Data from international organizations such as the World Bank, World Trade Organization, United Nations Conference on Trade and Development, United Nations Statistics Division, etc.

[7] For more, visit: GTAP Data Bases: 10.131 Regions. (2020). Retrieved August 20, 2020, from Purdue.edu website: https://www.gtap.agecon.purdue.edu/databases/regions.aspx?version=10.131

more aggregated economies into separate GTAP regions. To use the program, a researcher needs some data: a table of value-added by subregion and by GTAP sector. The SplitReg, then, uses these value-added proportions to split industry and final demand columns of the original GTAP data. In some rare cases, the SplitReg may produce an unbalanced database. A second program, the GTAPAdjust, is used to remove any balances (Horridge, 2011; 2016; 2017). After splitting two countries, the results are also seen separately (the SplitReg is fully documented by Horridge, 2011-2017). Also, there is a need to use the TASTE (Horridge & Laborde, 2008) to extract tariff data for Turkmenistan as there is no data available by the international organizations for this country.

Additional data: As for other tariff and trade data, World Integrated Trade Solution (WITS) offers a "treasure" of trade-related data to a researcher. The paper relies on the WITS to gather almost all of the Central Asian countries' trade and tariff data. Besides, the initial and final bound rates, together with Central Asian economies' other WTO commitments, can be derived from the WTO Data portal and Tariff Analysis Online facility websites.[8]

Output in the GTAP model

The GTAP model can be solved in a general equilibrium modeling package (GEMPACK)[9] or utilizing the RunGTAP programs. In this research, the authors solve and analyze the GTAP model in GEMPACK economic modeling software in addition to the RunGTAP program.

The GTAP model outputs are a result of shocks given by modelers imposing some changes in an exogenous variable. After that, the outputs, which are changes in the endogenous variable, are obtained as a form of percentage changes and/or

[8] Data portal - timeseries.wto.org and Tariff Analysis Online - tao.wto.org

[9] GEMPACK is known as a modelling system for CGE economic models, developed at the Centre of Policy Studies (COPS) in Melbourne, Australia, and sold worldwide to other CGE modelers.

volume changes. Further, the percentage of changes can be divided into changes in price or quantity (e.g., price and quantity GDP are shown as *pgdp* and *qgdp*, respectively). Moreover, trade balance changes (in millions of USD) by region-wide and sector-wide are also represented by the model (Nugumanova, 2017).

Another vital advantage of GTAP model outputs – the so-called "bottom line" of CGE-based analyses is the opportunity of calculating the impacts on welfare (Burfisher, 2016). Decomposing welfare effects in the GTAP model is comprehensively documented by Huff and Hertel (2000). Equivalent variation (EV) explains gains and losses in the welfare of the researching economy. The EV, a welfare effect indicator, is measured in millions of USD.

Luckily, an analytical welfare decomposition has been established, which allows a break-down of the sources of welfare gains/losses to be undertaken (Corong, 2017). A researcher can decompose the welfare effects, namely, endowment effect, commodity terms-of-trade effect, allocative efficiency, technical change, population growth, the investment-savings terms-of-trade, preference change (Turakulov, 2020).

AnalyseGE: AnalyseGE is a powerful tool for modelers to assist their results in detail. The software allows modelers to explain and interpret their results comprehensively, even analyzing the calculation equation by equation. The use of AnalyseGE is well documented with some model experiments by Pearson, Hertel, and Horridge (2002):

> *AnalyseGE is a software tool that is aimed at assisting modelers to move quickly between these different information sources. The AnalyseGE interface gives users "point and click" access to the equations of the model, the data, and the simulation results. In particular, a modeler can click on any equation and ask the software to group the terms into different natural parts and give the numerical values of each term. This dramatically reduces the burden associated with analyzing simulations and offers the potential for significantly boosting the*

> *productivity of applied general equilibrium modelers (Pearson, Hertel & Horridge, 2002).*

For experienced modelers, the AnalyseGE software makes them more efficient and sounder in their General Equilibrium simulations analysis and allows them to open up the *"black-box"* (as some researchers claimed) of the GTAP model. For non-modelers, it gives a chance to look closer at the model's results analysis.

III. LITERATURE REVIEW

This chapter introduces the empirical analysis of this research. It is divided into three subchapters: literature review regarding empirical analysis regarding land-locked features' impacts on the economy; the consequences of protectionism; tariff liberalization and trade facilitation analysis in Central Asia.

Economic impacts of land-lockedness

On earth, one out of five is a land-locked country. MacKellar et al. (2000) found that states that do not directly access sea outlets had a 1.5% lower growth rate. Sea access is crucial in international trade as the transportation of goods by land is seven times more expensive than the sea's logistic costs (Limao and Venables, 2001, as cited in Raballand et al., 2003). By analyzing IMF data for 97 developing countries, Radelet and Sachs (1998) estimated that transport and insurance costs are two times higher for land-locked countries than coastal countries.

After the Soviet Union collapsed, “Many observers of the newly independent countries highlighted the negative role of land-lockedness, and example of Uzbekistan’s double-landlocked status, i.e., from Uzbekistan it is necessary to transit at least two other countries to reach an ocean port (a situation shared only with Liechtenstein)” (Pomfret, 2019). Raballand et al. (2003) claim that land-lockedness could reduce trade by more than 80% when measured by a dummy variable (which equals one if both countries are land-locked, 0 otherwise). According to him, a high transport cost ratio is predominantly acute in Central Asia since land-locked states are heavily dependent on border-crossing (Raballand et al., 2003).

If one asks why Central European countries are continuing to develop despite those countries are also landlocked. The answer will be that there is a significant difference between Central Asian landlocked countries and European land-locked countries. For example, relatively bigger Central Asian countries should cross

around 2,000-3,000 km to reach the port while their counterparts in Europe can reach the coast in 500-600 km. European land-locked countries are close to the major markets comparing to the Central Asian economies. Although Central Asia is home to around 73 million people, the population spread unequally over a relatively large geographic area, including deserts and mountainous, with low connectivity. Low density and long distances in the region hinder trading bilaterally (Saroj Kumar, 2015). Intra-Central Asian trade flows are relatively small (Pomfret, 2019).

Moreover, researchers argue that institutional quality has been weak for decades in Central Asia as the weak institutions remain a prominent factor in untapped trade potential. However, a more convincing answer would lie in increasing transportation costs separating *de facto* Central European states and Central Asia economies (Raballand et al., 2003). Hence, according to Raballand et al. (2003), five factors distinguish Central Asian economies from Central European land-locked countries: geography, unbalanced trade,[10] rail management policies, corruption levels, and a low-income trap.

Central Asia exclusively exports a handful of commodities: crude oil, cotton, gold, metals (copper, aluminum, and iron), and natural gas. Two factors can explain why only commodities remain active. First, transportation costs are expensive except for these commodities, and second, rail transport constraints exporters who do not provide repeated large volumes of freight (Raballand et al., 2003). Fruit or canned fruits and vegetables are problematic to export as they require a cold supply chain. As a result, Central Asian republics are ending up exporting goods with lower value-added (Raballand et al., 2003). Having quite a similar trading pattern or commodity structure limits the potential for further intra-regional trade, too (Saroj Kumar, 2015).

[10] For example, because of unbalanced trade, freight container may even come back empty to its origin from Central Asian countries. As a result, freight forwarders increase the average price to the region.

The consequence of protectionist policy

Protectionism is usually disguised by the *import-substitution policy* (inward-oriented growth), which is usually put opposite to *export promotion policy* (outward-oriented growth) and adopted mostly by developing countries (Bruton, 1998; Yilmazkuday, 2003). The import-substitution policy refers to substituting imported goods with locally produced goods to meet internal demand. This industrialization policy especially gained fame during the 1960s as some countries had a vast internal market.[11] The government encourages this policy by imposing higher tariffs, quotas, as well as exchange rates, prices of the production, interest rate (Yilmazkuday, 2003). Import-substitution aims to promote economic growth, but, in the end, destroys the economy since domestic producers never qualify for the world export market in the absence of competition with foreign industries (Yilmazkuday, 2003). The Central Asian economies also chose this policy selectively or thoroughly as the way of economic development (Alam & Banerji, 2000; Anderson & Swinnen, 2008). This, in turn, led to inflated costs in trade and made the region unattractive to the world.

Trade policy regimes all over Central Asia vary from more liberal in the Kyrgyz Republic to relatively liberal in Kazakhstan and Tajikistan and to quite restrictive in Uzbekistan. Whereas tariffs are not predominantly restrictive by global standards, tariff structures are quite complex, and changes are not predictable or transparent. Non-tariff measures (NTMs) are extensive and pervasive. Whilst hard-data on NTMs in the region is still limited, anecdotal evidence suggests that NTMs and their associated implementing procedures leave considerable room for time-delays and discretion in trading (Saroj Kumar, 2015).

[11] Brazil is a follower of this policy during the 1960s. As a result, Brazil's exports and imports remained very 7% of GDP both in 1970 and 1998 (Irwin, 2009).

Empirical evidences in tariff liberalization and trade facilitation

First of all, let us go through existing literature that debates whether multilateralism benefits the developing world, including this study's interest – Central Asian Republics.

