School of Economics and Finance
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Trade, Productivity and Welfare Effects of Regional Integration in South Asia

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Declaration

This dissertation was written while I was studying at the School of Economics and Finance, Curtin Business School, at the Curtin University. To the best of my knowledge and belief, this thesis contains no material previously published by any other person except where due acknowledgement has been made. This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

Signature: ____________________________

Date: ________March 03, 2014_________

Dedicated to

my parents

to whom I owe my life

and

my children

who make that life feel bright.

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ABSTRACT

The thesis investigates the economic effects of the South Asian Free Trade Agreement (SAFTA) that was signed in 2004, and is in operation since 2006. After a chapter with a brief overview of the economic structure and trade policies of the region, the subsequent three chapters analyse how trade flow, productivity, and welfare of the region have been affected by the agreement. Application of an extended gravity model with several panel methods (random effect, panel feasible GLS, and generalized methods of moments) show that the current regional free trade agreement, that contains some thin margins of preferences on a limited number of tariff lines, has not been able to generate additional intra-regional trade flows. The results show that, though GDP of the trading partners is important in explaining trade, geographic proximity is not an important factor for the South Asian countries.

Global free trade improves productivity by making available new inputs, technology transfer, and competitive pressure. The effect of regional integration on productivity growth is unknown and depends among others on increased competition, cross border resource flow and technological spillovers. When a stochastic production frontier and a data envelopment analysis based frontier are estimated in the context of the South Asian data, it is found that these frontiers have shifted inward in post-SAFTA period compared to the pre-SAFTA period. However, there is evidence of country heterogeneity in terms of the performance of the labour and capital inputs, suggesting that consideration of deep integration allowing inputs to flow across borders might be beneficial for the underperformers of the region.

From the perspective of a social planner alternative policies are evaluated in terms of their welfare contribution, and this is done in the context of a general equilibrium framework. A simulation experiment involving 15 per cent regional tariff preference with the static version of the global trade analysis project (GTAP) model shows that all the members gain welfare, whereas the regions in the rest of the world lose. Individual country welfare rises significantly without hurting other countries' welfare when the regional concession is accompanied by additional 10 per cent autonomous liberalization.

However, the two-stage tariff reductions in the recursive dynamic version of the GTAP model show that, except for India and Nepal, all other South Asian countries suffer welfare loss. Net welfare change for the region as well as for the rest of the world turns out negative. The overall conclusion of the thesis is that the South Asian countries are devoting real resources to keep alive an agreement that only offers tariff preferences on a limited number of tariff lines. The agreement is less effective as the member countries are pursuing unilateral liberalization and signing new preferential agreements with countries outside of the region. In such circumstances, if deeper integration is not politically feasible and the multilateral negotiation remains stuck then alternative policy options might be to pursue unilateral liberalization, as proposed in Bhagwati (2002).

Key Words*: Regional Integration, Trade Flow, Productivity, Welfare, South Asia*

JEL Classification: *F10, F13, F15, R13*

ACRONYMS

AFTA	ASEAN Free Trade Area
ASEAN	Association of Southeast Asian Nations
BIMSTEC	Bay of Bengal Initiative for Multi-Sectoral Technical Cooperation
CACM	Central American Common Market
CAP	Common Agricultural Policy
CDE	Constant Difference Elasticity
CDS	Credit Default Swap
CES	Constant Elasticity of Substitution
CET	Constant Elasticity of Transformation
CGE	Computable General Equilibrium
COE	Committee of Experts
CU	Custom Union
CV	Compensating Variation
DEA	Data Envelopment Analysis
EEC	European Economic Community
EFTA	European Free Trade Association
EU	European Union
EV	Equivalent Variation
FDI	Foreign Direct Investment
FTA	Free Trade Area
GATT	General Agreements on Tariffs and Trade
GFCF	Gross Fixed Capital Formation
GSP	Generalized System of Preferences
GTAP	Global Trade Analysis Project
HS	Harmonized System
LDC	Least Developed Countries
MERCOSUR	MERcado Comun del SUR (Spanish) Common Southern Market (English)
MFN	Most Favoured Nation

NAFTA	North American Free Trade Area
NTB	Non-tariff Barrier
OECD	Organization for Economic Cooperation and Development
PPP	Purchasing Power Parity
PTA	Preferential Trading Area
RCA	Revealed Comparative Advantage
ROO	Rules of Origin
RTA	Regional Trading Agreement
SAARC	South Asian Association for Regional Cooperation
SAFTA	South Asian Free Trade Agreement
SAM	Social Accounting Matrix
SAPTA	South Asian Preferential Trading Agreement
SARSO	South Asian Regional Standard Organization
SFA	Stochastic Frontier Analysis
SITC	Standard International Trade Classification
SMC	SAFTA Ministerial Council
SPS	Sanitary and Phytosanitary
TFP	Total Factor Productivity
VER	Voluntary Export Restraint
WTO	World Trade Organization

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CHAPTER 1
INTRODUCTION

1.1 The Setting

The general agreement on tariffs and trade (GATT) was signed in 1947 to facilitate international trade on a non-discriminatory basis. The option of imposing discriminatory tariffs by forming preferential trading blocs is, however, permitted in an exception clause (Article XXIV). Signatories to the agreement are taking recourse to the clause to such an extent that the much desired multilateral trading system seems to be upstaged by these preferential blocs. There are more than 300 such preferential agreements throughout the world (Rocha and Teh, 2011), and because of their non-standard and often complicated rules of origin the world trading system has been turned chaotic. Some economists call it the noodles bowl problem (Kuroda, 2006; Baldwin, 2008), and Bhagwati (2008) refers to it as the 'termites' in the world trading system. Theoretically, economic effects of these blocs are unknown under any realistic set of assumptions. Every region has its own peculiarities and the economic effects of the integration need to be studied from the perspective of the specific region.

South Asia is the least integrated region in the world. In 2008, only 4.1 per cent of total trade in South Asia was intra-regional, while the corresponding figures for the European Union (EU) and the Association of the Southeast Asian Nations (ASEAN) were 67.5 per cent and 25.3 per cent respectively (Foxley, 2010). The success story of the ASEAN free trade area (AFTA) inspired the leaders of the South Asian countries to sign the South Asian free trade agreement (SAFTA) in 2004, which began operation from January, 2006. The move to create the bloc can also be attributed to the attempt of the region to prevent the harmful trade diversion effects of other blocs. Though trade blocs are created to boost the intra-regional trade flows, whether the dream is realized depends on some crucial factors. Complementarities in production structure, level of initial tariffs, pervasiveness of non-tariff barriers, market structure, existence of scale economies through larger market size, and political willingness are only a few to mention among such factors.

Current literature shows that the trade structure in the South Asian countries are not complementary (For example, Hasan, 2007), and they compete with each other in the same export markets of the EU and North America. Warr (2005) shows that, except for India, the complementary indices for the South Asian countries are below one, implying that the potential for trade diversion from the regional trade bloc is very large, as discriminatory tariffs will be applicable on the existing large trade volume of the South Asian countries with the outside countries. The case for the trade bloc in this region is further weakened by the fact that its members are actively pursuing unilateral trade liberalization programs and forming blocs with outside countries, thus turning the regional tariff-preference margins thin and less effective. Moreover, each member country maintains a lengthy list of sensitive items that avoid regional preferences and include many commodities of export interest for the region.

The possibility for intra-regional trade expansion through tariff measures, the only legally enforceable feature observed in SAFTA looks bleak. Few studies were done before the SAFTA came into force, and obviously the results from these studies are ex-ante in nature. Since some post-SAFTA data are available by this time, it is worthwhile to investigate the economic effects of the agreement ex-post in the light of the available data.

Regional integration creates changes that affect the structure of production, prices, income distribution, stock market, and many other aspects of the economy both within and outside the region. Generalizing the effects of integration is thus difficult. Theoretical ambiguity about the effects of regional integration is examined by Baldwin and Venables (1997). Usually the gains or losses from an economic integration depend on the circumstances under which it is taking place. From an array of probable effects, three closely related effects of regional integration, namely, on trade flow, productivity, and welfare are analysed in the context of South Asia in this thesis. The experience of some rapidly growing Asian economies like China, Indonesia, Malaysia, and Thailand, shows that along with capital accumulation and technological progress, increases in trade flow played a crucial role in their economic success (Lee and Cheng, 2011, Dees 1998; and Kim and Lau, 1994). Low level of trade flows within South Asia compared to other regions in the world has raised the question of whether preferential tariff concessions within the region can be an effective tool in boosting intra-regional trade flows, and thereby raising productivity and welfare of the region.

Several studies have been done to investigate these issues and need to be re-examined in the context of new data, model extension, and estimation methodologies that better suit the data generation process. Hassan (2001) uses a gravity-type model to point out that the current level of trade among the South Asian countries is below their trade potential. Rahman *et al.* (2006) argue for a trade creation possibility of the regional integration agreement in South Asia. Because of the timing of the study and data availability, the predictions of these studies are only hypothetical. The current study extends these studies by investigating the pattern of trade flow changes from the South Asian countries to the rest of the world and vice versa in both the pre-SAFTA and post-SAFTA periods. Moreover, how the response of bilateral trade flows in the post-SAFTA period depends on the income similarity of the trading partners is also examined.

Evidence on productivity growth in the context of regional trade liberalization in South Asia is hardly available in the literature, though there are some studies that link the productivity performance of the South Asian countries to global trade liberalization. The case of post-liberalization productivity growth in some key industrial sectors and the agricultural sector in Bangladesh are investigated respectively in Salim (2003) and Selim (2012). Similarly, Khanal and Shrestha (2008) examines the productivity effect of the trade liberalization program in Nepal. Mukim (2011) takes a selected set of manufacturing firms from the border region of India and Sri Lanka to study the productivity effect of bilateral trade liberalization between these two countries. A general finding from these studies is that trade liberalization is an important factor in productivity growth. However, the effect on productivity of regional trade liberalization is a bit different from general trade liberalization. Regional integration enlarges market but at the same time replaces globally efficient supply sources with the regionally efficient supplies, and thus makes the productivity effect uncertain. These issues are addressed in this thesis.

An outcome closely related to the changes in both trade flows and productivity is the welfare consequences of the regional trade liberalization. The welfare issue is addressed in the literature from either the partial equilibrium or the general equilibrium perspective, depending on the level of aggregation and the number of commodities investigators are interested in. World Bank (2006) examines the welfare effect of a potential bilateral free trade agreement between Bangladesh and India that involves tariff elimination on five commodities of export and import interest for these two countries. Raihan and Razzaque (2007) use the Global Trade Analysis Project (GTAP) database to examine the welfare effects of partial and full tariff elimination on the South Asian countries. In the current thesis, these studies are extended by examining the welfare effect from a different simulation perspective that allows the South Asian members to liberalize their economies both unilaterally and preferentially. Welfare results are also obtained under a dynamic simulation scenario and compared with the results from static analysis.

1.2 Research Objectives

The major research objective of the study is to investigate the effects of the regional free trade agreement in South Asia on the intra-regional trade flow, productivity performance, and economic welfare of the member states. More specifically, the aims of the thesis addressed in the forthcoming chapters are to:

1. Assess the impact of the free trade agreement, SAFTA, on the trade flow patterns of the member countries.
2. Examine the national level productivity implications of the regional trade agreement in South Asia.
3. Evaluate, from both the static and the dynamic perspective, the overall changes in welfare that are likely to arise from the regional tariff preferences under SAFTA.

4. Analyse the trends in the functional distribution of income of the South Asian countries that are likely to emerge from the liberalization scenarios.

These research objectives are approached with methodologies that are appropriate to the specific issues concerned. The changes in trade-flow pattern attributable to the regional integration, for example, are investigated in an extended gravity model framework that controls for theoretically important variables that affect bilateral trade flows, and the relevant parameters of interest are estimated with several panel estimation methods to check the robustness of the results. The productivity performances of the South Asian countries over the past few decades including the post-SAFTA periods are examined by comparing their relative distance from the South Asian productivity frontier. Two approaches employed for this purpose are the stochastic frontier analysis (SFA) and the data envelopment analysis (DEA) approaches. Finally, since the regional integration is likely to affect the whole economy, directly or indirectly, the welfare effect of the agreement is analysed form a general equilibrium perspective. The results are derived from both a static and a dynamic version of the GTAP (Global Trade Analysis Project) model and are compared with the existing studies. A roadmap of the thesis is provided in the following section.

1.3 Organization of the Thesis

The thesis is divided into six chapters, including this introductory chapter. Chapter 2 sets the scenario within which the regional integration is taking place by providing a brief overview of the basic economic characteristics and trade policy environment of the South Asian countries. A preliminary assessment of the export and import patterns and the status of regional integration in South Asia vis-à-vis some other prominent blocs are provided in this chapter.

The background information on regional integration is then followed in Chapter 3 by the exploration of the issue of how the intra-regional trade flow patterns have changed in response to the regional trade bloc. Controlling for gravity related variables, the trade creation and the trade diversion aspects of the agreement are investigated with a panel of data. Since South Asian countries vary widely in terms of their size, the trade flow equation is examined in the presence of variables like income dissimilarity and its interaction with the regional dummy, to see if the export response from regional integration depends on the economic sizes of the trading partners.

The links between trade and productivity and the effects on the productivity performances of the South Asian countries of the preferential trading agreement are analysed in Chapter 4. Regional integration might have different impacts on productivity compared to that expected under the multilateral free trade agreement, as preferential agreements entail distorted incentives for sourcing of inputs and final products regionally, instead of the more efficient source elsewhere. Total factor productivity change can arise from the acquisition of state-of-art technologies (technical change) and the competency in using them (technical efficiency change), both of which are examined in this chapter. It is shown in the chapter that the capacity to utilize the available technologies among the South Asian countries differs and they have much to gain from cross-border factor mobility and technical cooperation.

Trade policy changes give rise to a new constellation of prices, different collection of tariff revenues, and a new set of terms of trade, all of which affect the welfare of the members of the region and the rest of the world. The welfare consequences of trade policies are particularly important, because the desirability of policy changes and ranking among alternative policies are often made in terms of their welfare implications. The concept of the measurement of economic welfare and how it is affected by trade policy changes are analysed in Chapter 5 from several simulation perspectives. It is shown there that though static simulations with regional tariff reductions bring different amount of gains for the members, from the perspective of a dynamic simulation, all the members, except for India and Nepal, suffer welfare loss in the long run. However, the differences in factor earnings across countries are likely to be reduced, as the prices of the abundant factors (skilled and unskilled labour) rise faster than those experienced by the scarce factors (such as capital).

Finally, Chapter 6 brings together the key findings of the previous chapters, and indicates the policy implications of the study. Limitations of the thesis and the potential for further research in this area of study are also indicated in this final chapter.

CHAPTER 2

SOUTH ASIA: ECONOMIC PROFILE, POLICY REFORMS AND TRADE PATTERNS

2.1 Introduction

In an attempt to provide a solid foundation for the subsequent chapters on trade flow, productivity, and welfare effects of the regional trade liberalization, a brief overview of the basic economic characteristics and important policy changes in the South Asian countries taken since their independence are introduced in this chapter. A general understanding of the economies in South Asia, when juxtaposed with some other major regional blocs, will help not only to evaluate the problems or prospects of regional integration, but also to gain some idea of the unexploited opportunities that may be available from regional cooperation in this region. Learning about the economic environment within which the South Asian economies are operating are important as diverse experiences from various regional blocs show that preferential trade liberalization policies are neither desirable nor undesirable, but should be evaluated on empirical grounds.

A distinctive feature of regional integration is the discriminatory nature of trade liberalization and the possibility of a harmful trade diversion effect. The welfare outcome of a regional integration depends on a matrix of factors like the initial level of tariffs of the members, similarity of the economic structure, market sizes, market structure, and the depth of commitments (Schiff and Winters, 2002; Shams, 2003; and DeRosa, 1998). Similarly, market sizes also have influence on productivity, especially through the scale economy and pro-competitive forces (Melitz and Ottaviano, 2008; and Alcalá, and Ciccone, 2004). Focusing on the key characteristics of the region and a brief overview of the SAFTA agreement will thus afford us valuable insights into the probable effect of the preferential trade liberalization in South Asia.

The rest of the chapter is organized in the following sections. Economic fundamentals of the South Asian countries along with their external sector performance are analysed in Section 2.2, which is followed in Section 2.3 by economic reform measures undertaken by the South Asian countries since their independence, so that the fertility of the field for cooperation or the preparedness for integration can be evaluated. Effects of regionalism cannot be determined without considering what is happening in other parts of the world regarding preferential trade liberalization, as trade creation and trade diversion – two major economic consequences of regional integration – depend on this external scenario. Hence, Section 2.4 highlights the proliferation of the preferential agreements vis-à-vis the multilateral trading system. Progress of the South Asian countries in terms of their intra-regional trade flow and the experience of some other regional blocs are examined in Section 2.5. Finally, Section 2.6 concludes this chapter with few remarks.

2.2 Economic Fundamentals and External Sector Performance of the South Asian Countries

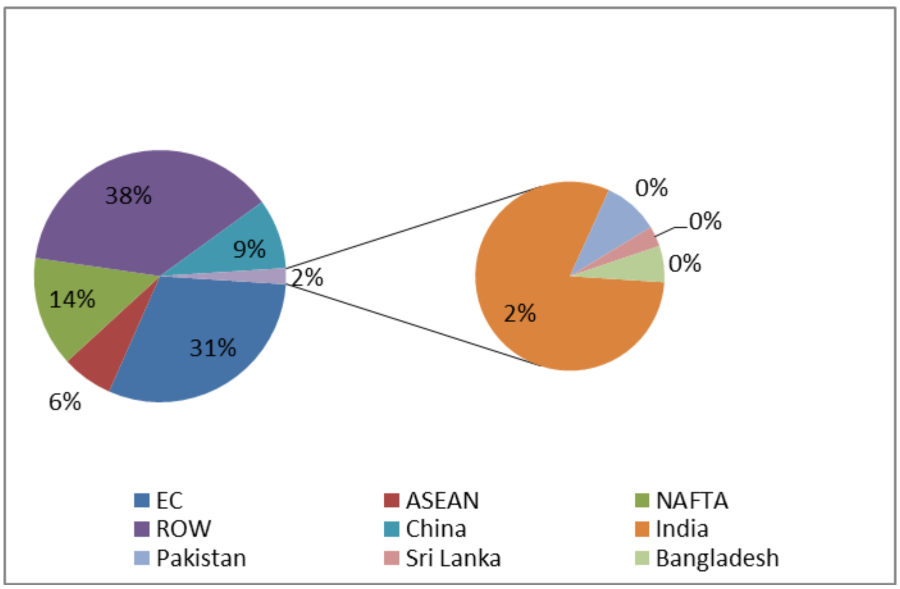
2.2.1 Economic Fundamentals

United Nations geographical region classification system identifies South Asia as comprising nine countries: Afghanistan, Bangladesh, Bhutan, India, Iran, Maldives, Nepal, Pakistan, and Sri Lanka. However, the World Bank groupings tend to exclude Afghanistan and Iran, and retain the other seven countries while reporting data or doing analysis on South Asia. For the purpose of the thesis, the seven nations that came under the regional umbrella of the South Asian Association for Regional Cooperation (SAARC) in December 1985 are treated as the South Asia region, leaving aside Iran and Afghanistan[1] in the analysis. Four of these seven members, Bangladesh, Bhutan, Nepal, and Maldives (under special provision) are considered as the least developed countries (LDCs) while the remaining three – India, Sri Lanka, and Pakistan – are given non-LDC status. A map of the South Asian countries is provided in the appendix to chapter 2.

[1] Afghanistan became a member of SAARC in 2006. Considering its short experience with SAARC and the political uncertainty and instability it is undergoing, this latest member is not included in the subsequent analysis.

India is an influential and crucial player in that it contains 74 per cent of the population and accounts for around 82 per cent of the total regional GDP. The importance of South Asia in world trade and India's relative economic dominance in the region is illustrated in Figure 2.1. The role of India in the region becomes clear from the right hand side smaller pie of the figure, where its 2 per cent of world trade share in the big pie represents the lion's share of trade in South Asia. In the global context all other South Asian countries are so small that their relative contribution to world trade in fact rounds to zero.

Figure 2.1: Relative Importance of Trade among Various Parts of the World (2010)



Source: Author's Construction based on data collected from IMF's Direction of Trade Statistics

Various slices of the smaller pie in the right hand side of the diagram constitute two per cent of the big pie in the left hand side. The zeroes (rounded to single digit) in the small pie at the right hand portion of the diagram indicate some of the individual South Asian countries' (Bangladesh, Pakistan, and Sri Lanka) share of trade in the world trade. These small figures have the implication that, if India is not considered, South Asia has little influence on the rest of the world. However, at the disaggregated level the region has significant impact on some products. Readymade garments from Bangladesh, India, Pakistan and Sri Lanka, tea from Sri Lanka, and rice from India and Pakistan constitute a major part of the world supply in these items.

Trade orientation of the South Asian countries can be understood from Table 2.1 where the direction of trade flows among these countries and with the rest of the world in the year 2010 is reported. The figures in the table suggest that except for the Maldives and Nepal, South Asian countries export more than 90 per cent of their exports to the rest of the world. The picture is similar in case of import source for these countries. Though regional trade orientation for Nepal is much higher than other South Asian countries, it is not evenly spread within the region. India accounts for 57 per cent of Nepal's import source and 59 per cent of export destination.

Table 2.1 Trade Flow Matrix of the South Asian Countries (2010)

	Exports to (Imports from)							
Reporter	Bangladesh	Bhutan	India	Maldives	Nepal	Pakistan	Sri Lanka	ROW
Bangladesh	--	0.02 (0.00)	1.95 (13.88)	0.00 (0.01)	0.06 (0.19)	0.42 (1.51)	0.07 (0.09)	97.49 (84.33)
Bhutan	NA	--	NA	NA	NA	NA	NA	NA
India	1.36 (0.10)	0.07 (0.00)	-- (0.00)	0.05 (0.01)	0.86 (0.14)	1.01 (0.09)	1.49 (15)	95.18 (99.50)
Maldives	1.44 (0.00)	0.00 (0.00)	21.31 (9.14)	--	0.00 (0.00)	0.01 (0.41)	8.23 (3.99)	69.01 (86.45)
Nepal	6.21 (0.29)	0.34 (0.00)	59.05 (57.04)	0.00 (0.00)	--	0.12 (0.03)	0.02 (0.03)	34.27 (42.60)
Pakistan	1.78 (0.17)	0.00 (0.00)	1.36 (5.66)	0.02 (0.00)	0.00 (0.00)	--	1.19 (0.16)	95.64 (94.00)
Sri Lanka	0.36 (0.10)	0.00 (0.00)	5.03 (19.96)	0.47 (0.09)	0.00 (0.00)	0.67 (2.19)	--	93.47 (77.66)

Notes: Figures are percentages of total export (total imports) of the reporter countries

In addition to this external trade structure of the South Asian countries there are some other basic economic features that make South Asia different from other regions. These key economic indicators are provided in Table 2.2 below. A striking feature that emerges from the table is that it contains over one-fifth of the global population on an area of only 2.7 percent of world's land surface. In spite of its enormous population, the economic activity of this region is very small. The region has a per capita income of only $US 1213, which is very close to the per capita GDP of the world's poorest region Sub-Saran Africa ($US 1165) and much lower than the all developing country per capita GDP average of $US 4757 (World Bank, 2012).

The agricultural sector still dominates the economies of South Asia, especially in terms of providing employment, and the export structure is not well diversified which is reflected in their relatively high export concentration index[2]. Carpet and garments export, for example, account for about 70 per cent of total merchandize export in Nepal. Similarly, tourism and fishing occupy a major share of export in the Maldives, while the same is true for Bangladesh but with the export item manufactured garments. A general idea of the export and import concentration of the South Asian countries can be found from the list of top 10 export items and import items at four digit HS (Harmonized System) code that are provided in the appendix to Chapter 2 at the end of the thesis (Table A2.1 and Table A2.2). The cumulative export shares computed in the last column of these tables show that, except for India, more than 50 per cent of export earnings of the South Asian countries come from these ten items, and the figures are staggeringly high at more than 99 per cent for Maldives and more than 82 per cent for Bhutan.

[2] Export concentration index measures the degree to which a country's export is concentrated in or diversified among SITC (Standard International Trade Classification) three digit level commodities. The inverse of the index shows the equivalent number of commodities, each having equal-sized, that the country trades. The lower the index, the less concentrated are a country's exports.

Table 2.2: Basic Economic Indicators of the South Asian Countries (2010)

Indicators		Bangladesh	Bhutan	India	Maldives	Nepal	Pakistan	Sri Lanka	South Asia	World
Area (Square km)		147,570	38,394	3,287,263	298	147,181	796,095	65,610	3,989,969	510,072,000
Gross (Current US $ billion) (% of South Asia)		104.5 (5.42)	1.4 (0.07)	1566.6 (81.18)	1.3 (0.07)	13 (0.67)	182.5 (9.46)	46.7 (2.42)	1929.8 (3.09) [a]	62364.1
Per capita GNI (Atlas method, Current US $)		640	1361	1340	4270	490	1050	2290	1213	9097
Per Capita GDP Growth (2009-2010)		4.4	5.8	8.3	3.3	2.7	2.1	7.2	7.3	3.0
Population (million)		164	0.71	1171	0.31	30	173	20	1591	6855
Population Growth, (2009-10) (annual average), %		1.6	2.3	1.4	1.4	2.0	2.3	0.9	1.5	1.2
Share in GDP of (%)	Agriculture	19	24	17	20	34	21	14	18	3
	Industry	29	37	28	18	16	24	28	28	28
	Service	53	38	55	62	50	55	58	55	69
Population Below Poverty Line		30	31.7	37	21	24.7	24	7.6	29	21
Gini Index		33.2	38.1	36.8	37.3	47.2	31.2	49	na	na
Human Development Index		0.54	0.61	0.52	0.60	0.55	0.49	0.66	na	na
Export Item Concentration Index [b]		39.8	62.7	14.2	77.1	40.8	21.3	20.9	--	--
Export Market Concentration Index [b]		23.1	94.2	16.2	33.5	64.7	18.6	22.6	--	--
Budget Deficit (% of GDP)		4.9	4.4	8.8	20.7	2.8	6.3	7.9		
External Public Debt (% of GDP)		20	54.05	18	79.1	21	24	35	--	--

Source: Data retrieved from the World Bank web site: http://web.worldbank.org/ (accessed on June, 2012) and World Development Report 2012.
Note: na -- not available.

[a] % of world.

[b] Export item concentration indexes are based on Herfindal – Hirshman scale (0 to 100) and are intended to measure the degree of export item concentration at the three digit level SITC revision 3. Similar method applies for export market concentration index.

An analysis of the major export items of the region reveals that though agriculture dominates the production structure of this region, most of the countries in fact depend on exporting various types of manufactured items. Low level of productivity in agriculture along with a large number of populations to feed means that, after fulfilling their own requirement, there is little left for export. As an exception only rice is included in the top ten export items of India and Pakistan, and tea in Sri Lanka. A portion of these exports, of course, goes to the other South Asian countries. India, for example, sent 8 per cent of her total cereal exports to her regional partners in 2010.

In general, however, various types of light manufacturing items dominate the export scene of all countries in the region. For example, 73.8 per cent of Bangladesh's export was in the category of miscellaneous manufactured articles in 2007 and a similar scenario exist for other countries in the region. In the case of import, both agricultural and non-agricultural products feature prominently. All of the South Asian countries invariably depend on import of petroleum oil, transport equipment, Portland cement, and various types of edible oil. As long as the natural resource endowment determines the production pattern and demand is inelastic, the countries of the region cannot avoid importing these products. Consequently, their balance of payments fluctuates with the international price movements of these commodities.

In terms of output volume, the services sector occupies a dominant position in all of the South Asian countries, which indicates that the possibilities of increasing trade and welfare through services sector liberalization is enormous. A special feature of services trade is that it requires physical proximity as well as interaction between producers and consumers. Because of proximity and cultural links among the South Asian nations, all four modes of services sector liberalization – cross border supply (mode 1), consumption abroad (mode 2), commercial presence (mode 3), and the presence of natural person (mode 4) – are promising. Low intra-regional trade in South Asia can be attributed to the failure of incorporating into the negotiation the services sector that occupies more than half of the GDPs of the member countries.

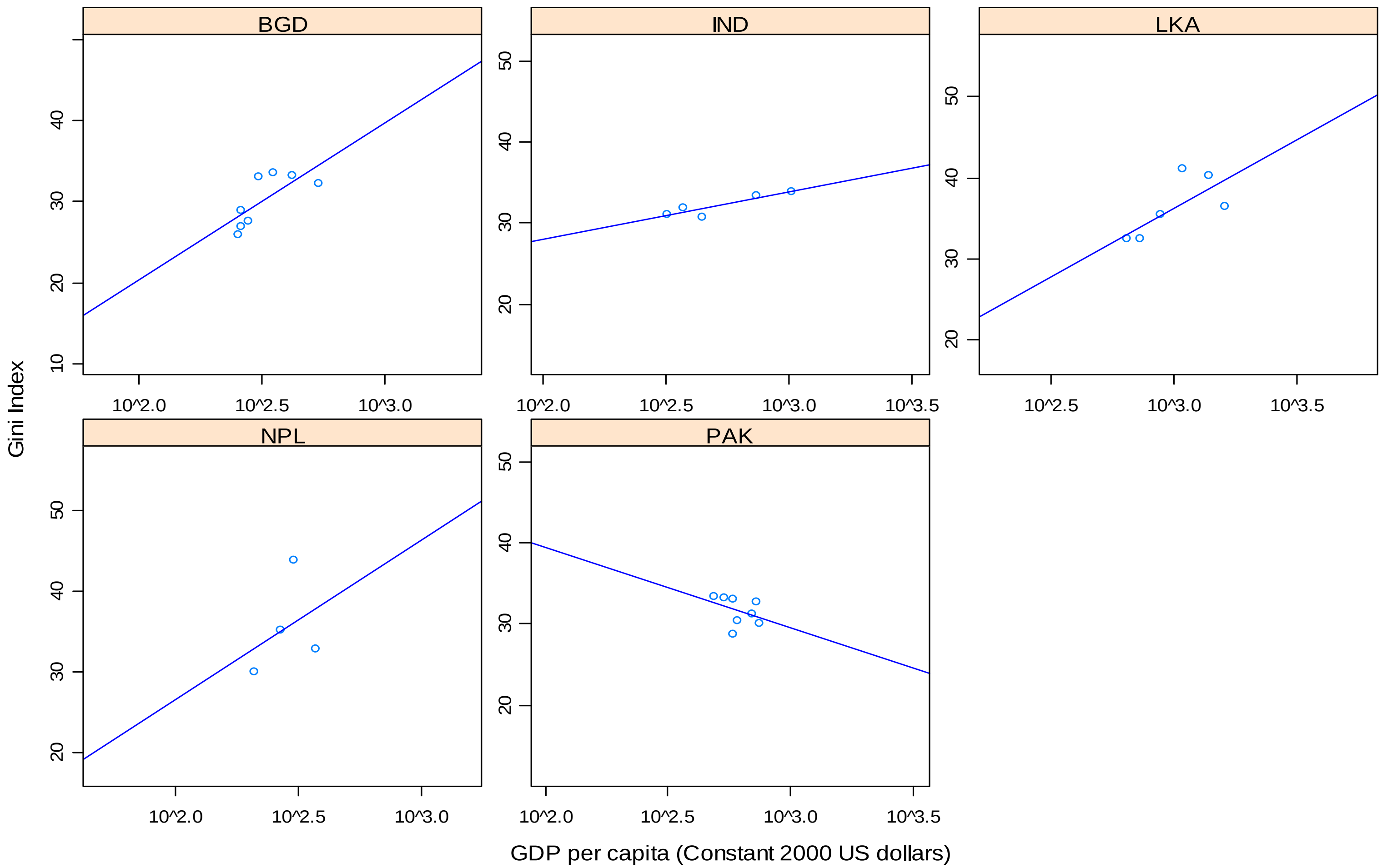
Liberalization of services trade in preferential trading agreements (PTAs) is gaining popularity, which is evidenced from the fact that more than half of the 147 PTAs signed in the previous decade include provisions for exchange of preferences in the services trade (Sauve and Shingal 2011). In contrast to goods trade, the possibility of trade diversion is low in the case of services sector liberalization. This happens because, services trade are often characterized by quota type restriction (e.g. so many foreign banks are allowed to operate, or there may be ceilings for foreign equity ownership) and in a quota protected environment regional integration tends to be less trade diverting (Sala, 2005). Since preferential treatment for the services trade are offered often through relaxation of rules and regulations, not through reduction of tariffs, and barriers are sometimes prohibitive generating no revenue, Matoo and Fink (2003) reach the conclusion that, terms of trade diversion costs are lower for the services trade.

Accumulation of wealth through GDP growth in South Asia during the past three decades has been reasonably well. However, because of the presence of high inequality, the overall economic prosperity has not been shared by all. Still around 30 per cent of populations in South Asia live below the international poverty line. The income inequality, measured in terms of the Gini index[3] as shown in Table 2.2, varies between 33 to 50 per cent among the South Asian countries for the reported year. The pattern of economic growth and income inequality, the latter being measured by the Gini index, for the South Asian countries individually and as a whole is shown in Figure 2.2. Except for Pakistan, there are clear upward trends in the relationship between per capita income and the worsening of the income inequality index in the South Asian countries. Thus it important for the governments of the region to ensure safety nets when implementing trade policy reforms.

[3] Gini index, named after the Italian statistician Corrado Gini, shows the variability of values of a variable. The index ranges from 0 (indicating perfect equality) to 1 (or 100 per cent)(indicating perfect inequality where one person owns everything).

Figure 2.2: Economic Growth and Income Inequality in the South Asian Countries

(Based on available data form 1981 to 2010)



Notes: (1) The lines through the points are least square fit (2) The horizontal axes are in log_{10} scale.

Balisacan and Duncans (2006) show that unequal access to education and highly skewed pattern of land distribution pattern are at the source of inequality. The challenge of integration in South Asia lies not only in creating a larger market but also at the same time incorporating the deprived segment of the population into the expanded regional market. Experience of the East Asian countries show that infrastructure development and various kinds of agricultural support policies made it possible for them to achieve growth and reduce inequality at the same time (ADB, 2012). Promotion of trade through regional integration and creation of opportunities for investment into these two crucial areas of development (i.e., infrastructure development and agricultural support policies) will also help South Asia to achieve growth without sacrificing equality.

Along with inequality, unemployment – especially the hidden one – is a severe problem and creation of employment for the low-skilled workers remains a critical challenge for the region. A large portion of the export sectors in South Asian countries contain products that are either low value added processed items or primary products where price elasticities tend to be low in the world market. Consequently, gains from trade liberalization will rapidly reach a limit with the expansion of world output. A more equitable income distribution can create sustained increase in demand for these commodities. Trade liberalization giving special emphasis to egalitarian policies will increase output without compromising employment expansion. Opening up of the countries and giving market access for labour intensive products to the regional members can prove beneficial and welfare enhancing for the masses of the region.

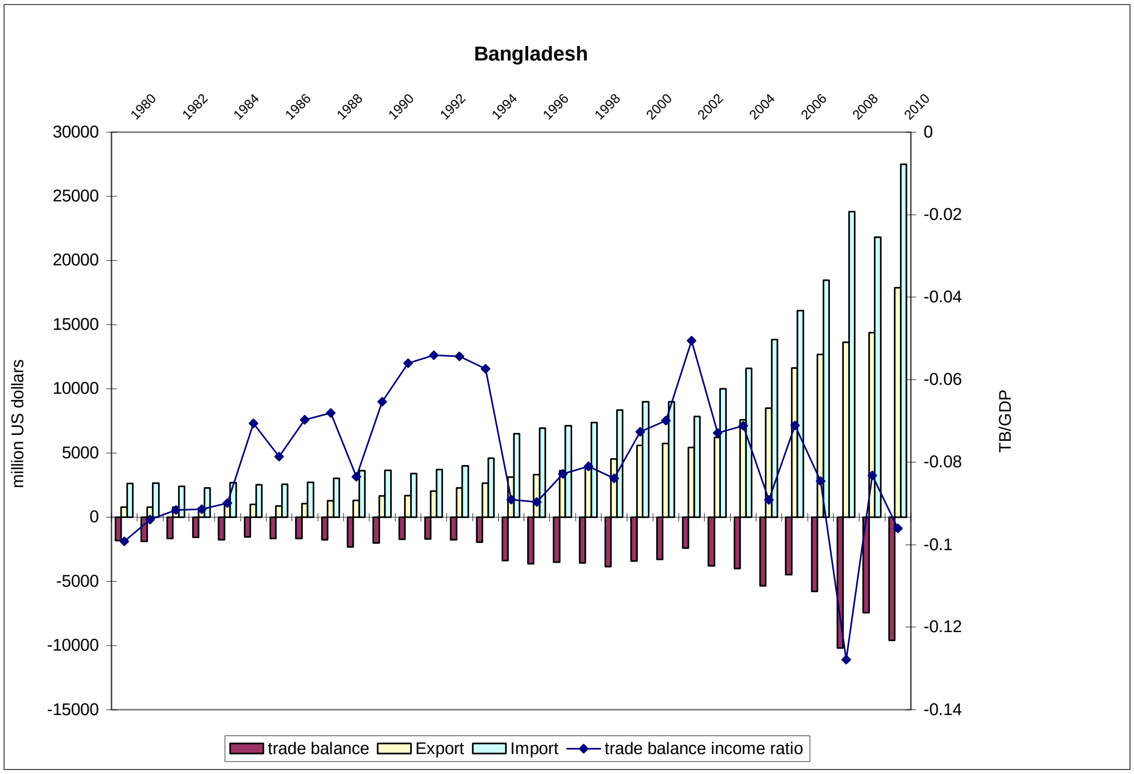
2.2.2 External Sector Performance

During the Nineties, a wave of domestic reform and various measures reflecting economic liberalization of the external sector, swept through the South Asian countries. Elaborate controls on financial and other major industrial sectors were removed. Exchange rates were aligned more toward the flexible rate system. These market oriented measures resulted in high growth of both exports and imports. However, imports were growing at a faster rate than exports, resulting in the growing trade deficit observed during the Nineties and in the recent decade. Figure 2.3 shows the trade balance along with trade balance as a percentage of GDP from 1980 to 2010 for the six South Asian countries. Dramatic rise in (negative) trade balance is a recent phenomenon in South Asia. However, negative trade balance itself is not a matter of concern, especially at the early stage of development when it is natural for imports to rise disproportionately more than exports with income. What is more important is the trade balance GDP ratio. As this ratio gets larger in the negative direction, foreign debt grows rapidly and the capacity to maintain such imbalance becomes difficult or rather impossible if foreigners are unwilling to finance these deficits.

Except for the Maldives, all other countries in this region are facing severe deficits in terms of their trade balance GDP ratio. For Bangladesh and India, the current figure is around 10 percent of GDP while for Pakistan, Nepal, and Sri Lanka the figure exceeds 15 per cent. In case of the Maldives, the pattern of absolute trade balance resembles the other countries of the region, but the strong economic performance of the Maldives in the recent decade has enabled her to carry the trade deficit with ease. It is interesting to note that a large portion of the trade balance in South Asia is not governed by quantity of imports alone, but rather by the price of imports, particularly by the price of oil. Because of high price in 2005, for example, more than 20 per cent of export earnings in South Asia were spent for paying import bill on oil. Current account balances during that year for some countries in this region were slightly negative, which would not be the case if oil price remained unchanged. Growing domestic demand without adequate supply response also contributed to the rising trade imbalance.

The observed deficit in merchandise trade in South Asia is to some extent offset by its burgeoning services sector, and the net foreign incomes received. Some countries in this region like India, Sri Lanka, and the Maldives are showing increasing strength in the services sectors of information technology, business process outsourcing, and tourism. Earnings from manpower export also remain important. Though trade balances are negative for the South Asian countries, these counterbalancing forces keep their current account balance tightly close to zero. Net inflow of foreign direct investment and foreign portfolio investment also play important roles in mitigating the negative trade balance effects.

Figure 2.3: Export, Import and Trade Balances of the South Asian Countries



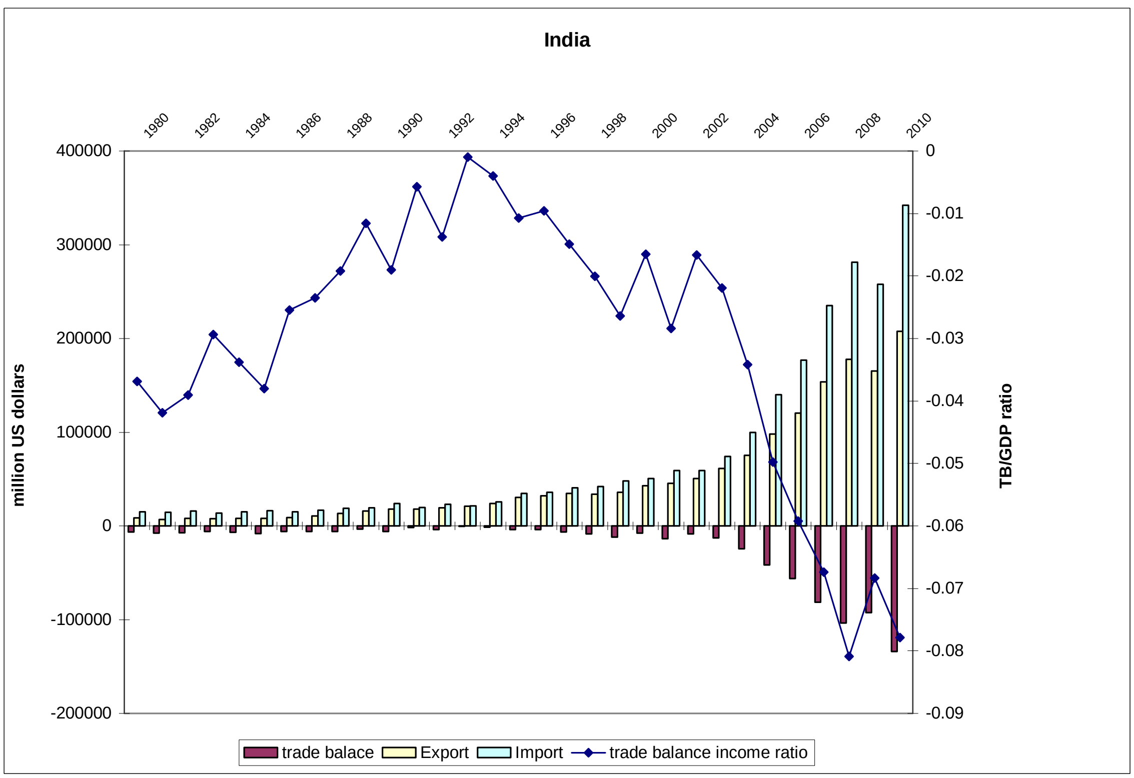
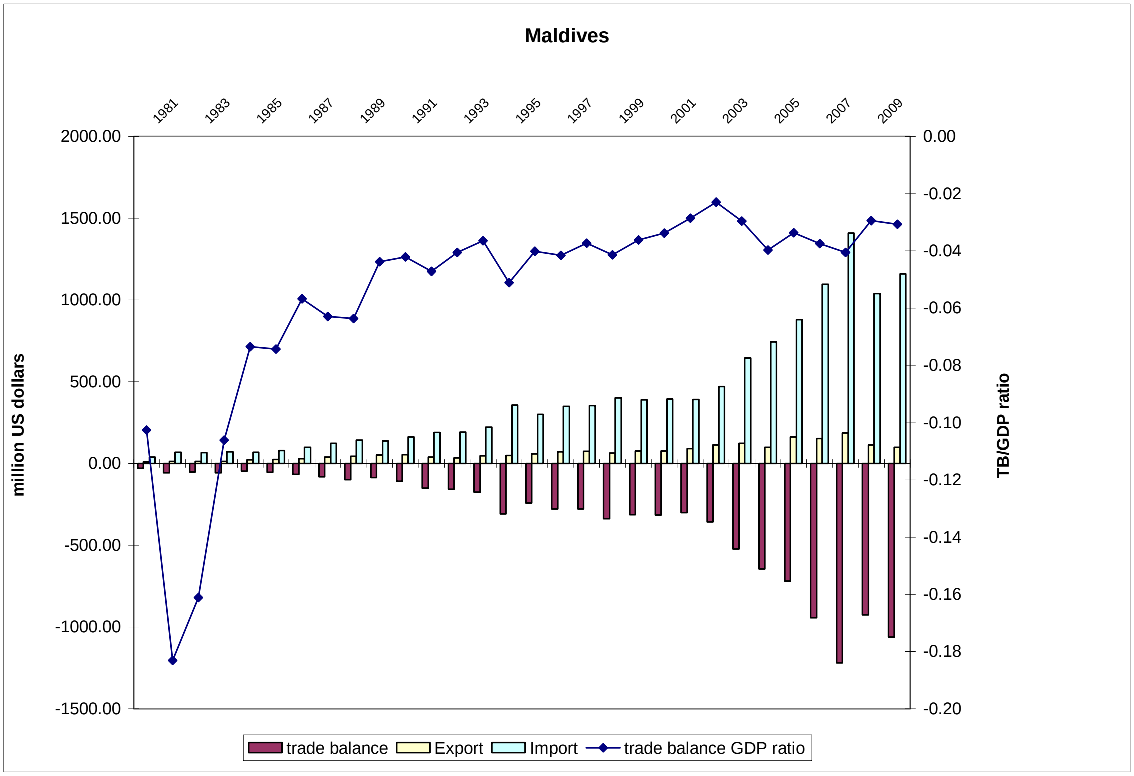


Figure 2.3 (Continued)



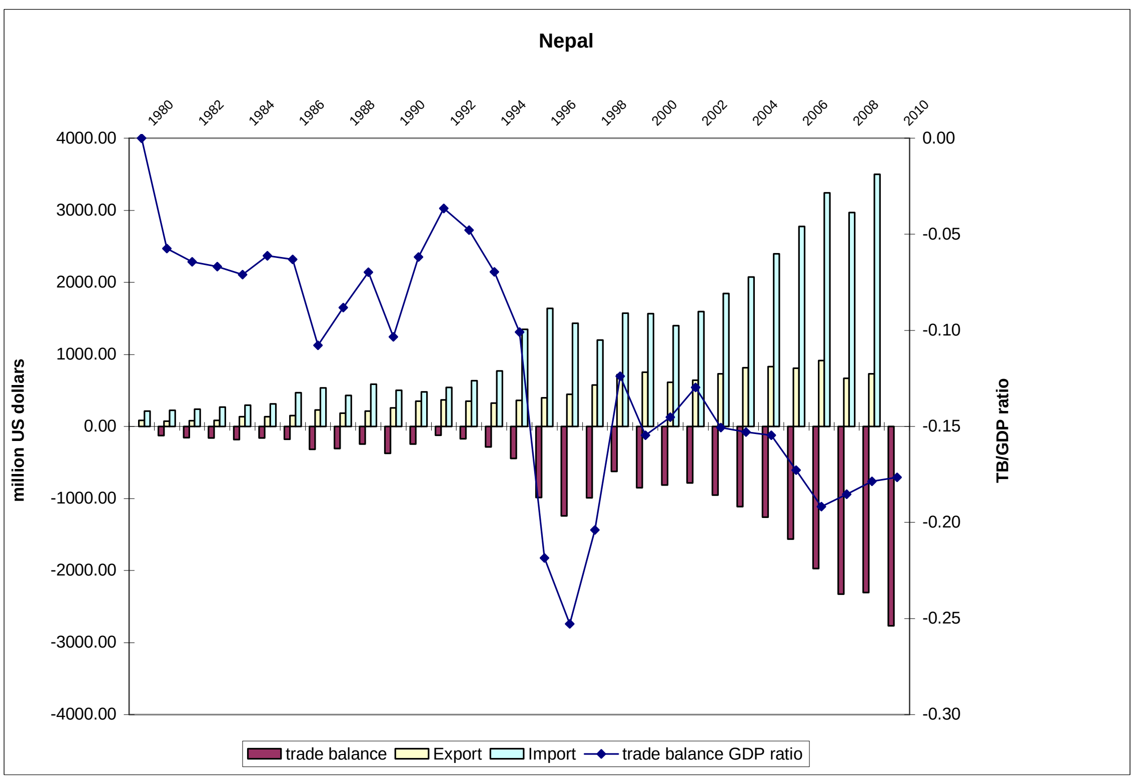
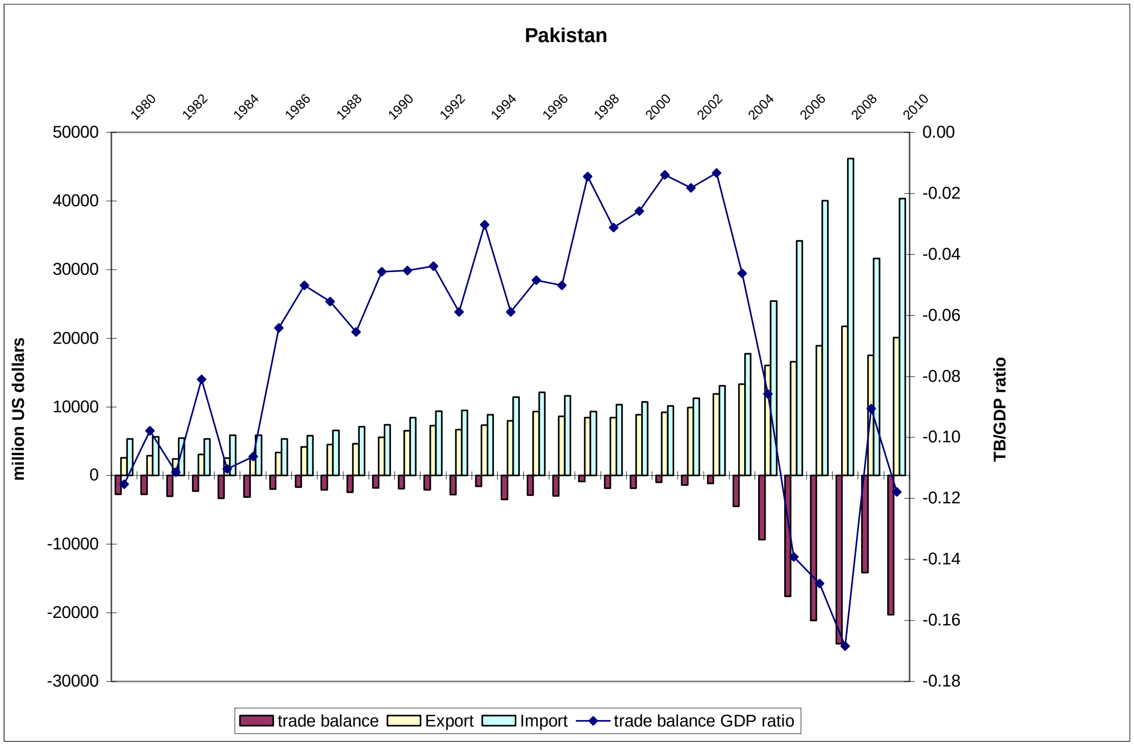
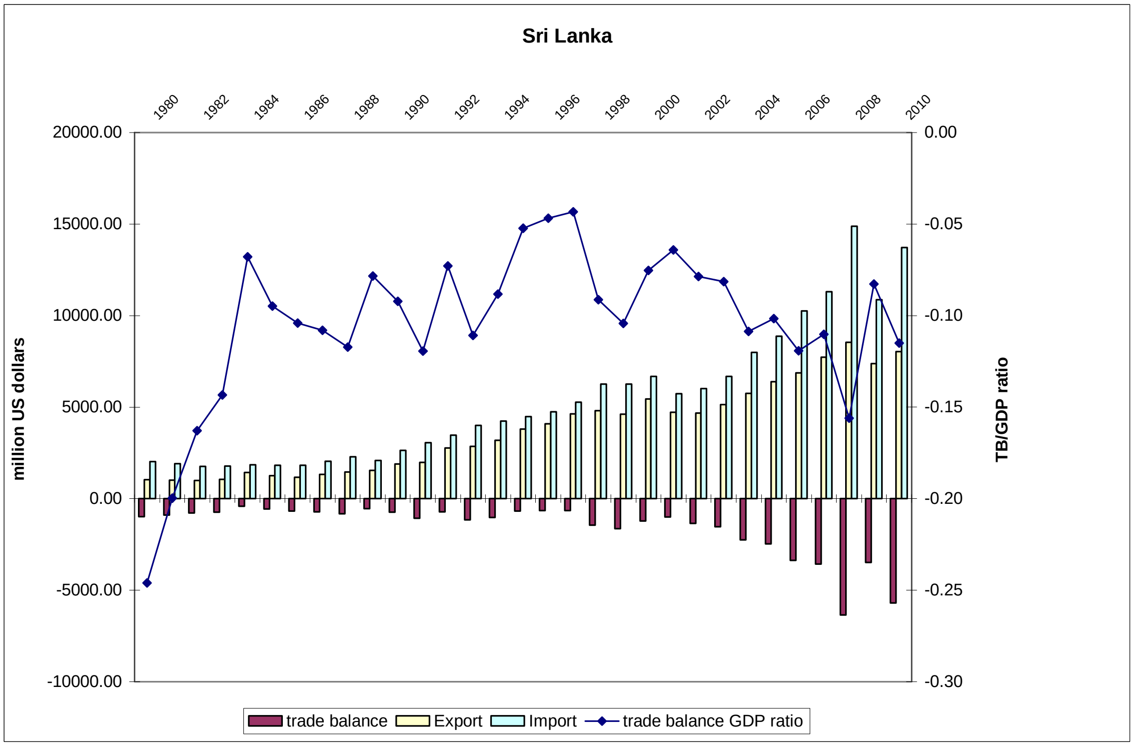


Figure 2.3 (Continued)





Source: Author, utilizing data from DataStream (2011).

Trade deficit is intimately related to the government budget deficit, giving rise to the so called twin deficits problem. As fiscal deficits are increased, for example by reducing taxes, national savings fall requiring the country to either to increase foreign borrowing or reduce lending, both of which means deterioration in current account balance. Bartolini and Lahiri (2006) review a large sample of country over the past thirty years and find empirical support for the twin deficit hypothesis. Carrying a large amount of budget deficit for a long period of time can create an enormous foreign debt servicing problem. Many of the Contemporary European countries including Greece and Italy are facing such problems and paying high price in terms of political instability and accepting unpalatable budget cuts for many people relying on the welfare state.

2.3 Economic Policy Reforms in South Asia

Before the Nineties South Asia was considered as one of the most protected region in the world and their trade policies were driven mainly by import substitution strategy[4]. When the governments of this region realized that economy wide regulations were acting as severe constraints in utilizing resources efficiently, they began to find ways to integrate with the world economy starting in the eighties but more vigorously pursued supporting policies in the nineties. Most of the countries in the region initiated broadly similar types of reform measures during that period. Private sectors were given more roles to play in the previously state controlled sectors like finance, telecommunications, media, power generation, and infrastructure development. Tariffs were substantially reduced and trade regimes were simplified with the hope that these measures will enable them to access new technology, create additional sources of trade, production, and generate employment opportunities.

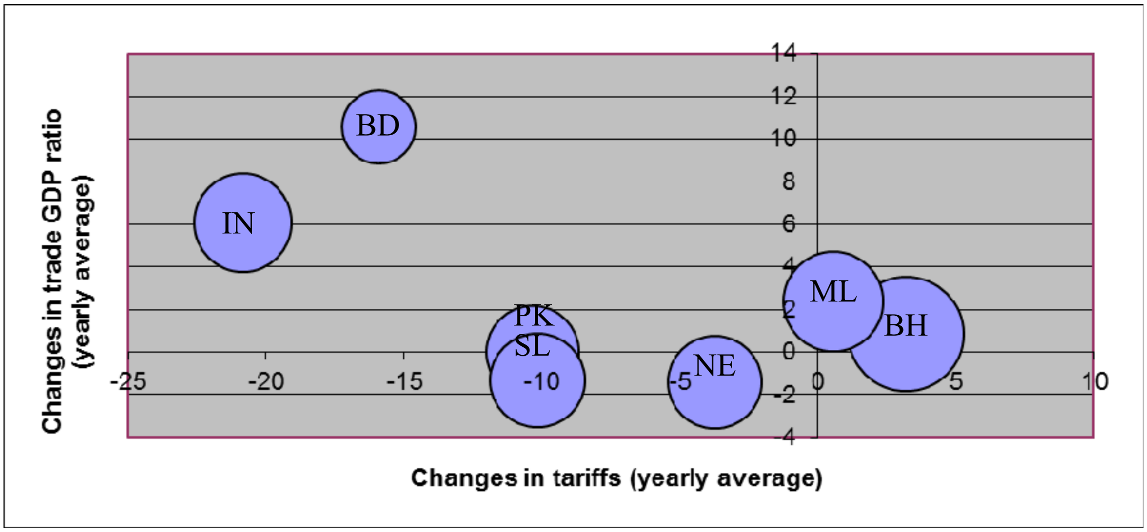
The region has become less protective as the average tariffs, which were in the range of 60 per cent to more than 100 per cent during the early nineties, have been reduced to the 13 per cent to 27 per cent range by 2005, and to the 9 to 15 per cent range in 2010, except for the Maldives and Bhutan whose average tariffs have hovered around 20 per

[4] Sri Lanka, however, started liberalization reforms in 1977, somewhat earlier than the rest of the South Asian countries.

cent during the past decade (WDI, 2011). The trade openness ratio (total trade as percentage of GDP) as a result became higher for all of these countries over this period. For India the ratio has increased from 15 per cent in 1990 to 25 per cent in 2004 and to 43.3 per cent in 2010, while these figures were respectively 17.6 per cent to 31 per cent and then to 43.5 per cent for Bangladesh, 68 per cent to around 80 per cent and then again declined to 45 per cent for Sri Lanka, 23 to 46 and then to 52 per cent in Nepal. There are no discernible patterns for Pakistan and the Maldives with regard to their integration with the world economy over time. Pakistan has seen her openness ratio to fluctuate between 32 to 38 per cent while for Maldives the openness ratio swung between 129 to 375 per cent during the past three decades.

The strength of integration with the world economy tends to be counter cyclical. Recent global recession has caused Pakistan's import and export to fall by 7.4 per cent and 0.5 per cent respectively, while for the Maldives import dropped by 10.4 per cent and export earnings precipitously came down by 14 per cent over the 2008-2009 periods. Even though the South Asian countries have been found to lose export market in the rest of the world during adverse times, some of them have in fact increased their export earnings from their regional markets. In spite of falling total export earnings from 21705 to 17523 million US dollars, Pakistan increased her regional export earnings from 806 to 814 million US dollars in 2009 over the previous year. In case of the Maldives, external transaction fell in both regional and world market, but the extent of the reduction from these two sources was 16.4 per cent and 40 per cent respectively. So the regional market is providing a kind of buffer or cushion against the external shocks.

Figure 2.4: Measures of Trade Liberalization and GDP Growth (1990-2010, based on available data)



The overall tariff reforms and integration with the world economy in terms of their total trade had some implication for the GDP growth in the reform period, which is shown in Figure 2.4 with the help of a bubble chart. The chart displays information on three variables in two dimensions. The horizontal axis and the vertical axis shows respectively, changes in tariffs and changes in openness (trade-GDP ratios). The third variable, GDP growth, is indicated in the relative sizes of these bubbles. In accordance with this figure, all major economies of the region, except for the two small nations, the Maldives and Nepal, have implemented significant tariff reforms. Trade reform and integration with the world economy has produced mixed results for various countries of the region. India implemented significant tariff reform by reducing her tariff level on a yearly average of more than 20 per cent for the past two decades and achieved around 9 per cent GDP growth rates over these periods, while Bangladesh, though implemented substantial tariff cuts, achieved only modest GDP growth rate during the same time period.

The case of Bhutan and the Maldives come at odds with the explanation. Bhutan achieved a high level of growth even though her average tariffs with the outside world slightly increased during the past decade and the openness status remained virtually unchanged. The economy of Bhutan is closely tied with the Indian economy with a sub-regional agreement, and her economic performance reflects the growth of the Indian economy. Similarly, the average tariffs of the Maldives did not change much, however she managed to increase her integration with the rest of the world through non-tariff measures and achieved a high growth rate. Sri Lanka represents the most open regime in the region; however as her income is growing fast, the relative share of trade in GDP seems to be falling. The recent global financial crisis has also adversely affected her export performance.

Moreover, as these economies became more liberalized, it was harder for them to maintain fixed exchange rate system and at the same time control domestic macroeconomic variables through monetary policies. To retain control over monetary policies, these countries preferred to gradually align their exchange rate more toward the flexible exchange rate system. A brief introduction of the country-specific policy measures that have important ramifications for their endeavour to integrate with rest of the world is given below.

2.3.1 Policy Reforms in Bangladesh

After separation from Pakistan in 1971, various sectors of the Bangladesh economy were nationalized on a massive scale. The state share in the industrial fixed asset jumped form 34 per cent in 1970 to 92 per cent in 1972 (Rahman 2006). Severe import control, widespread use of prohibitive duties and exchange control marked the economic policy environment up to 1976. The aims of these policies were to prevent the balance of payment problem and attain import substitution industrialization. Policy changes were introduced in the latter half of the seventies by withdrawing restriction on investment and deregulating state owned enterprises. Tariffs were reduced and incentive packages were declared for the export oriented sectors. The import regime was further liberalized through the structural adjustment policies in the mid-eighties. As imports were simplified and the effective rates of protection were reduced, raw materials and industrial goods could then be imported with relative ease.

Market oriented policy reforms continued in the nineties. A large number of quantitative restrictions were eliminated and fiscal incentives for export oriented sectors were introduced. The average unweighted customs duty fell from 47 per cent in 1993 to 16 per cent in 2004 (GOB, 2004). Substantial reforms in the telecommunication sector throughout the 2000s decade encouraged foreign participation in this sector and helped Bangladesh to offer one of the lowest mobile tariffs in the world. In 2010 a new scheme known as public-private partnership (PPP) was introduced to undertake various types of small, medium, and large scale projects involving stakeholders from both the government and the private sector (World Bank, 2011). The major challenges that the country are currently facing are the issue of granting foreign participation in extracting its only available natural resource gas, and producing enough electricity, severe shortage of which is stifling her economic activity, and getting rid of the systemic corruption entrenched in economic activities. To some extent other countries in the South Asia region are also facing the same problems.

2.3.2 Policy Reforms in Bhutan

One of the smallest countries in the world, