An Ex-Ante Evaluation of Deeper Integration among South Asia and Southeast Asia: A General Equilibrium Analysis

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&

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Abstract

The present paper attempts to analyze the deeper integration prospects among South Asian (SA) and South East Asian (SEA) nations using general equilibrium analysis. Recent years have seen disruptions in global trade due to pandemics and wars. This call for greater cooperation among nations that are highly vulnerable to external shocks. Most of the existing literature deals with the issue of integration using standardized CGE modeling with perfect competition assumption and full employment closures. In the present study, we relax the full employment assumption in the standard GTAP model to introduce the possibilities of meaningful regional welfare gains due to trade integration. By using the GTAP 10 database for the aggregation scheme and applying underemployment closure, the model has been made more realistic. The simulation of scenario one is ambitious, where tariff barriers are reduced to zero, while non-tariff barriers (NTB) are reduced by 25 percent. The second simulation scenario deals with a staggered reduction in tariffs for agriculture and manufacturing, registering a halving of the existing tariff barriers, while NTBs are reduced by 10 percent. The reveal promising positive welfare effects for the region as a whole and terms of trade seems to improve. The manufacturing sector in South Asia and Extraction and Processed Food sector in South-East Asian region seem to have maximum gain. This integration helps in finding out robust solutions to the long held issues of relatively stagnant manufacturing sector. The backward linkages of GVCs in these regions can be shifted for more lucrative sources and destinations for trade. The welfare decomposition of the simulations prove that the gains to the endowments are more significant than the gains in allocative efficiency, suggesting that the

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natural resources in the regional integration are put to more and efficient use. These findings pave the way for larger interest and efforts in bringing about deeper integration while addressing the call for reducing structural and infrastructural impediments.

Keywords

Regional Development, GTAP, Economic Integration, CGE Modeling

JEL Classification Codes: F13, F15, F17

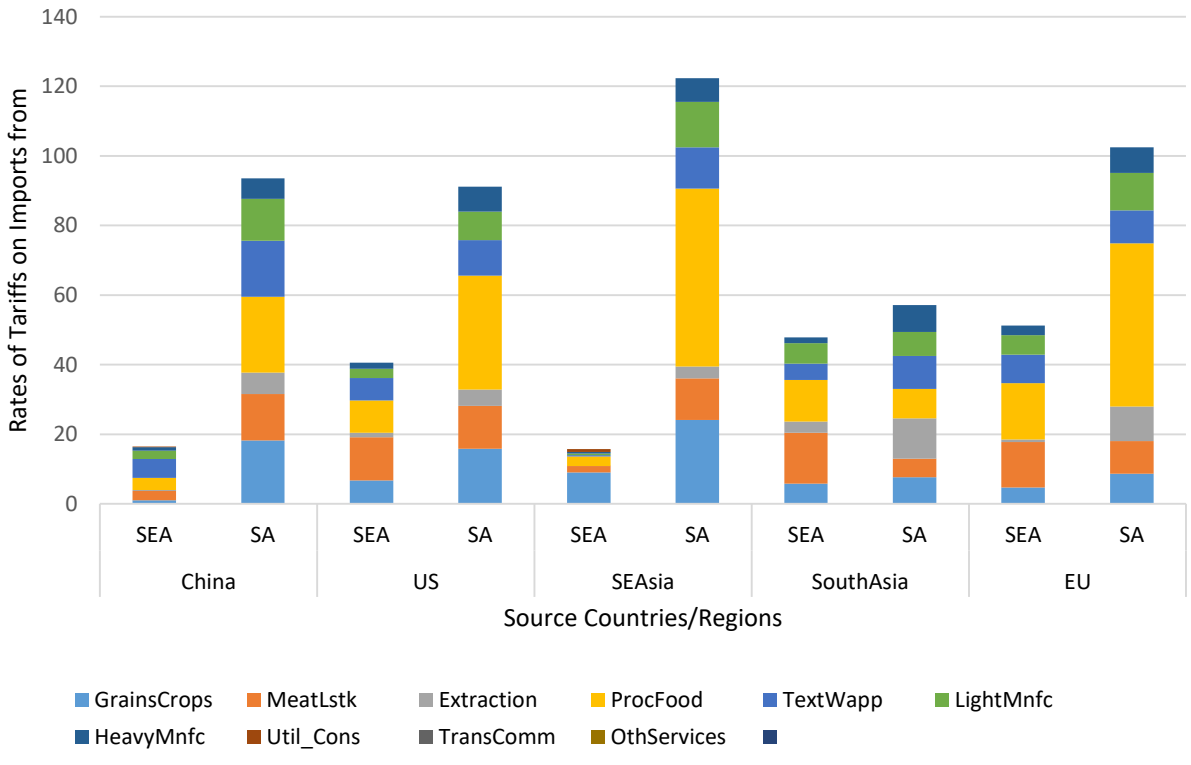
I. Introduction

The global economic scenario is continuously changing and there has been a huge shift in the pattern of international trade especially after COVID-19 pandemic. The economies are continuously exploring the prospects for trade integration which is a sophisticated way to integrate with the other countries to emerge as stronger player in the world market. There is a rise in free trade agreements across the world. We can see more than 350 existing regional trading agreements in force, with about 250 accessions to the same (WTO, 2024). Moreover, the trend of comprehensive and deeper integration trade agreements such as RCEP, CPTPP, and IPEF etc. The African Union has fast-tracked the process of deeper integration, to the extent that the free mobility of factors of production is also conceived of as the viable option. The regional trading agreements do not exclusively correspond to the trade theory rationale, but the aspect of universalism and internationalism also play a determined role. It seems, however, that a proper integration of world society could start with increase in mutual economic welfare. These trade agreements have an economy wide impact across the globe; causing several stakeholders to take a very calculated view of the integration.

The present study details about deeper integration between South Asia and South-East Asian region. The global south (removing China) resides 70 percent of world population with 32 percent of total global GDP as their shared income (IMF, 2024). This disparity is due to the history of colonisation and continued dependence of the erstwhile colonies upon the global North. For example 73% of Morocco's trade is dependent upon European Union (Elbehri, 2004). This sort of dependence is not only harmful for economic expansion but also compromises the sovereignty and integrity of a nation. Among the countries of the global south, 32% world population consists of only South Asia (SA) and Southeast Asia (SEA), thereby registering as the single largest block in the world population wise. This region can also be identified as a single block due to history of colonial past, similarities in social structure, cultural exchanges, value systems, linguistic connections, contiguity and economic vulnerability. Both these regions have a large trade dependency upon three major trading partners namely, the US, China and the EU. The Southeast Asian economies are more vulnerable due to Chinese aggressive techniques of devaluation.

The regions of SA and SEA are known to have gone through a period of severe protectionist policies. Whereas most of the economies across the world have seen a systematic and gradual decrease in the tariff barriers, the SA and SEA have followed suit reluctantly and with caution. Among the two, South Asia continues to have larger tariffs upon the source countries in comparison to Southeast Asia. Among the tariff structures, most of high tariffs are levied upon the primary sector, and relatively lower for the manufacturing sector. (See Figure 1)

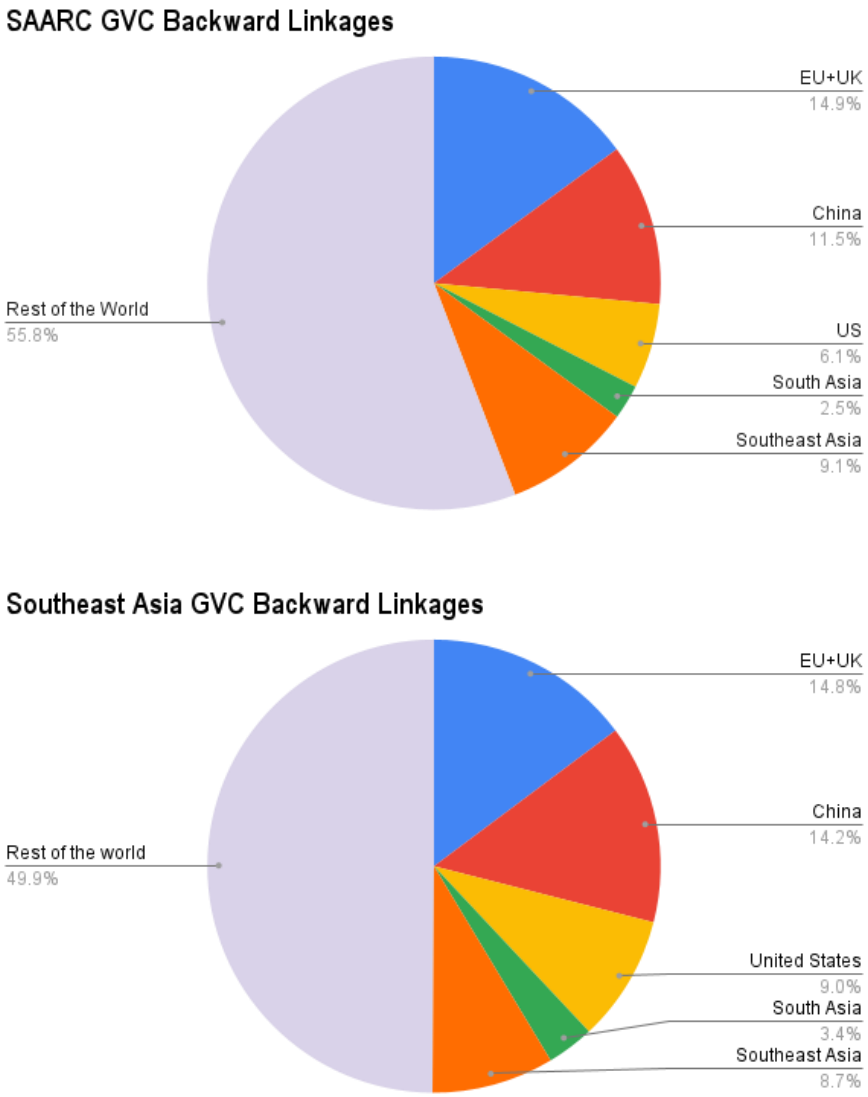
Figure 1
Percentage of tariffs imposed by SEAsia and South Asia upon countries/regions



Source: GTAP 10 Database

Due to these severe controls, the economies of these two regions report on of the least integrated regions in the world. The intra-regional trade in South Asia is close to 5% of the total trade with the rest of the world, due to dismal infrastructure for trade. This percent goes up to 25% in case of Southeast Asia. The regional trade indicators identify that currently the exports of SA to SEA are

around $ 50 billion, but the projections by World Bank indicate that the export potential of SA to SEA is close to $ 200 billion (World Bank, 2022).



Source: Authors' calculations using RIVA GVC simulations and database

Along the same line, commonalities among these regions can be drawn from complementarities in sectors, huge potential of expansion in manufacturing and service sector, and shared vision of becoming a strong member in international trade. An integration in this region is going to be of value in all the sectors within the region, including, natural resources, extraction, manufacturing, services and agriculture. The course of integration will create or divert trade within the region but

will not reduce the welfare of the region at an aggregate level. These kind of structural shifts are necessary to address the slack within the region in a sector. An integration scenario will give a new lease of life to over strained services sector and relatively inefficient primary sector.

The regional integration between SA and SEA has been a topic of interest for several decades. Within the region, ASEAN was established in 1967 for the regional cooperation and integration in Southeast Asia; while in 1985, SAARC was established for the regional cooperation in South Asia. Some studies on integration of SA and SEA do not provide a very optimistic view of the policy deliberations. Among them is Bandara and Yu, who find very pessimistic results of creating a South Asia Free Trade Area (Jayatilleke S. Bandara, 2003). Their simulations are based on GTAP version 5 database. This database accounts for the interim periods of liberalisation which were reported in 1999. The economy wide structural changes and improvements in trade relations is obviously not accommodated in this paper. An earlier paper by Panagariya also extend a rather pessimistic view of the trade integration within south Asia (Panagariya, 1999).

Among the researches that extend a more optimistic view are Nag and Sikdar, who discuss the welfare impact of India-ASEAN free trade agreement. Their conclusions are encouraging but are limited by the use of full employment closure (Nag & Sikdar, 2011). This paper discusses only the reduction in tariff barriers and also excludes the integration of other countries in SA with SEA, thereby limiting the scope of understanding the impact of creating the regional trade block. This shortcoming is dealt with in a simulation paper by Wignaraja et al. They discuss the impact of deeper integration by reducing the tariff and non-tariff barriers and also by reducing the trade costs. They find that the South Asia gains impressively but the gains for India and Pakistan are marginal within the region. They however, use standard closures in the GTAP model (Wignaraja & et.al., 2014).

It is against this backdrop, the present study attempts to analyse a deeper trade agreement between South Asia and South-East Asian region using CGE modelling. The CGE modelling is a handy tool for the policy-makers to evaluate the prospective economic welfare or lack thereof, in a scientific way. This paper attempts to reconcile the benign notions of integration and reduced form notions of welfare through GTAP framework.

The rest of the paper is organized as follows: the next section II details about simulation scenarios. Section III discusses the Methodology. The results of the study are discussed in section IV followed by conclusions and policy implications in section V.

II. Simulation Scenarios

An ex-ante evaluation could venture into exploring the efficient and maximum possible outcomes. In other words, a scenario of complete liberalisation with no practical barriers to trade. Such an exercise would be akin to the principles of universalism and countries without borders. However, this would be too simplistic a conjecture. The integration process inhibits a significant time lag, in addition to the complexities of negotiations and the realisation of the desired level of integration. Further, a scenario with no practical barriers would render the possibility of zero or minimal transportation costs.

The exercise of ex-ante evaluation must accommodate the issues and immediate possibilities of integration. Therefore, the two scenarios conceived here are identified as ambitious and limited. The Ambitious scenario adjusts for the inherent rigidities of the existing trade patterns yet brings out a clear possibility of significant integration. In this scenario, the bilateral tariffs have been reduced to zero. The Non-tariff measures have seen a reduction in recent years, but preliminary analysis indicates that the decrease in NTMs to practically zero is neither possible nor advisable. The decrease in NTMs to a 50% level from existing barriers is introduced in this scenario. Additionally, an improvement in shipping technology that reduces the shipping cost to and from SA and SEA by 25% is included.

The Limited scenario is postulated to recognize the sensitive list of trade products. This indicates that governments will take a relatively cautious route to integration and meticulously study the interim equilibrium within the trade pattern. This scenario starts with reducing the effective tariffs on primary goods by 50%. These goods are broadly aggregated as Grain Crops, Meat and Livestock, Extraction, and Processed Food. The tariffs on Textiles and Apparel, Light and Heavy Manufacturing have been reduced to zero. The preliminary analysis of tariffs indicates that there exist practically zero rates on tariffs on services such as Utilities, Transport and Construction, and Other services in the GTAP database. With the ambition of increasing the transport infrastructural viability among the SA and SEA region, the shipping cost within the region has been brought down by 10%.

In sum, the simulation scenarios can be established as follows in table 1:

Table 1: Simulation Scenarios

	Limited	**Ambitious**
Closure	Unemployment	Unemployment

Tariffs	50% reduction on Primary Goods 100% reduction on Textiles, Light and Heavy Manufacturing	Zero tariffs on all imports
Non-Tariff Barriers	25% reduction in NTMs from the baseline	50% reduction in NTMs from the baseline
Shipping Cost	10% reduction in shipping cost in the region	25% reduction in shipping cost in the region

Source: Prepared by Authors

III. Methodology

Present paper uses Standard GTAP version 7 (Corong, Hertel, McDougall, Tsigas, & Van Der Mensbrugghe, 2017) for a CGE model. This model incorporates the latest development in perfectly competitive economic situation. For the simulations the database used is provided with GTAP 10 database (Aguiar, 2019). The aggregation schemes and shock scenarios are discussed as below.

Aggregation scheme

In order to evaluate the general equilibrium effects on the global economy, the aggregation scheme is designed to understand the parties getting affected majorly. This means that with SA and SEA regions integrating, there will be trade-creation and trade-diversion effects across the world economy. Since major export destinations and import sources for SA and SEA are the US, China, and the EU, they have been disaggregated from the original scheme in the standard GTAP database. Thereby, the new regions mean North America without the US and East Asia without China.

With this disaggregation, the number of regions in the simulations is 12. The sectors and factors of production have been kept at the standard levels, that is, 65 sectors and 5 factors of production. In factors of production, the endowment of skilled and unskilled labour has been made in the standard model.

Unemployment Closure

The standard model assumes full employment. For several reasons, the modelers must go beyond the full employment assumption (Peterson, 2019). There has been a sustained existence of

unemployment at the world level of about 5%. The range of unemployment varies more within the SA and SEA regions (ILOSTAT, 2023). These unemployment includes structural, frictional, and seasonal unemployment. With the assumption of full employment, the labour force is assumed constant; with a particular shock, the factor prices and output prices adjust to clear the market and reach equilibrium (Burfisher, 2016). When this assumption is relaxed, it suggests wage rigidities within the market. Thereby, the labour demand and supply adjust to clear the market. This closure in the GTAP model ensures that, in the medium run, it is possible to increase employment.

Solution Method and Systematic Sensitivity Analysis

The CGE model employed here uses the simultaneous equations for consumption and production at the global level. In this study, Johanson-type linearised equations have been used. This method brings about the static analysis of the shock upon the economies in the medium run. One of the shortcomings of this method is that it does not accommodate the non-linear trajectories of growth. However, despite this limitation, it is the closest approximation to the closest post-shock scenario. After the simulation of shocks, a systematic sensitivity analysis (Arndt & Pearson, 1998) has been undertaken upon the parameters of Elasticity of substitution between primary factors of production (ESUBVA), the elasticity of substitution between domestic and imported goods (ESUBD), Expansion parameter in tradable commodities (INCPAR), and transformation parameter of the sluggish primary factor in one level nested production function (ETRAE). All of these parameters are made variable by 50% to study the post-shock variations in the model. These simulations were run 532 times using the Stroud method in the model. After the sensitivity analysis, the results provided extend the mean and standard deviation of all the simulations. Using Chebyshev's inequality, the 95% confidence interval for the outcome variables is created. This ensures the extent of variability within the mathematical model and makes the estimates more robust.

IV. Results and Discussion

The results reveal huge welfare gains for the region as a whole. In the post shock scenario, the Equivalent variation (EV) results show the SA region is going to register a gain of $86.5 billion USD and a rise of 3 percent in in real GDP for the region as shown in table 2 below. In the ambitious scenario, the gains are about twice the limited scenario. The SA regions may fetch $ 177.3 billion USD in equivalent variation which is about 6% rise in real GDP. It is also interesting to note that the other regional groups register losses in response to the shock. The fall in real GDP for China, the US, and the EU is 0.06, 0.07, and 0.04 percentage points. This is not a terrible fall

in the GDP of the respective economies. However, these have a tendency to become notable falls in the case of the ambitious scenario, where the fall is around 0.1, 0.15, and 0.09 percentage points. The gains for SA and SEA and losses for other regions are theoretically consistent. These changes will take place due to structural changes and access to markets for both regions. In the existing trade pattern, these shocks bring trade creation and trade diversion effects. The fact that China, the US, and the EU suffer the most is indicative of the SA and SEA regions' trade dependence as major export destinations, experiencing a diversion in trade.

The welfare outcomes mentioned in Table 2, as is used by the AnalyseGE mode in the GTAP model (Huff & Hertel, 2000) can further be decomposed to find out the major contributors to the EV as shown in table A2 in Appendix. It is noticeable, that Allocative Efficiency, Endowment and Technological improvement, effects of increased terms of trade and positive Investment and Savings effects have generated the welfare in South Asian and Southeast Asian regions to be such. Allocative efficiencies rise due to the decrease in distortions in the market that were present due to tariffs and non tariff or other protectionist measures. As the production reaches efficient level, endowments such as Land, Labour and Natural Resources are put to more intensive use, similarly the expansion leads to technological augmentation causing more output to be produced with same set of inputs. The negative effects noted in these decomposition values are mostly for the regions of China, the US and the EU.

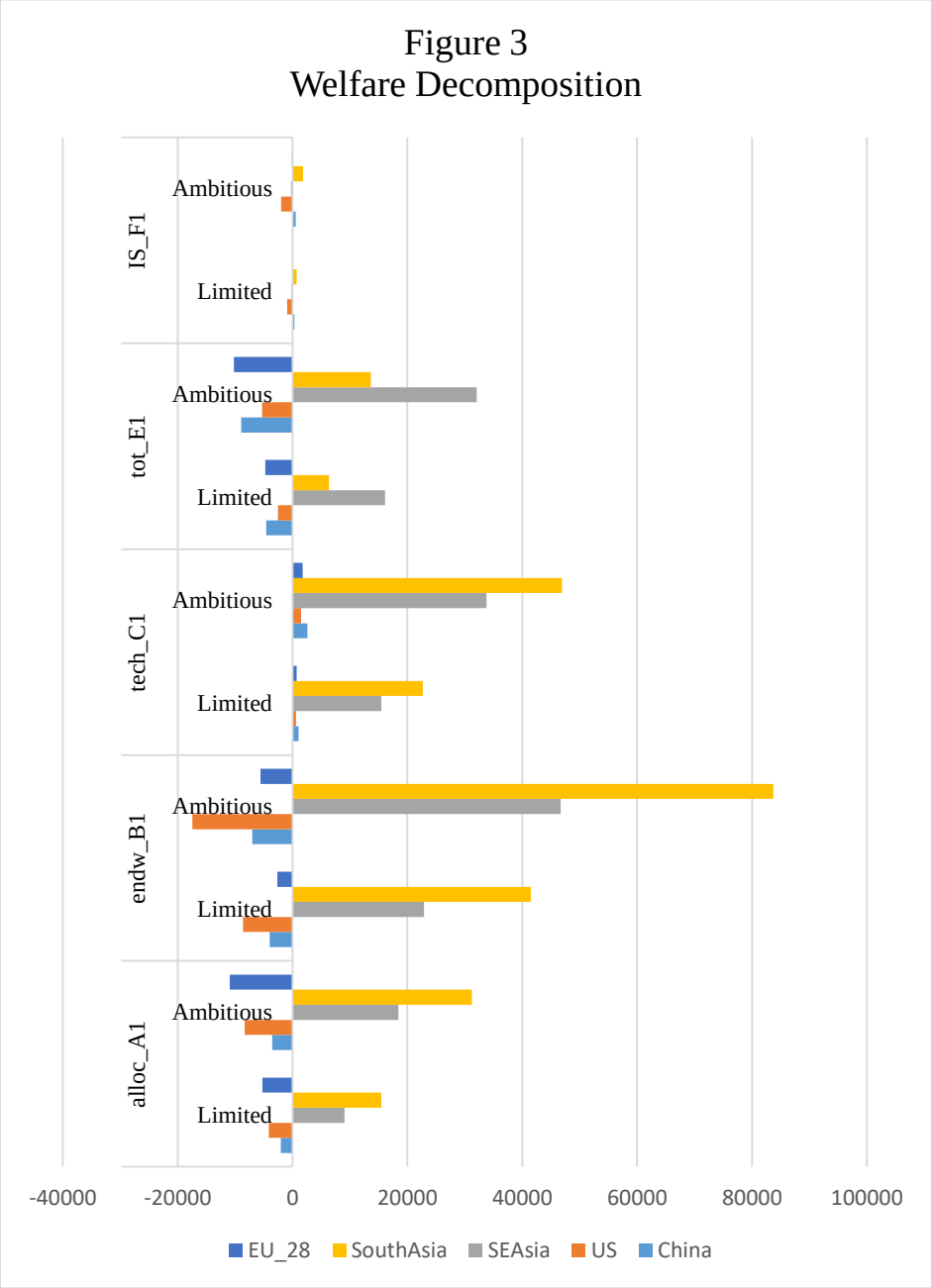
Table 2: Equivalent Variation and Real GDP Gains

	Equivalent Variation US $ (Billion)		Real GDP Percentage change	
	Limited	ambitious	limited	ambitious
1 Oceania	-2.34	-4.10	-0.12	-0.22
2 EastAsia	-8.78	-17.40	-0.08	-0.15
3 China	-9.22	-16.31	-0.06	-0.1
4 US	-15.68	-31.53	-0.07	-0.15
5 SEAsia	63.31	130.62	1.66	3.36
6 SouthAsia	86.75	177.30	2.96	5.97
7 NAmerica	-0.92	-1.88	-0.02	-0.04
8 LatinAmer	-2.41	-4.95	-0.03	-0.06

9 EU_28	-11.94	-25.07	-0.04	-0.09
10 MENA	-2.51	-4.31	-0.03	-0.05
11 SSA	-1.57	-2.88	-0.04	-0.08
12 RestofWorld	-1.95	-3.78	-0.02	-0.04

Source: *Authors' computations using the GTAP 10 database*

Figure 3
Welfare Decomposition



Source: Authors' calculations using GTAP 10 database

The welfare decomposition also makes clear that endowment effect for both South Asia and Southeast Asia is very large, suggesting that the endowments of land, labour and natural resources are put to more use and efficient use in these economies. The integration helps in utilising the untapped potential for production in these regions. (See Figure 3)

Further, in terms of trade sector, the trade balance in SA and SEA is reported to be in deficit. With the integration, both regions register more trade-to-GDP ratio, suggesting a rise in intra-regional trade. It can be noted that the SA trade deficit is more than double the trade deficit in SEA in both limited and ambitious scenarios. It is not surprising that these regions reflect such a high extent of trade deficit, considering that the terms of trade have seen a significant increase in percentage points from base to a rise of 1.71% for limited and by 3.84% in ambitious scenarios as shown in table 3.This suggests that the export value for the SA and SEA have increased compared to the rest of the world. In this sense, with higher valued exports, details of which will be discussed in the following results analysis, the consumers in the SA and SEA will be able to afford more imports from the rest of the world. The static analysis, in this case, is highly encouraging. It ensures that several export sectors will gain significantly, while hitherto stunted sectors will find economies of scale and access to regional markets, making these sectors more competitive.

Table 3 Trade Balance and Terms of Trade

	Trade Balance $ US Billion		Terms of trade Percentage change	
	Limited	Ambitious	limited	ambitious
1 Oceania	1.37	2.51	-0.08	-0.11
2 EastAsia	5.83	11.64	-0.16	-0.32
3 China	5.03	9.51	-0.14	-0.25
4 US	12.71	25.80	-0.11	-0.22
5 SEAsia	-10.96	-22.11	1.56	3.32
6 SouthAsia	-26.43	-53.05	1.71	3.84
7 NAmerica	1.00	2.12	-0.03	-0.07
8 LatinAmer	1.67	3.45	-0.11	-0.21
9 EU_28	7.35	15.40	-0.06	-0.12

10 MENA	0.83	1.55	-0.09	-0.15
11 SSA	0.63	1.22	-0.16	-0.3
12 RestofWorld	0.92	1.93	-0.08	-0.15

Source: *Authors' computations using the GTAP 10 database*

When we compare the export price index in both scenarios for the SA and SEA regions, it is clearly identifiable that for Textile and Apparel, Light Manufacturing, and Heavy Manufacturing, the export price falls down in Southeast Asia. The reduction in export prices makes these sectors more competitive in the world market. However, the ambitious scenario provides relatively higher prices in comparison to the limited scenario. The largest gain in South Asia is in the meat and livestock export prices. At the world level, there is a decrease in the production of livestock, but the South Asian markets seem to benefit from these shifts in production. The export prices of services also rise in response to the integration. So does the rise in export prices of Food grains and Processed Food. The rising export prices is indicative that other economies will have a competitive advantage over the integrating region.

Table 3 (exports price index, percentage change)				
	Limited		Ambitious	
px_ir	SEAsia	SouthAsia	SEAsia	SouthAsia
1 GrainsCrops	1.44	2.91	3.02	6.07
2 MeatLstk	0.70	3.81	1.42	7.86
3 Extraction	3.69	0.09	7.68	0.22
4 ProcFood	1.19	1.69	2.36	3.57
5 TextWapp	0.39	1.51	0.71	3.25
6 LightMnfc	0.88	0.64	1.71	1.50
7 HeavyMnfc	0.90	0.10	1.74	0.32
8 Util_Cons	1.23	1.08	2.43	2.35
9 TransComm	1.44	2.11	2.86	4.45
10 OthServices	1.67	2.42	3.35	5.07

Authors' calculation using the GTAP 10 database

Quantity of Output

The most interesting findings can be found in the changes in quantity of output among various sectors (Refer to Table A3 in the Appendix). The following major conclusions can be drawn with this outcome.

- The sectors of Extraction, Processed Food, and Textile and Apparel see a fall in production in South Asia, in both the scenarios. In case of Processed Food, and Textile, the fall in production also means a rise in export prices (Table 3), and increase in terms of trade. The value of per unit exports in these sectors has increased, suggesting that the world market will be having a higher comparative advantage in production of commodities in such sectors.
- Despite rising export prices for services such as Utilities, Construction, Communication, and Transportation, the South Asia and Southeast Asia gain tremendously in increasing production. This increase is registered more in the SA than in SEA. The theoretical underpinning of such a behaviour is that the services exports from these regions have a comparative advantage over the rest of the world. So, the result of returns to these services is more expansion in the services, but at a higher remunerative price. This can further be explained by Melitz's firm heterogeneity assumption (Melitz, 2003), where efficient firms register immediate gains due to integration.
- An interesting gain-loss story is with Meat and Livestock production. In both scenarios, the production in these sectors at world level fall by about 0.4%. However, the production in South Asia rises, especially in stark opposition to a significant fall in the production in Southeast Asia. This is the only sector, where the two regions act as loss of one while the gain of others. Other than Meat and Livestock, all other sectors register positive gain for both the regional groups, albeit the extant of gain varies between them.
- In terms of heavy manufacturing, the rise of production in the SA and SEA, does not reduce the production in US to a significant level. The same can be said about China too, with the remark that the marginal decline in heavy and light manufacturing that China suffers is slightly more than that of the US.

The changes in production among sectors is theoretically consistent. It can be identified that the creation of a free trade zone does have trade-creation and trade-diversion effects. Within the sector, SA suffers trade-diversion in Food Grain production, whereas the SEA is registering trade-

creation. While most other regions also have an increased trade in Food Grain, the SA region loses out. This may seem counterintuitive considering the large agricultural sector in SA, but if the Revealed Comparative Advantages (RCA) are considered then the results do explain the shift. The fall in the production of Food Grain also indicates that the RCA of India, major exporting economy within SAARC, is lower than most of the ASEAN nations (Ahuja, 2020).

Additionally, the increase in output in Manufacturing within the SA region is more than the increase registered in the SEA region. This change is structural and ensures that SA's manufacturing sector finds sound grounds. The reduction in output in manufacturing sector in China brings about the trade diversion in this sector. The trade dependencies of ASEAN upon China can be relaxed to find a suitable source of Imports from SA to SEA.

Systematic Sensitivity Analysis

Following the Stroud Method, the values for terms of trade, real GDP, and quantity of output have been calculated for both Limited and Ambitious Scenarios. When the model is shocked along with the range of changes in the five elasticity parameters mentioned earlier, the permutations run 532 times. The total number of simulations extends the range within which the post-shock values will exist. These bounds reaffirm that the variation within the model simulations is not very high. The target outcomes of the shock can be strengthened considering the pessimistic (lower bound) and optimistic (upper bound) values of the variables. These projections can be calculated for other variables, too.

Implications and Policy Design

The results discussed here reveal a very encouraging picture of the post-shock scenario. Until recently, due to the paucity of data and application of only textbook simulations, it gave a grim or unencouraging possibility of growth and welfare. However, the results can now be a beacon for further policy research and help expedite the integration process among the regions. The following broad suggestions can be made concerning policy shifts for these regions.

1. Although the SA region, particularly India, has expanded the service sector significantly in recent years, the manufacturing sector has maintained a fairly stagnant share of India’s

GDP. Without a sound manufacturing sector, the expansion of the real economy may not be realised to its full potential. Further, within the South Asian region, the industrial clusters for textiles and light manufacturing can contribute to reducing the world's dependence on China. An alternative market for SEA and the rest of the world will effectively challenge Chinese hegemony and build a strong and resilient manufacturing sector.

2. South Asia is known to be heavily dependent on the primary sector. More than half of its population continues to be dependent upon Agriculture. This further adds to the problem of disguised and seasonal unemployment. A structural shift from agriculture to manufacturing is inevitable for a healthy economy. Since SA has a lower RCA in Food Grain and better RCA in manufacturing, the fall in trade barriers will naturally foster growth in manufacturing. This does not mean that the output in the primary sector will fall; on the contrary, the output per person and labour productivity and labour returns in primary sector will rise.
3. One key element of the shock simulations is improvements in shipping technology. Unless the connectivity, infrastructure, and logistical issues are addressed, the outcomes of policy interventions are not going to be valuable. The marginal gains that result from the reduction in tariff and non-tariff barriers are not significant enough to engage in the tedious process of economic integration. The improvement in shipping technology suggests that the regional governments must streamline the nomenclature, size, and transport vehicles across the region. The heavy infrastructural projects like railways, roadways, and ports will serve in reducing the costs and increasing the exportability in the region.

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Appendix

Table A1						
Tariff imposed by SEA upon Source Region						
rTMS	China	US	SEAsia	SouthAsia	EU_28	Total
GrainsCrops	1.03	6.73	9.08	5.83	4.72	70.23
MeatLstk	2.69	12.41	1.81	14.63	13.1	94.93
Extraction	0.24	1.28	0.01	3.2	0.68	11.79
ProcFood	3.53	9.29	2.76	11.99	16.2	120.35
TextWapp	5.45	6.48	0.39	4.68	8.2	71.12
LightMnfc	2.36	2.61	0.44	5.87	5.55	45.24
HeavyMnfc	1.04	1.82	0.42	1.62	2.84	17.6
Util_Cons	0.13	0	0.81	0	0	0.98
TransComm	0	0	0	0	0	0
OthServices	0	0	0	0	0	0
Total	16.47	40.62	15.72	47.82	51.28	432.24
Tariff imposed by SA upon Source Region						
rTMS	China	US	SEAsia	SouthAsia	EU_28	Total
GrainsCrops	18.26	15.85	24.15	7.69	8.68	173.26
MeatLstk	13.32	12.32	11.95	5.34	9.36	91.91
Extraction	6.18	4.65	3.42	11.51	9.93	46.22
ProcFood	21.74	32.75	51.07	8.5	46.87	285.52
TextWapp	16.12	10.26	11.89	9.51	9.49	137.33
LightMnfc	12	8.15	13.07	6.86	10.81	118.13
HeavyMnf	5.95	7.17	6.74	7.69	7.37	87.54
Util_Cons	0	0	0	0	0	0.14
TransComm	0	0	0	0	0	0
OthServices	0	0	0	0	0	0
Total	93.56	91.15	122.29	57.09	102.5	940.05

Authors' calculation using the GTAP 10 database

Table A2: Welfare Decomposition								
Limited								
WELFARE	alloc_A1	endw_B1	tech_C1	pop_D1	tot_E1	IS_F1	pref_G1	Total
3 China	-2060	-3953	1027	0	-4594	352	0	-9228
4 US	-4133	-8634	601	0	-2552	-963	0	-15680
5 SEAsia	9050	22876	15439	0	16101	-147	0	63319
6 SouthAsia	15460	41504	22686	0	6364	738	0	86751
9 EU_28	-5216	-2667	717	0	-4737	-44.8	0	-11948
Total	8437	41556	42701	0	0	-0.002	0	92694
Ambitious								
WELFARE	alloc_A1	endw_B1	tech_C1	pop_D1	tot_E1	IS_F1	pref_G1	Total
3 China	-3518	-7009	2567	0	-8931	579	0	-16311
4 US	-8312	-17428	1503	0	-5288	-2009	0	-31534
5 SEAsia	18418	46666	33785	0	32055	-296	0	130629
6 SouthAsia	31253	83694	46902	0	13652	1800	0	177301
9 EU_28	-10943	-5594	1793	0	-10217	-116	0	-25077
Total	17885	85667	92128	0	-0.001	-0.004	0	195680

Authors' calculation using the GTAP 10 database

Table A3 : Change in Quantity of Output (percent)					
Limited Scenario					
qo	China	US	SEAsia	SouthAsia	EU_28
Land	0	0	0	0	0
UnSkLa	-0.1	-0.11	2.63	3.4	-0.08
SkLab	-0.11	-0.09	2.77	4.16	-0.07
Capital	0	0	0	0	0
NatRes	0	0	0	0	0
GrainsCr	0.05	0.12	0.49	-0.23	0.17
MeatLst	-0.11	-0.15	-2.74	3.97	-0.13
Extractio	0.08	0.01	0.97	-1.82	-0.19
ProcFoo	-0.03	-0.03	2.99	-3.24	-0.05
TextWap	0.25	0.27	1.92	-2.3	0.55
LightMn	-0.04	-0.07	0.99	1.91	-0.09
HeavyM	-0.06	0	0.99	1.93	-0.1
Util_Con	-0.18	-0.22	2.9	3.86	-0.13
TransCo	-0.05	-0.08	0.73	2.4	-0.04
OthServi	-0.06	-0.06	1.08	2.12	0
CGDS	-0.22	-0.36	3.63	5.41	-0.22
	China	US	SEAsia	SouthAsia	EU_28
Land	0	0	0	0	0
UnSkLa	-0.17	-0.22	5.36	6.85	-0.17
SkLab	-0.19	-0.19	5.67	8.39	-0.14
Capital	0	0	0	0	0
NatRes	0	0	0	0	0
GrainsCr	0.1	0.26	1.08	-0.44	0.34
MeatLst	-0.21	-0.3	-5.47	7.95	-0.25
Extractio	0.16	0.04	2.12	-3.77	-0.35
ProcFoo	-0.06	-0.07	6.32	-6.49	-0.11
TextWap	0.58	0.51	3.79	-4.79	1.15
LightMn	-0.06	-0.14	1.84	3.73	-0.16
HeavyM	-0.11	-0.01	1.71	4.16	-0.17
Util_Con	-0.33	-0.45	5.93	7.79	-0.27
TransCo	-0.1	-0.16	1.46	4.84	-0.12
OthServi	-0.1	-0.13	2.28	4.26	-0.01
CGDS	-0.4	-0.73	7.42	10.87	-0.47

Authors' calculation using the GTAP 10 database