Table 6: Literature review summary of multilateralism and developing countries

Author(s)	The main conclusion for the pros
Drabek & Bacchetta, 2004	The WTO membership brings several vital benefits to the Members, but there are limits on how far and how much the Agreements can help.
Tomz, M. *et al.*, 2007	Trade is higher when both countries had GATT rights and obligations, either as formal members or as non-member participants, compared with dyads in which neither country belonged to the agreement.
Tang, Wei, 2009	On average, economic growth rises by 2.5% for at least five years after a country's GATT/WTO accession, leading to a permanently higher output of about 20%.
Felbermayr & Kohler, 2010.	WTO membership results in higher trade for developing countries than for industrial ones. WTO membership results in higher bilateral trade of about 40 percent, on average.
Chang, Lee, 2011	The GATT/WTO membership has a significant trade-promoting effect for dyads that have both chosen to be members. (The effect is larger than bilateral trade preference arrangements, GSP, and larger than when only one country in a dyad has chosen to be a member.)
Eicher & Henn, 2011	WTO membership fosters regional trade integration among developing country members at the expense of more distant trade.
Allee, Scalera, 2012	The more rigorous a state's accession to WTO, and thus the more significant the policy change required, the greater the benefits it will receive from membership in the organization.
Larch, M. *et al.*, 2019	GATT/WTO promoted trade between all countries (increased by 171%); the impact was much more vital for developing economies.
Author(s)	The main conclusion for the cons
Campos, 2004	WTO membership had a minor impact on trade openness, FDI, and growth, but a positive effect on domestic reform.
Subramanian, Wei, 2007	WTO membership appears to be more effective in terms of trade-creation for industrial countries than for developing countries.
Drabek, Woo, 2010	Disappointment and lesser benefits from the WTO membership usually happen when benefits are overestimated while implementation costs are underestimated.
Rose, 2004, 2005, 2007	The gravity model shows that belonging to WTO matters little, and hard to demonstrate GATT/WTO has encouraged trade.

Source: Author's own illustration

Typically, the WTO accession – a starting point of multilateralism boosts economic growth in developing countries by allowing for more significant economies of scale thanks to new market access. Countries undertaking the reforms

required to join the WTO tend to grow at around 2.5% points faster than others once the process is completed. Moreover, on average, those countries have grown 20% faster than the overall world average for the last twenty years (Tang & Wei, 2009).

Besides, developing countries appeal to more Foreign Direct Investment (FDI) using the WTO membership as a "seal of approval" recognized by the international business community (Evenett & Primo 2005; Drabek & Bacchetta, 2004). The accession offers a predictable business environment and gives investors a reliable guarantee that there will be no policy reverses. According to Winters (2002), trade reforms born from the WTO accession tempt efficiency in the allocation of resources and foster long-run growth and create more competitive markets with more crystal-clear and predictable policymaking. Since WTO accession helps a state to reform the economy (Staiger & Tabellini, 1999), a developing country that every so often struggles to reform may take WTO commitments as an opportunity to diversify and liberalize its economy (Campos 2004; Drabek & Bacchetta, 2004). WTO membership can be used to "buy" political support from those who have initially been against market-oriented reforms since it is justified as a synonym with access to foreign markets and lower-priced imports. (Tang & Wei, 2009).

Besides, developing countries appeal to more Foreign Direct Investment (FDI) using the WTO membership as a "seal of approval" recognized by the international business community (Evenett & Primo 2005; Drabek & Bacchetta, 2004). The accession offers a predictable business environment and gives investors a reliable guarantee that there will be no policy reversals. According to Winters (2002), trade reforms born from the WTO accession tempt efficiency in the allocation of resources and nurture long-run growth and create more competitive markets with more crystal-clear and predictable policymaking. Since WTO accession aids a state to reform the economy (Staiger & Tabellini, 1999), a developing country that often struggles to

reform may take WTO commitments as an opportunity to diversify and liberalize its economy (Campos 2004; Drabek & Bacchetta, 2004). As a synonym for access to foreign markets and lower-priced imports, WTO membership can be used to "buy" political support from those who have initially been against market-oriented reforms (Tang & Wei, 2009). Empirical studies document that tariff liberalization due to the multilateral and regional trade agreements improve economic welfare, and trade creation greatly exceeds trade diversion (Turakulov, 2020; Robinson & Thierfelder, 2002). According to Robinson and Thierfelder (2002), the welfare gains are more significant when models incorporate facet s of "new trade theory," such as increasing returns, imperfect competition, and links between tariff liberalization, capital accumulation, and total factor productivity growth. Freer trades offer a country the potential to arrange production more efficiently and provide consumers with the potential to consume more of every product (Thompson, 2011).

A recent WB study shows that acceding countries' exports grow faster starting two years before WTO membership and grow at an increased rate for at least the five years post-WTO accession. WTO accession is also correlated with higher import growth rates. As a result, the share of developing countries' trade in global trade has risen from 10 percent in the mid-1990s to more than 30 percent today. There is also evidence of a dramatic shift in foreign investment into acceding countries associated with WTO membership – even more dramatic than what is observed for exports and imports (Saroj Kumar, 2015).

However, along with the benefits mentioned above, the accession may come with some side-effects or bring lesser benefits than expected to a country's economy. Usually, the membership's dissatisfaction happens when benefits are overestimated while the implementation costs are underestimated by developing countries (Drabek & Woo, 2010). Campos (2004) uses panel data for 25 transition economies between

1990 and 1998 and finds that WTO membership had an insignificant impact on trade openness, FDI, and growth. One of the most popular and striking critical researches toward WTO was presented by Rose (2004, 2005, 2007). His extensive search reveals that countries belonging to the GATT/WTO do not have different trade patterns than outsiders. Using the Gravity Model, Rose (2004) compares the WTO countries with the outsiders in the system. He concludes that it is hard to prove that the GATT/WTO has encouraged trade (Rose, 2004) or made trade flows more stable and predictable (Rose, 2005). Also, Rose (2007) believes that GATT has not brought a profound effect on developing countries' economies. Tomz et al. (2007), as well as Chang and Lee (2011), comment on Rose's skeptical note. According to them, the incorrect classification of many developing countries as outsiders of GATT members led to such a conclusion. When the countries are classified correctly (including de facto members), the result shows that GATT/WTO has a significant trade-promoting effect. Subramanian and Wei (2007) also refuse Rose's 'paradox' and find that GATT/WTO promoted the trade splendidly but unevenly. That is, according to them, the WTO membership creates more effective trade for industrial countries than for developing ones. That is because developed states engage in more tariff liberalization and obligations. The more rigorous a state's accession to WTO, and thus the more significant the policy change required, the higher the benefits it will receive from accession (Allee & Scalera, 2012; Larch et al., 2019).

Tariff liberalization and trade facilitation analysis in Central Asia

There are no empirical studies to evaluate specifically the tariff liberalization (reduction/elimination) and trade facilitation impacts in Central Asian nations as a whole to the author's best knowledge. However, some studies analyze Central Asian republics one by one. The largest economy – Kazakhstan, is studied much. For example, Nugumanova (2017) simulated two scenarios: the CU among Russia, Kazakhstan, and Belarus (1); and bilateral full tariff liberalization between China

and Kazakhstan (2) using GTAP CGE (static) model. In the first scenario, Kazakhstan's welfare and GDP decreased by $215 million and 0.04%, accordingly. In the second scenario, Kazakhstan gains $261 million in welfare but loses 0.03% in GDP (Nugumanova, 2017). Turakulov (2020) also estimated that 'full' membership of Kazakhstan leads to $631 million in welfare gain and 0.2% GDP growth (Turakulov, 2020). Kazybayeva and Tanyeri-Abur (2003) analyzed Kazakhstan's accession based on two sets of scenarios by CGE modeling: a 50% reduction of tariffs in individual sectors and all sectors, and a 100% tariff in individual sectors, and all sectors protection under import substitution policy. The former shows that the GDP and welfare increased, and the unemployment decreased while the latter represents that the GDP and household welfare decreased along with the unemployment rate increased. Jensen and Tarr (2007) also analyzed Kazakhstan's WTO accession by developing a 56-sector small, open economy comparative static CGE model of Kazakhstan. Their findings show that Kazakhstan would gain 6.7% of the value of consumption in the medium run and 17.5% in the long run from WTO entry. The authors estimated that FDI liberalization in services could account for 70% of the total gains. Hindley (2008) pointed out that membership in the WTO would have more impact on imports than exports. The largest source of gains would come from a better institutional framework, liberalization of foreign investments, and a reduction in corruption (Hindley, 2008). Song (2010) projected that Kazakhstan's GDP would increase by 0.02% following WTO membership, according to CGE analysis. Potential FTAs with Korea, Japan, and China appears to improve Kazakhstan's terms of trade, although joining the WTO has an insignificant effect on Kazakhstan's terms of trade.

As for trade facilitation in Central Asia, regional cooperation can also have a massive dividend in facilitating trade. With reliance on other countries for transit to

reach ports, improvements in one country alone will not yield the expected results. A joint approach to education policies, NTMs, corridor management, and border crossing procedures would add considerably to the more efficient movement of goods and people (Saroj, 2015). High costs of international trade in Central Asia are a symptom and a cause of regional disintegration (Pomfret, 2019).

IV. EMPIRICAL ANALYSIS

Before starting the experiments, the tariff data is updated to the latest data using the AlterTax tool of RunGTAP software (see the updated data in Appendix B). This updated scenario becomes the baseline scenario for research experiments.

Regional and sectoral data aggregation

The GTAB v10 distinguishes 65 sectors in each of the 141 countries/regions. These regions and sectors are aggregated according to the research focus. For example, this research is dedicated to the Central Asian economy. So 141 GTAP regions are aggregated as Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, CIS_FTA (the former Soviet Union states that have FTA with Central Asian countries), and the remaining countries as ROW (Appendix C to see in detail). As for the sectors, the primary industries of Central Asian countries, namely, agriculture, extraction (oil, gas, coal), processing foods, manufacturing (heavy and light), vehicles (commercial and passenger transportations), and other services are chosen as the research focus (Appendix D). Overall, in this study, 141 regions are mapped into seven regions, and 65 sectors are aggregated as six industries for Scenario One, Two, and Three. Scenario Four – trade facilitation scenario post-Customs Union in Central Asia (CACU) – has three regions CACU (Central Asia Customs Union), CIS_FTA, and ROW (Table 7).

Table 7: GTAP regional and sectoral aggregation

Aggregated regions		**Aggregated sectors**
Scenario One, Two, Three	*Scenario Four*	*For all Scenarios*
Kazakhstan Kyrgyzstan Tajikistan Turkmenistan Uzbekistan	CACU	Agriculture Extraction ProcFood (processing foods) Manufacture Vehicles OthServices (other services)
CIS_FTA (CIS countries)	CIS_FTA (CIS countries)	
ROW (rest of the world)	ROW (rest of the world)	

Experiment #1: WTO membership and trade facilitation effect

To simulate the economic impacts of tariff liberalization (tariff reduction and/or elimination) and trade facilitation in Central Asian republics, the research conducts two main experiments. **The first experiment** simulates the WTO membership of Turkmenistan and Uzbekistan and trade facilitation due to the membership in *Scenario One* and *Scenario Two*. **The second experiment** tries to measure the economic impact of the Customs Union (CU) among Central Asian countries and the free movement of goods among the five nations, and trade improvement toward the world in *Scenario Three and Four*. Each experiment has two scenarios, as described fully in Table 8.

Table 8: Description of research experiments and scenarios

Ex#	Scenario	Description	Shock list	Baseline Scenario (BS)
Experiment #1: WTO and TF	Scenario #1	Uzbekistan and Turkmenistan join WTO.	Adopt Kazakhstan's tariff commitment as a shock.	Tariffs are updated to the latest one
	Scenario #2	TF in CA increases due to WTO membership and its trade facilitation agreement.	Each Republic levels up in TF to the level of the country before itself	New BS based on S1
Experiment #2: CU and TF	Scenario #3	Customs Union (CU) in CA with Common External Tariff (CET)	Kyrgyzstan's tariff system is adopted as CET	New BS based on S2
	Scenario #4	Trade is facilitated due to the CU formation in CA	Trade facilitation rose to 14% in CACU	New BS based on S3 and Central Asian states is aggregated as CACU.

Note: All experiments are conducted in RunGTAP software that utilizes data of GTAP version 10. The results are static.

Scenario One (S1) explores the economic impact of WTO membership of Uzbekistan and Turkmenistan. As mentioned above, Uzbekistan is accelerating WTO membership, and currently, negotiations are taking place in Geneva (as well as through virtual meetings). Also, Turkmenistan acceded to its observer status of WTO in July this year. The research assumes that Uzbekistan and Turkmenistan join WTO following the most recent WTO acceder – Kazakhstan's tariff commitments

path. For example, Kazakhstan's tariff in agriculture was reduced by 23.6% post-WTO entry. More likely, Uzbekistan and Turkmenistan's WTO tariff commitments will become around this percentage changes (Table 9). Hence, for example, a 23.6% reduction is considered as the first scenario's shock for the agricultural sector.

Table 9: Assumed changes in Turkmenistan and Uzbekistan's tariff (S1)

	Kazakhstan's tariff pre- and post-WTO entry			Tariff shocks after WTO entry	
	2010	2020	change (%)	Turkmenistan	Uzbekistan
1 Agriculture	11.4	8.7	-23.6	13.9	11.7
2 Extraction	7.1	4.0	-43.2	0.7	8.2
3 ProcFood	11.5	7.0	-38.8	9.2	4.6
4 Manufact	8.2	5.9	-27.7	1.7	5.6
5 Vehicles	8.6	7.1	-17.6	0.4	10.8
6 OthServices	2.5	5.0	100.0	0.0	0.0

Source: Author's computation and aggregation based on WITS data

Scenario Two (S2) deals with trade facilitation in Central Asian countries. After all Central Asian nations join WTO, they should fulfill the trade facilitation (TF) commitments. It is expected that WTO membership improves the trade atmosphere in Central Asian economies. According to WTO (2015), trade facilitation is likely to boost developing countries' exports by 3.5% annually and augment their economic growth by 0.9% each year.

TF refers to all measures towards simplifying procedures and reducing costs in international trade; it encompasses from clearance of goods across borders within the shortest time at minimum cost to unnecessary administrative burdens on cross-border movement of goods and services. So, it is complicated to measure it.

There are mainly two substitute ways to measure the trade environment in a country. *The first one* is the *ad valorem tariff (AVE)* equivalent method in which trade costs associated with soft infrastructure are seen as a tariff burden. By removing such an amount of tariff, we assume that trade costs are eliminated to that extend. This approach appears to be more direct and logical but has several serious problems. For

example, it leads to biased welfare results since they include the 'imaginary' tariff revenue gains and losses associated with TF.

Moreover, the tariff-equivalent mechanism unacceptably ignores the fact that TF reduces prices and increases demand simultaneously (Narayanan et al., 2016). *The second one* is shocking on the import-augmented technological change (*'ams' variabl*e) in the GTAP CGE model. A positive change in this exogenous variable leads to higher effective demand and lower effective prices; thus, its effects are much more pronounced than a commensurate degree of tariff shock (Narayanan et al., 2016). To understand the reason, one should grasp how trade is determined in the GTAP model. Two main factors drive changes in bilateral trade flow in the GTAP model:

1. The prices of bilateral imports (driven by market prices in the exporting country, export taxes/subsidies, transportation margins, and import tariffs).

2. Aggregate imports demand in the domestic market.

…and the third factor which captures effects other than prices and domestic demand for imports.

3. All other factors unobserved in the model, called *'import-augmented technological change.'*

Increases in this variable would lead to increased demand for imports as well as their reduced 'effective' prices, as seen in the equation below:

Figure 3: Impact of a change in 'ams' variable

$$qim_{bilateral} = D_{im.demand} + \text{'ams'} - \sigma_{CES} * (pim - \text{'ams'} - pim_{agg})$$

Thus, when no other prices and quantities change and 'ams' increases by 1%, bilateral imports increase by $(1 + \sigma_{CES})$ percent.

To shock the 'ams' variable, we utilize the World Bank's global Logistics Performance Index (LPI) as a benchmark. The LPI includes overall trade logistics performance—both *'soft'* and *'hard'* infrastructural issues. As presented in Table 4, Kazakhstan's LPI is the highest in Central Asian countries. The research question is, *what if each Central Asian economy reaches the TF/LPI level of the country ranking right before, as described in Table 10?* For example, Uzbekistan jumps from a 2.58 score in the LPI to the level of Kazakhstan – 2.81 LPI. So, 'ams' shock for Uzbekistan would be 8.9%. Note that, for the sake of reality, we assume that Kazakhstan also raises its TF (1.4% in 'ams') to the level of Iran (2.85 LPI) – the best performer in the region.

Table 10: Assumed changes in Central Asian economies' TF (S2)

	2018 LPI	change (ams, %)	Aftershock LPI
Kazakhstan	2.81	1.4	2.85
Uzbekistan	2.58	8.9	2.81
Kyrgyzstan	2.55	1.2	2.58
Turkmenistan	2.41	5.8	2.55
Tajikistan	2.34	3.0	2.41

Source: Author's computation based on World Bank LPI (2018)

Experiment #2: CU among Central Asian economies

The second experiment tries to measure the economic impact of the Customs Union (CU) among Central Asian countries and free movement of goods among the five nations, and trade improvement toward the world (ROW and CIS_FTA region in our aggregated data).

Scenario Three (S3) simulates the economic impact of the Customs Union (CU) formation in Central Asia. (We name this trade deal as CACU.) The CU is a preferential agreement in which all tariffs between members are eliminated. A common external tariff (CET) is established to 'outsiders.'

Table 11: Assumed CET for Customs Union of Central Asia (S3)

	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
1 Agriculture	9.9	6.6	10.0	18.2	15.3
2 Extraction	2.7	3.4	5.0	1.2	14.4
3 ProcFood	5.9	4.4	8.9	15.1	7.6
4 Manufact	3.7	4.2	8.8	2.3	7.8
5 Vehicles	6.9	5.3	4.7	0.5	13.1
6 OthServices	0.0	0.0	0.0	0.0	0.0

Source: Author's computation based on World Bank LPI (2018)

As the tariffs between Central Asian countries already zero (*de jure*) due to the CIS FTA, we set common external tariff (CET) for 'outsiders.' Usually, setting CET among the member countries is challenging since each party's interest should be concerned. That is why the research adopts the tariff system of the most liberalized Central Asian state, the Kyrgyz Republic. For example, once Kyrgyzstan's 6.6% tariff in agriculture is adapted as CET, all remaining countries gradually decrease their agricultural tariffs by 6.6% (Table 11). For the sake of reality, since 'Extraction' is the major industry in Kazakhstan and Turkmenistan, the average of 2.7% and 1.2 is adopted. In the case of the 'Vehicles' industry, the average 10% of Uzbekistan and Kazakhstan is set as CET as these two countries have automobile industry. Therefore, the S3 sets these tariffs as a target rate and see the economic impact.

Scenario Four (S4) estimates the free movement of goods across Central Asia without borders. Simultaneously, due to the CU, Central Asia is expected to facilitate trade for exporters from the ROW and CIS_FTA region. Hence, we assume that overall TF should increase because of the newly created CU.

As we saw in Table 10, each Republics' TF rises thanks to the Trade Facilitation Agreement of WTO in Scenario Two. Hence, the average of the CACU region's TF is now 2.63 LPI. Then, we assume that the CACU reaches 3.0 LPI of Saudi Arabia, Brazil, Lithuania, due to the integration in the region. In this case,

'ams' in the CACU region is ought to increase by 14%. So, in short, S4 quantifies the economic impacts of the "what if the CACU facilitates its trade atmosphere by raising it to 14%" question.

V. RESULTS OF ECONOMIC MODELING SCENARIOS

In this chapter, we deliberate the results of our analysis in the following sequence. Firstly, we look into the macroeconomic and more aggregated sectoral results. Then we focus on trade-related and industry level outcomes.

In the GTAP CGE model, tariff elimination or reduction reduces the domestic market prices of imports. This, in turn, results in augmented demand for imports by firms for intermediate inputs, by private households, and government for consumption. Low-priced imported intermediate inputs for firms also reduces the cost of production across a variety of commodities. Additional, reduced demand for domestic production results in a surplus supply situation, which can be corrected by reducing market prices to get equilibrium.

In bilateral relations, when an importer country reduces tariffs on its partners, the degree of increase or decrease of imports from each of them would depend on two opposite effects - *trade creation* and *trade diversion*. In the GTAP model, trade creation occurs by overall expansion in demand for cheaper imports, and trade diversion does by expanding exports by partners facing higher tariff reduction at the cost of others, accomplished in terms of a response to price differentials. This is the primary mechanism that impacts bilateral trade. The shocks on trade facilitation also act similarly by dropping the effective prices of imports and raising the demand for imports.

To conduct the scenarios, the RunGTAP – a visual interface to various GEMPACK programs – is employed. The RunGTAP allows the user to run simulations interactively in a Windows environment using the GTAP general equilibrium model. Its default (macroeconomic) closure can be adjusted according to the research objective. Then, the researcher chooses interested variables to shock

and method of solutions. The result appears on the 'Result' page, and a careful interpretation is required from the researcher.[12]

Macroeconomic outcomes

Welfare changes are measured in equivalent variations (EV), a measure of economic welfare changes associated with price changes. The EV is the change in wealth, at current prices, that otherwise would have the same effect on consumer welfare as would the change in prices while income is unchanged. Economic welfare is the volume of money that consumers in a region would pay instead of facing the changes in prices and quantities resulting from the simulation shocks. It is entirely different from GDP, representing the total value added in the economy (Narayanan et al., 2016).

Table 12: Short- and long-term economic welfare changes (million USD)

Short term	Scenario 1	Scenario 2	Scenario 3	Scenario 4
1 Kazakhstan	0	958	5	13,964
2 Kyrgyzstan	0	121	4	
3 Tajikistan	0	220	-81	
4 Turkmenistan	-6	624	37	
5 Uzbekistan	-13	1,049	-14	
6 CIS_FTA	-20	-38	-4	-247
7 ROW	96	102	89	709
Long term				
1 Kazakhstan	-26	2,330	-19	31,366
2 Kyrgyzstan	0	236	5	
3 Tajikistan	-1	501	-32	
4 Turkmenistan	24	1,226	-116	
5 Uzbekistan	145	2,179	192	
6 CIS_FTA	-88	60	-21	726
7 ROW	-94	-1,263	284	5,202

Source: Author's computation by GTAP CGE model (RunGTAP)

Welfare changes

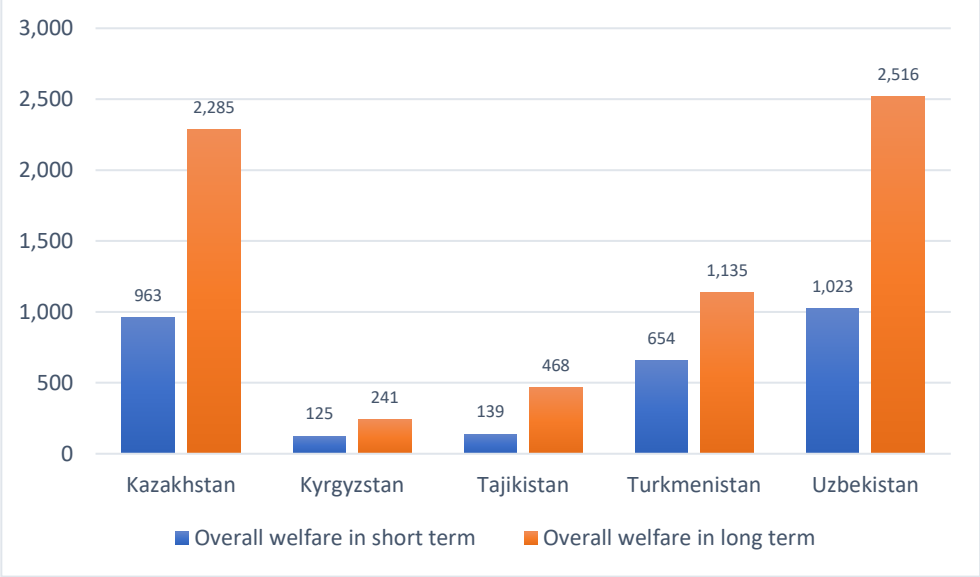
Table 12 presents short- and long-term economic welfare changes for all scenarios. Note that, as we discussed above, Central Asian states are aggregated as one – CACU region in Scenario Four. As you can see, the WTO entry of Uzbekistan

[12] The RunGTAP is fully documented in here: https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=1638

and Tajikistan brings adverse economic welfare effects to both country and the CIS_FTA region in the short-run. The ROW region gains $96 million. However, as time goes by, in the long-term, the WTO membership gradually brings benefits to Turkmenistan and Uzbekistan, $24 and $145 million, respectively. The remaining region sees negative economic welfare because it is merely an occurrence of trade diversion in those regions. This holds for S2. When trade is facilitated because of WTO membership, Central Asian economies are gaining overall $2,971 million in the short term while $6,472 million in the longer-term. Since the S2 assumes no trade facilitation in the ROW and CIS_FTA region in the meantime, these two regions become relatively lesser attractive to trade. The CIS_FTA region sees welfare-loss in the short-term but welfare-gain in the long-term.

When Central Asian republics establish CU in S3, Tajikistan and Uzbekistan undergo a negative economic welfare effect. As time goes by, the situation changes. Kazakhstan and Turkmenistan start having negative welfare – -$19 million and -$116 million, accordingly, while Uzbekistan becomes the most beneficiary with $192 million in the region. Tajikistan's loss lessened from -$81 million to -$32.

Figure 4: Overall welfare gain in short- and long-term (million USD)



Source: Author's own illustration based on the scenarios result

Simultaneously, the CIF region is expected to lose from CU formation by the Central Asian region while the world benefits. We assume, due to the CU formation in S4, CA improves its trade atmosphere. Central Asian nations enjoy a large amount of economic welfare both in the short- and long-term in this case, overall, $13,964 million, and $31,366 million, accordingly.

The Central Asian region gains combined welfare of $2,903 million in the short-term and $6,645 million in the long-term due to the overall effect of WTO membership (S1), trade facilitation (S2), and CU formation(S3), as described by Figure 4. Uzbekistan and Kazakhstan – the largest economies in CA – gain significantly much more in comparison to their neighbors. It is because *"welfare gains appear to be bigger for larger economies in general, indicating that economic size matters more than the extent to which each country improves its trade facilitation"* (Narayanan et al., 2016). Overall, the welfare gains are more obvious when the trade facilitation scenarios (S2 and S4) are concerned (see scenario-wise chart in Appendix E).

GDP changes

Table 13 illustrates real GDP changes in conducted scenarios. The changes in long-term scenarios are much more conspicuous. The S1 – WTO membership scenario – indicates that Turkmenistan and Uzbekistan see a slight increase in their GDP in the short-term, 0.01% and 0.04%, respectively. Their WTO membership does not affect other regions as they both are small economies. Nevertheless, in longer terms, trade in Kazakhstan and Tajikistan seems to be diverted to Turkmenistan and Uzbekistan. Consequently, it is predicted that Turkmenistan and Uzbekistan have more GDP increase – 0.09% and 0.42%, respectively – at their neighbors' expense (providing that other variables are consonant).

When the trade environment is facilitated in Central Asian states due to the

WTO trade facilitation agreement (S2), all countries see a positive economic impact. Uzbekistan gains much – 2.30%. In the long-term, Tajikistan's GDP rises by 7.12%, following by Uzbekistan (5.04%), Kyrgyzstan (4.06%), Turkmenistan (3.01%), and Kazakhstan (1.10%).

Table 13: Short- and long-term real GDP changes (%)

Short-term	Scenario 1	Scenario 2	Scenario 3	Scenario 4
1 Kazakhstan	0.00	0.40	0.00	
2 Kyrgyzstan	0.00	1.76	0.01	
3 Tajikistan	0.00	1.84	0.23	4.26
4 Turkmenistan	0.01	1.46	0.03	
5 Uzbekistan	0.04	2.30	0.04	
6 CIS_FTA	0.00	0.00	0.00	-0.01
7 ROW	0.00	0.00	0.00	0.00
Long-term				
1 Kazakhstan	-0.01	1.10	-0.01	
2 Kyrgyzstan	0.00	4.06	0.03	
3 Tajikistan	-0.01	7.12	1.08	10.41
4 Turkmenistan	0.09	3.01	-0.36	
5 Uzbekistan	0.42	5.04	0.53	
6 CIS_FTA	0.00	0.00	0.00	0.03
7 ROW	0.00	0.00	0.00	0.01

Source: Author's computation by GTAP CGE model (RunGTAP)

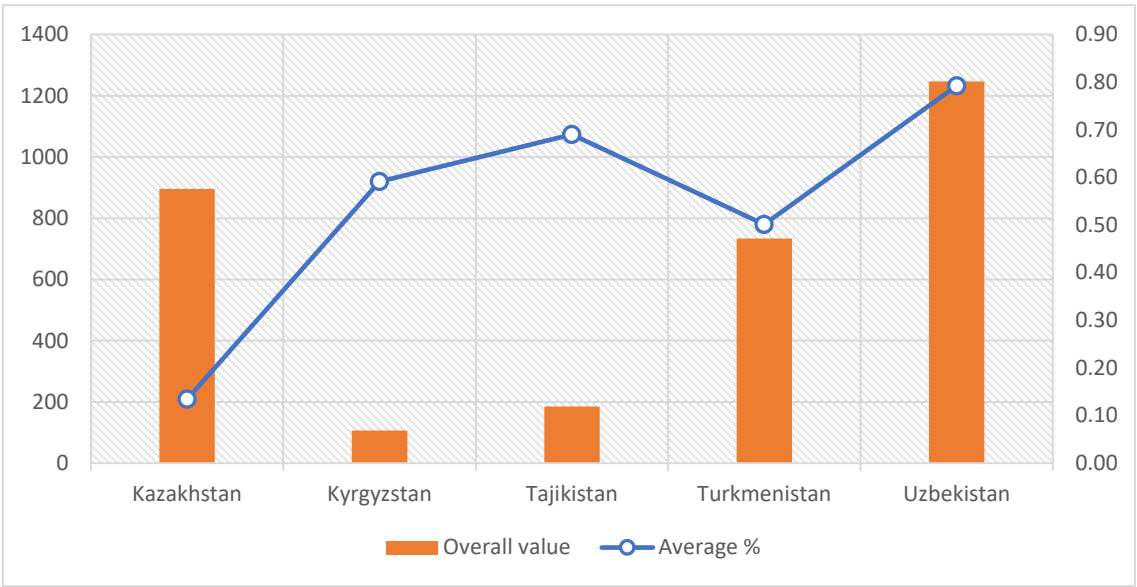
When the CU is established (S3), all regions are estimated to win in GDP terms in the short-time, while Central Asian oil and gas-rich states – Kazakhstan and Turkmenistan – lose slightly in long-term scenarios. After the trade environment is enhanced in S4, the GDP of the CACU region increases by 4.26% in the short-term and 10.41% in the long-term. Also, the world sees a relatively positive effect because of the trade facilitation in the CACU region.

A question arises: Why do Tajikistan, Turkmenistan, and Kyrgyzstan gain much more than Kazakhstan in terms of real GDP changes while Kazakhstan's welfare-gain is much higher than that of these states?

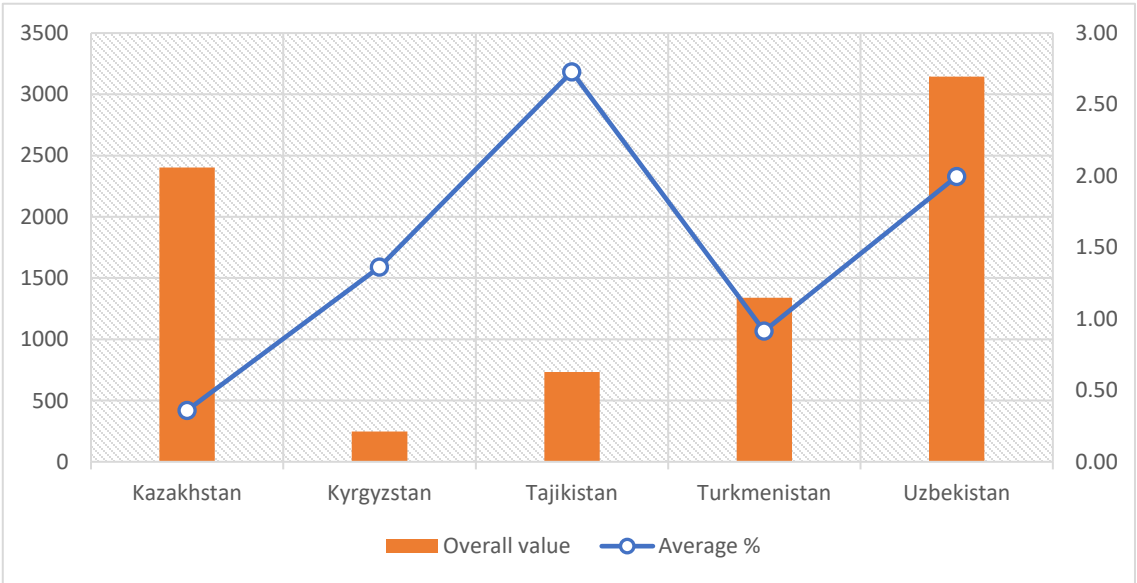
Answer: To answer the question, we should look at the GDP changes from a

value point of view rather than a percentage viewpoint. A percentage shows the *'speed'* of changes, not the *'value'* of changes. Figure 5 shows the GDP changes in overall value ($, million) and average percentage (%) of S1, S2, and S3 for the short- and long-term. As you can see through <Chart a>, despite Tajikistan and Kyrgyzstan see much higher average GDP changes (%), the value they gain as million USD is much lesser than that of Kazakhstan. This holds for <Chart b> for a longer-term. That is because the economies of Tajikistan and Kyrgyzstan are the smallest in Central Asia. *The bigger economy, the bigger value (USD) in GDP. The smaller economy, the more significant percentage changes (%).*

Figure 5: Average percentage and overall value for short- and long-terms



a) Changes in short-term



b) Changes in short-term

Source: Author's own illustration based on the scenarios result

Poverty reduction impact

The extent of poverty reduction because of an increase in growth has been projected at between 2-3% for a 1% rise in income (Ravallion & Chen, 1997; World Bank, 2000). A typical estimate from some cross-country studies is that a 10% increase in a country's average income will reduce the poverty rate by between 20-30% (DFID, 2008).

Table 14: Overall poverty reduction rates in Central Asia countries(%)

Scenarios	Short-term	Average GDP percentage gain	Poverty reduction
Scenario One, Two, Three	Kazakhstan	0.13	0.26
	Kyrgyzstan	0.59	1.18
	Tajikistan	0.69	1.38
	Turkmenistan	0.50	1.00
	Uzbekistan	0.79	1.58
Scenario Four	CACU	4.26	8.52
	Long-term		
Scenario One, Two, Three	Kazakhstan	0.36	0.72
	Kyrgyzstan	1.36	2.72
	Tajikistan	2.73	5.46
	Turkmenistan	0.91	1.82
	Uzbekistan	2.00	4.00
Scenario Four	CACU	10.41	20.82

Source: Simulation results on GDP, assuming that 1% of GDP growth reduces poverty by 2%.

> *"The central lesson from the past 50 years of development research and policy is that economic growth is the most effective way to pull people out of poverty and deliver on their wider objectives for a better life" (DFID, 2008).*

Another study finds that a 1% increase in per-capita income may reduce income poverty by as much as 4% (or by less than 1%, depending on the country's initial circumstances, namely the distribution of assets, ownership, etc.). [13] Narayanan et al. (2016) utilize a conservative assumption of a one-to-one reduction in poverty when GDP grows. In this study, we utilize the mean of all of the findings above.

Table 14 summarizes the overall poverty reduction rates in Central Asian

[13] Economic growth versus poverty reduction: A "hollow debate"? - OECD Observer. (2017). Oecdobserver.org.

countries because of S1, S2, and S3 and in the CACU region because of S4. In the short-term, populous Uzbekistan could decrease the poverty rate by 1.58% on average while Kyrgyzstan, Tajikistan, and Turkmenistan by around 1.00-1.38%. In the case of S4, the overall poverty rate in the CACU region is estimated to drop by 8.52%. In the long-term scenarios, Tajikistan reduces the poverty rate the most – 5.46%, following Uzbekistan 4%, Kyrgyzstan 2.72%, Turkmenistan 1.82%, and Kazakhstan 0.72%. The CACU territory could reduce the poverty rate by 20.82%.

Job creation effect

Employment gain is another significant benefit of tariff liberalization and trade facilitation in Central Asian states. Economic growth generates job opportunities and hence more robust demand for labor which is usually the poor's sole asset.

Table 15: Employment rate increase in Central Asian republics (%)

Scenarios	Short-term	Average GDP percentage gain	Employment increase range
Scenario One, Two, Three	Kazakhstan	0.13	0.04-0.10
	Kyrgyzstan	0.59	0.18-0.47
	Tajikistan	0.69	0.21-0.55
	Turkmenistan	0.50	0.15-0.40
	Uzbekistan	0.79	0.24-0.63
Scenario Four	CACU	4.26	1.28-3.41
	Long-term		
Scenario One, Two, Three	Kazakhstan	0.36	0.11-0.29
	Kyrgyzstan	1.36	0.41-1.09
	Tajikistan	2.73	0.82-2.18
	Turkmenistan	0.91	0.27-0.73
	Uzbekistan	2.00	0.60-1.60
Scenario Four	CACU	10.41	3.12-8.33

Source: Simulation results on GDP, assuming that 1% of GDP growth increases employment between 0.3-0.8%.

There is a robust relationship between economic growth and the employment rate. Typically, if real GDP increases, employment rises, and the unemployment rate falls, and vice versa. The standard Cobb-Douglas production function suggests that the relationship between output and employment should be positive (An et al., 2019). For every 1% increase in GDP, employment increases by a range of 0.3-0.8%

(Hufbauer et al., 2013).[14] When these ranges are applied per 1% gain in GDP, we will summarize the result like in Table 15.

Table 15 highlights that employment increase expectations under all scenarios are quite robust. In the short-run, the job creation would be 1.28-3.41% in the CACU region while 3.12-8.33% in the longer-term scenarios. The average employment increase range as a result of average gains from S1, S2, and S3 scenarios would be 0.16% to 0.43% in the short-term and 0.44% to 1.17% in the long-term.

Trade and industry level outcomes

Impact on the trade balance

Table 16 illustrates the impacts on trade balance under different scenarios over short-and long-period in million USD. The first thing easily noticeable is that Kyrgyzstan and Tajikistan see a trade deficit more than their neighbors. This holds

Table 16: Impact on Trade Balance in short- and long-run (million USD)

Short-term	Scenario 1	Scenario 2	Scenario 3	Scenario 4
1 Kazakhstan	-2	-9	-2	
2 Kyrgyzstan	1	-149	-5	
3 Tajikistan	1	-317	96	181
4 Turkmenistan	-13	67	30	
5 Uzbekistan	-40	82	-52	
6 CIS_FTA	15	-28	5	-152
7 ROW	38	354	-72	-29
Long-term				
1 Kazakhstan	-4	157	-5	
2 Kyrgyzstan	1	-325	-6	
3 Tajikistan	1	-366	83	753
4 Turkmenistan	-14	40	38	
5 Uzbekistan	-49	19	-65	
6 CIS_FTA	-4	9	-3	-26
7 ROW	69	466	-42	-727

Source: Author's computation by GTAP CGE model (RunGTAP)

[14] In South Africa, Australia, and Canada, a 1% increase in GDP is matched by an increase in employment of 0.6% or higher. In contrast, there is virtually no response of employment to growth in China, Turkey, and Indonesia. – IMF Blog. (2020). The Crisis is Not Over, Keep Spending (Wisely).

particularly true for the trade facilitation scenario in S2. The trade deficit of Kyrgyzstan and Tajikistan -$149 million and -$317 million in the short-term while -$325 million and -$366 million in the long-term. However, the words 'positive' and 'negative' in the trade balance have only a numerical meaning. They do not necessarily reflect whether the economy of a country is performing healthy or not. A trade deficit here may, for instance, reflect an increase in domestic demand for goods destined for consumption and production. The overall trade balance due to the trade facilitation in the CACU region through S4 would be $181 million in the short-term and $753 million in the long-term.

Changes in industry level

Table 17 and Table 18 summarizes changes in the industry quantity *(qo)* under all scenarios throughout the short- and long-run, respectively. Apparently, in the short-term, overall industry quantity does not increase as much as it does in long-term scenarios. Significantly, as you can see, under the trade facilitation scenarios (S2 and S4) in the short-term, Central Asian economies' output shrinks too much extent. This is certainly true in the case of Tajikistan. It should signal that Tajikistan uses a careful approach during the negotiations. Tajikistan's manufacturing sectors seem to need a longer phase-out period to lessen the transition. Because, in the long-run, the country will be the most gainer overall (Table 18).

In the long-term, the Central Asian states increase industry output (Table 18). As we can see when the trade regime is facilitated (in S2 and S4), the industry output boosts. Tajikistan, in this case, becomes the ultimate winner. The CACU region gains in the longer-term, ranging from 2.36% to 8.1% while the CIS_FTA and ROW also slightly increase their output.

Table 17: Changes in the industry outputs in the short-term

Scenario 1	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
Agriculture	-0.06	0	-0.01	-0.09	-0.13
Extraction	0.01	0	0.01	0.06	0.08
ProcFood	-0.15	-0.01	0	-0.75	-0.22
Manufact	0.02	0.02	0.08	-0.2	-0.56
Vehicles	-0.72	0	0.07	0.59	-0.28
OthServices	0.01	0	0	0.05	0.11

Scenario 2	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
Agriculture	0.19	-0.43	0	0.14	-0.1
Extraction	-0.02	-0.98	-4.28	0.29	0.18
ProcFood	-0.07	-0.62	-2.87	-1.64	-2.33
Manufact	-1.04	-3.09	-14.74	-3.89	-3.87
Vehicles	-2.62	-1.7	-4.88	-1.89	-1.72
OthServices	0.09	0.77	0.72	0.42	0.64

Scenario 3	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
Agriculture	-0.34	-0.08	-0.39	-0.38	-0.37
Extraction	0.02	-0.04	2.04	-0.07	0.09
ProcFood	-0.32	-0.08	-0.39	-0.63	0.34
Manufact	0.28	0.15	6.92	1.49	-0.15
Vehicles	-1.43	-0.12	13.71	2.09	-3.67
OthServices	0.01	0.02	0.11	-0.05	0.12

Scenario 4	CACU	CIS_FTA	ROW
Agriculture	-0.18	0.03	0.01
Extraction	0.09	-0.04	-0.05
ProcFood	-3.44	0.11	0
Manufact	-8.61	0.06	0
Vehicles	-11.22	-0.25	-0.01
OthServices	1	0	0

Source: Author's computation by the GTAP CGE model (RunGTAP)

Table 18: Changes in the industry outputs in long-term

Scenario 1	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
Agriculture	-0.06	-0.01	-0.01	-0.06	0.09
Extraction	0.01	0	0.01	0.1	0.23
ProcFood	-0.16	-0.01	-0.01	-0.69	0
Manufact	-0.01	0.01	0.03	-0.07	0
Vehicles	-0.73	-0.01	0.04	0.74	0.29
OthServices	-0.01	0	-0.01	0.14	0.55

Scenario 2	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
Agriculture	0.57	0.34	2.24	0.82	1.47
Extraction	0.28	-0.2	-1.26	0.94	1.2
ProcFood	0.75	0.36	3.39	-0.6	-0.85
Manufact	0.45	0.42	3.73	-1.33	0.07
Vehicles	-0.47	-0.27	6.12	1.14	2.34
OthServices	0.9	3.63	7.18	2.29	3.81

Scenario 3	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
Agriculture	-0.34	-0.07	-0.01	-0.55	-0.08
Extraction	0.01	-0.04	2.48	-0.24	0.28
ProcFood	-0.34	-0.06	0.65	-0.92	0.64
Manufact	0.25	0.18	10.26	0.8	0.6
Vehicles	-1.47	-0.11	15.6	1.31	-2.97
OthServices	0	0.05	1.15	-0.53	0.71

Scenario 4	CACU	CIS_FTA	ROW
Agriculture	2.51	0.06	0.02
Extraction	2.31	0	-0.01
ProcFood	2.32	0.1	0.01
Manufact	2.8	0.08	0
Vehicles	2.36	-0.03	0.01
OthServices	8.1	0.04	0.01

Source: Author's computation by GTAP CGE model (RunGTAP)

VI. CONCLUSION AND IMPLICATIONS

Conclusion and policy implications

Resource-abundant but land-locked Central Asia has been struggling from the issue of high trade costs since independence. Land-locked countries cannot easily create trade-favorable hard infrastructure comparing to their coastal counterparts. The only way to ease such a burdensome trade atmosphere and to cut the high costs was to liberalize the economy. However, the Central Asian authorities even failed to meet the most basic requirement to liberalize its trade regime. Except for Kyrgyzstan, the remaining Republics postponed the WTO entry for more than 20 years. Uzbekistan and Turkmenistan are not yet a member of the Organization. As a result, poor hard-infrastructure and insufficient soft-infrastructure imprisoned the region into a low-income-trap vicious cycle (Raballand et al., 2003). Consequently, Central Asia has lagged in many fields. Unemployment and poverty rate are higher than the world average. Even though the economic growth is moderate, the per capita does not promise profuse social life.

This research evaluated the current trade and economic regime in the Republics. Overall, the most liberal economy is Kyrgyzstan's, while the most developed one is Kazakhstan's. Unfortunately, Tajikistan is still considered the poorest among the five nations but has a modest growth rate. Despite Uzbekistan's economy is the second-largest, it is also famous for the protectionist trade regime with the highest tariff rates. Turkmenistan, as many know, is the most isolated country in the world and heavily relies on its gas earnings.

The research proposed the following policy-targeted solutions, which are backed up by GTAP CGE static modeling to overcome high trade costs in Central Asia:

1) First of all, Uzbekistan and Turkmenistan join WTO – the essential 'requirement' for regional and global integration for any country.

As a result of the membership, Uzbekistan and Turkmenistan lose a little – -$13 and -$6 million, respectively, in the short-term. As time goes by, they start benefitting in the long-term – a $24 million and $145 million as economic welfare. The GDP rises to 0.09% and 0.42%, respectively.

2) Trade facilitation scenarios presented significant outcomes. The authors assumed that trade in each Central Asian Republic is facilitated due to the WTO membership.

When this scenario is quantified, in the short-term, Uzbekistan's welfare gain is the most with $1,049 million, followed by Kazakhstan's and Turkmenistan's welfare gain of $958 million and $624 million, accordingly. In the long-term, Kazakhstan's welfare gain of $2,330 million outruns Uzbekistan's $2,179 million.

Trade facilitation is projected to bring robust GDP growth to the region. The growth ranges from 0.40% to 2.30% in the short-run and 1.10% to 7.12% in the long-run.

3) Five Central Asian Republics form the Customs Union. They create a common single market; solve the region-wide issues collectively; attract investors to take advantage of the populous region and inexpensive labor market; have a stronger voice in the geopolitical world.

The CU requires to remove tariffs among members and set CET for non-members. When tariffs are eliminated and reduced, the short-term economic effects show slight growth in each economy while long-term effects project that Central Asian oil and gas economies – Kazakhstan and Turkmenistan – see -0.01% and -0.36% decrease, respectively.

4) The CU merges the members' trade facilitation affairs and improves trading (Chimilila et al., 2014). The free movement of goods is guaranteed among the members, and this eases trade-related issues for non-members. On the other hand, once exporters from non-member countries cross the CU border, they freely move within the territory (in some cases, the rules of origin might be applied).

When the trade environment is improved among CU members and toward non-members, it is projected that the CACU region gains in economic welfare both in the short- and long-term. The GDP rises by 4.26% across the region in the short run by bringing $13,964 million welfare gain in the short-run. The growth is 10.41% and the welfare is $31,366 million in the long-run.

The proposed solutions mentioned above additionally promise to reduce poverty and create new workplaces. The poverty rate is expected to reduce in a range of 0.26% and 8.52% in the short-term. This figure is much more apparent in the longer-term – around 0.72% to 20.8%. The expectations in employment-increase under all scenarios are quite robust. In the short-run, the CACU region may create workplaces by 3.41%, while this may lead to an 8.33% rise in the long-run scenarios.

Based on the findings of the model scenarios and the related discussion, several policy recommendations can be suggested to the Central Asian officials:

- Central Asian republics need to integrate deeply more than ever. The region is considered as peripheral territory unless the ‘five-stans’ unite. The previous (unfinished) CACO (Central Asia Cooperation Organization) can be a blueprint in this regard.

- WTO membership is the initial step to harmonize trade rules among the republics. The remaining Central Asian republics should support Uzbekistan and Turkmenistan, at least, with their previous negotiating and technical experiences

regarding accelerating WTO entry.

- In the meantime, the CU formation should be considered, and a research working group that estimates the potential impacts should be established. The region needs a concrete road map considering the previous CACO (Central Asia Cooperation Organization) project as a blueprint.

- According to model scenarios, Kyrgyzstan and Tajikistan's economy should be analyzed cautiously. Tariff shocks seem fragile for these Republics.

- The model scenarios suggest that the impacts of trade facilitation are much more robust than that of merely tariff liberalization. Hence, trade facilitation cooperation is especially significant in terms of the region's well-being. Customs Union formation's objective should focus on trade facilitation "teamwork" rather than tariff elimination and reduction.

Implications for further research

Experimental studies and quantitative models' application always provide room for improvements, which refer to the data or the methodology applied. This research also has its limitations for further study.

First of all, the data quality should be further enhanced. The data of Turkmenistan should be officially confirmed. Despite the GTAP collects data and claims the data as to the 2015 reference year, the data comes from cross-country data for Turkmenistan. For example, Turkmenistan's tariff rates have not been officially announced since 2002. So, the authors used the "latest" available 2002 tariff rates data for Turkmenistan. Moreover, Uzbekistan's results would be much more precise if the country were included in the GTAP database. In this research, the authors split Uzbekistan and Turkmenistan, originally named 'Rest of Former Soviet Union,' in the GTAP database.

Secondly, to see the results year-by-year, running policy scenarios using a dynamic model can improve results and understand policy issues usually omitted by a static model.

Thirdly, macroeconomic closure in the model should be redefined for much more accurate outcomes. This is especially true in terms of trade effects in this study. In some cases, we can see that GDP rises while TOT worsens. Why is it so? It is due to the need to pass some of the productivity increase to customers through lower prices. Else, how can they absorb the higher relative production increase? Hence, a productivity change that allows a country to produce, say, twice as much wheat for the same factor input results in a price decrease passed through to international consumers (and which looks like a terms-of-trade decline despite the higher economic growth). Therefore, to absorb the increased production, the macroeconomic closure should be cautiously adopted.

Fourthly, the impacts of China's Belt and Road Initiative (BRI) should be quantified along with the above-proposed scenarios. This quantification, however, will be quite extensive research to conduct.

Lastly, the research considers free movements of goods when the CU is established. The free movements of labor, capital, and services are separate scenarios. This research did not comprehensively analyze the diverse benefits introduced through a CU in Central Asia. Of course, this will be possible only by predicting the type of agreement in advance. In the future, if a CU is promoted in the region, it will be necessary to analyze it while looking at the trend of discussion.

Bibliography

Aguiar, A., Chepeliev, M., Corong, E. L., McDougall, R., & van der Mensbrugghe, D. (2019). The GTAP database: version 10. Journal of Global Economic Analysis, 4(1), 1-27.

Aguiar, A., Narayanan, B., & McDougall, R. (2016). An overview of the GTAP 9 database. Journal of Global Economic Analysis, 1(1), 181-208.

Alam, A., & Banerji, A. (2000). Uzbekistan and Kazakhstan: a tale of two transition paths. World Bank Policy Research Working Paper (2472).

Allee, T. L. and J. E. Scalera (2012), "The Divergent Effects of Joining International Organizations: Trade Gains and the Rigors of WTO Accession", International Organization, 66(2), 243-276

Anderson, K., & Swinnen, J. (Eds.). (2008). Distortions to agricultural incentives in Europe's transition economies. The World Bank.

Brockmeier M. (1996): A Graphical Exposition of the GTAP-Model. GTAP Technical Paper No. 8. The University of Purdue. https://www.gtap.agecon.purdue.edu/resources/download/181.pdf

Bruton, H. J. (1998). A reconsideration of import substitution. Journal of economic literature, 36(2), 903-936.

Burfisher M. (2016): Introduction to Computable General Equilibrium Models. Cambridge University Press.

Campos, N. F. (2004), "What Does WTO Membership Kindle in Transition Economies? An Empirical Investigation", Journal of Economic Integration, 19(2), 395-415.

Cheong, I., 2012. Economic assessment of the Korea-US FTA. Korean Social Sciences Review | Vol. 2, No. 1

Chimilila, C., Sabuni, C., & Benjamin, A. (2014). Trade Facilitation in EAC Customs Union: Its Achievement and Implementation in Tanzania. In Journal of Economics and Sustainable Development www.iiste.org ISSN (Vol. 5, Issue 25).

Corong, E. L., Hertel, T. W., McDougall, R., Tsigas, M. E., & van der Mensbrugghe, D. (2017). The standard GTAP model, version 7. Journal of Global Economic Analysis, 2(1), 1-119.

DFID. (2008). Growth Building Jobs and Prosperity in Developing Countries.

Drabek, Z. and M. Bacchetta (2004), "Tracing the Effects of WTO Accession on Policymaking in Sovereign States: Preliminary Lessons from the Recent Experience of Transition Countries", World Economy, 27(7), 1083-1125.

Drabek, Z. and W. T. Woo (2010), Is the World Trade Organization Attractive Enough for Emerging Economies? (2010 ed.), London: Palgrave Macmillan, 249-294.

Evenett, S. J. and C. A. Primo Braga (2005), WTO Accession: Lessons from Experience (Trade Note 22), Washington, DC: International Trade Department.

Hertel T.W. (1999): Applied General Equilibrium Analysis of Agricultural and Resource Policies. Staff Paper 99-2. https://www.gtap.agecon.purdue.edu/resources/download/11.pdf

Hertel T.W. (2012): Global Applied General Equilibrium Analysis using the GTAP Framework. https://www.gtap.agecon.purdue.edu/resources/download/5663.pdf

Hertel, Thomas Warren, ed. 1997. Global Trade Analysis: Modeling and

Applications. New York: Cambridge University Press.

Hindley, B. (2008), Kazakhstan and the World Economy: An Assessment of Kazakhstan's Trade Policy and Pending Accession to the WTO (ECIPE, No. 01/2008), Brussels: European Centre for International Political Economy.

Hufbauer, G., Schott, J., Cimino, C., & Muir, J. (2013). Report to the Payoff from the World trade agenda 2013.

Huff K.M., Hertel T.W. (January 2000): Decomposing Welfare Changes in the GTAP Model. GTAP Technical Paper No.5. https://www.gtap.agecon.purdue.edu/resources/download/2365.pdf

Irwin, D. A. (2020). Free trade under fire (Third edition), Princeton University Press.

Jensen, J. and D. G. Tarr (2007), The Impact of Kazakhstan Accession to the World Trade Organization: a Quantitative Assessment (Policy Working Paper, No. 4142), Washington, DC: World Bank Group.

Larch, M., J. A. Monteiro, R. Piermartini and Y. Yotov (2019), On the Effects of GATT/WTO Membership on Trade: They are Positive and Large after All (Working Paper, No. ERSD-2019-09), Geneva, Switzerland: WTO

Lee, M. H., & Cheong, I. (2011). A Critical Review on Regional Integration Processes in East Asia. Journal of International Logistics and Trade, 9(2), 33-55.

MacKellar, L., Wörgötter, A., & Wörz, J. (2000). Economic development problems of landlocked countries.

Narayanan, B., Sharma, S., & Razzaque, M. (2016). Trade Facilitation in the Commonwealth: An Economic Analysis. Margin, 10(3), 305–336. https://doi.org/10.1177/0973801016645218

Nugumanova, L. (2017). Analysis of Macroeconomic Policies in Kazakhstan: A General Equilibrium Approach (Doctoral dissertation, Justus-Liebig-Universität Giessen).

Pomfret, R. (2019). The Central Asian economies in the twenty-first century: Paving a New Silk Road. Princeton University Press.

Raballand, G. (2003). Determinants of the negative impact of being landlocked on trade: an empirical investigation through the Central Asian case. Comparative economic studies, 45(4), 520-536.

Radelet, S., & Sachs, J. D. (1998). Shipping costs, manufactured exports, and economic growth.

Ravallion, M., & Chen, S. (1997). What Can New Survey Data Tell Us about Recent Changes in Distribution and Poverty? In Source: The World Bank Economic Review (Vol. 11, Issue 2). https://www.jstor.org/stable/3990232

Robinson, S., & Thierfelder, K. (2002). Trade liberalization and regional integration: the search for large numbers. Australian Journal of Agricultural and Resource Economics, 46(4), 585-604.

Rose, A. K. (2004), "Do We Really Know That the WTO Increases Trade?", American Economic Review, 94(1), 98-114.

Rose, A. K. (2005), "Does the WTO Make Trade More Stable?", Open Economies Review, 16(1), 7-22.

Rose, A. K. (2007), Do We Really Know That the WTO Increases Trade? Reply", American Economic Review, 97(5), 2019-2025.

Saroj Kumar, J. (2015). "Maximizing the Benefits of WTO Membership and Global Economic Integration," Third China Round Table on WTO Accessions. Post

Accession, Dushanbe, Tajikistan, June 2-4, 2015.

Song, Baek-Hoon (2010, December 1-2), “Analysis of Economic Effects of Kazakhstan’s Accession to the WTO and Spread of the FTA”, Paper Presented at the 2nd Central Asian Domestic Conference, Seoul, Korea, 381-398.

Staiger, R. W. and G. Tabellini (1999), “Do GATT Rules Help Governments Make Domestic Commitments?”, Economics and Politics, 11(2), 109-144.

Tang, M. K. and S. J. Wei (2009), “The Value of Making Commitments Externally: Evidence from WTO Accessions”, Journal of International Economics, 78(2), 216-229.

Thompson, H. (2011). International economics. World Scientific Publishing Company.

Tomz, M., J. L. Goldstein and D. Rivers (2007), “Do We Really Know Th at the WTO Increases Trade? Comment”, American Economic Review, 97(5), 2005-2018.

Turakulov, V. (2020). Trade Policy Issues of Oil-rich but Land-locked Country Case: Focusing on Kazakhstan Post-WTO Entry. 무역연구, 16, 133-150.

Winters, L. A. (1999). Regionalism vs. multilateralism. Market integration, regionalism, and the global economy, 7-48.

Winters, L. A. (2002), Trade Policies for Poverty Alleviation (World Bank Group Report, No. 29799), Washington, DC: World Bank, 28-38.

World Bank. (2000). World Attacking Development (Issue September).

Yilmazkuday, H. (2003). Export promotion vs. import substitution. Import Substitution (July 2003).

Appendices

Appendix A Central Asian countries involved trade agreements

Countries	CIS	EEC	EAEU	CACO	SPECA	CAREC	ECO	SCO	WTO
Kazakhstan	x	x	x	x	x	x	x	x	x
Uzbekistan	x	(x)	o	x	x	x	x	x	o
Turkmenistan	(x)				x	x	x		o
Kyrgyzstan	x	x	x	x	x	x	x	x	x
Tajikistan	x	x		x	x	x	x	x	x

Source: Pomfret, R., 2019. The Central Asian Economies in the Twenty-first Century: Paving a New Silk Road. Princeton University Press. p, 216-217
Note: x – Member; (x) – Suspended membership; o – Observer.

Appendix B Tariff rates of GTAP v10 (2014) and updated years

GTAP 2014	1 Kazakhstan	2 Kyrgyzstan	3 Tajikistan	4 Turkmenistan	5 Uzbekistan	6 CIS_FTA	7 ROW
1 Agriculture	10.1	7.9	11.5	20.8	20.8	9.5	6.5
2 Extraction	1.7	6.5	1.4	12.6	12.6	3.1	0.4
3 ProcFood	16.2	7.4	11.7	18.1	18.1	11.5	5.7
4 Manufact	7.7	7.8	9.4	11.4	11.4	5.8	2.2
5 Vehicles	20.2	7.9	5.0	14.6	14.6	15.2	3.3
6 OthServices	0.0	0.0	0.0	0.0	0.0	0.0	0.0

AHS tariff (latest)	1 Kazakhstan	2 Kyrgyzstan	3 Tajikistan	4 Turkmenistan	5 Uzbekistan	6 CIS_FTA	7 ROW
1 Agriculture	9.869	6.593	9.972	27.922	15.339	5.093	7.912
2 Extraction	2.677	3.446	5.008	4.597	14.449	0.807	0.384
3 ProcFood	5.917	4.418	8.871	39.612	7.581	5.217	9.141
4 Manufact	3.679	4.173	8.779	7.500	7.767	3.272	1.980
5 Vehicles	6.877	5.268	4.666	6.330	13.118	4.549	3.196
6 OthServices	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Updated year:	2019	2018	2017	Extracted from GTAP TASTE	2015	latest	latest

Appendix C Regional aggregation by GtapAgg2

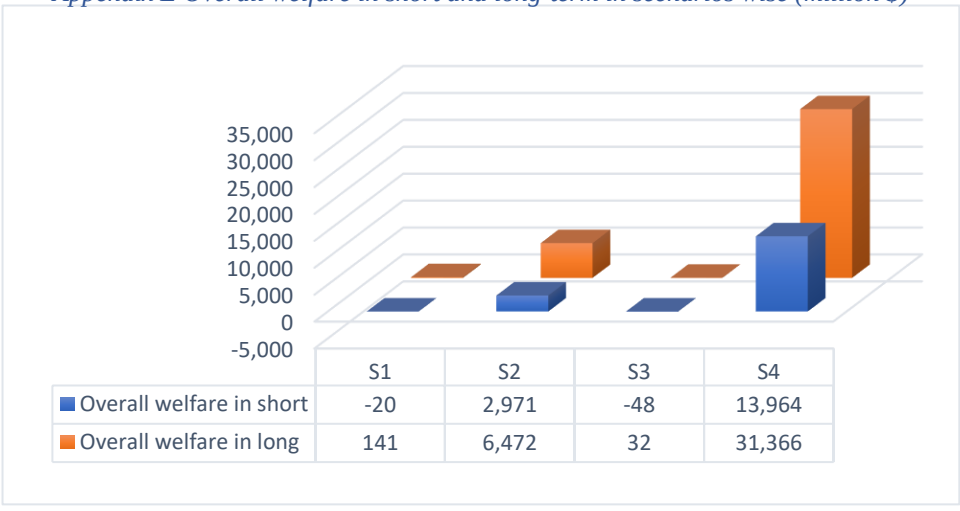
Agg. regions	Descriptions
Kazakhstan	Kazakhstan
Kyrgyzstan	Kyrgyzstan
Tajikistan	Tajikistan
Turkmenistan	Turkmenistan
Uzbekistan	Uzbekistan
CIS_FTA	Belarus; Russian Federation; Ukraine; Rest of Eastern Europe; Armenia; Azerbaijan; Georgia.

ROW	Australia; New Zealand; Rest of Oceania; China; Hong Kong; Japan; Korea; Mongolia; Taiwan; Rest of East Asia; Brunei Darussalam; Cambodia; Indonesia; Lao People's Democratic Republic; Malaysia; Philippines; Singapore; Thailand; Viet Nam; Rest of Southeast Asia; Bangladesh; India; Nepal; Pakistan; Sri Lanka; Rest of South Asia; Canada; United States of America; Mexico; Rest of North America; Argentina; Bolivia; Brazil; Chile; Colombia; Ecuador; Paraguay; Peru; Uruguay; Venezuela; Rest of South America; Costa Rica; Guatemala; Honduras; Nicaragua; Panama; El Salvador; Rest of Central America; Dominican Republic; Jamaica; Puerto Rico; Trinidad and Tobago; Caribbean; Austria; Belgium; Bulgaria; Croatia; Cyprus; Czech Republic; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Latvia; Lithuania; Luxembourg; Malta; Netherlands; Poland; Portugal; Romania; Slovakia; Slovenia; Spain; Sweden; United Kingdom; Switzerland; Norway; Rest of EFTA; Albania; Rest of Europe; Bahrain; Iran Islamic Republic of; Israel; Jordan; Kuwait; Oman; Qatar; Saudi Arabia; Turkey; United Arab Emirates; Rest of Western Asia; Egypt; Morocco; Tunisia; Rest of North Africa; Benin; Burkina Faso; Cameroon; Cote d'Ivoire; Ghana; Guinea; Nigeria; Senegal; Togo; Rest of Western Africa; Central Africa; South Central Africa; Ethiopia; Kenya; Madagascar; Malawi; Mauritius; Mozambique; Rwanda; Tanzania; Uganda; Zambia; Zimbabwe; Rest of Eastern Africa; Botswana; Namibia; South Africa; Rest of South African Customs ; Rest of the World.

Appendix D Sectoral aggregation by GtapAgg2

Agg. sectors	Descriptions
Agriculture	Paddy rice; Wheat; Cereal grains nec; Vegetables, fruit, nuts; Oil seeds; Sugar cane, sugar beet; Plant-based fibers; Crops nec; Bovine cattle, sheep and goats; Animal products nec; Raw milk; Wool, silk-worm cocoons; Bovine meat products; Meat products nec; Processed rice.
Extraction	Forestry; Fishing; Coal; Oil; Gas; Minerals nec.
ProcFood	Vegetable oils and fats; Dairy products; Sugar; Food products nec; Beverages and tobacco products.
Manufact	Textiles; Wearing apparel; Leather products; Wood products; Paper products, publishing; Petroleum, coal products; Chemical products; Basic pharmaceutical products; Rubber and plastic products; Mineral products nec; Ferrous metals; Metals nec; Metal products; Computer, electronic and optic; Electrical equipment; Machinery and equipment nec; Manufactures nec.
Vehices	Motor vehicles and parts; Transport equipment nec.
OthServices	Electricity; Gas manufacture, distribution; Water; Construction; Trade; Accommodation, Food and servic; Transport nec; Water transport; Air transport; Warehousing and support activi; Communication; Financial services nec; Insurance; Real estate activities; Business services nec; Recreational and other service; Public Administration and defe; Education; Human health and social work a; Dwellings.

Appendix E Overall welfare in short and long-term in scenarios wise (million $)



	S1	S2	S3	S4
Overall welfare in short	-20	2,971	-48	13,964
Overall welfare in long	141	6,472	32	31,366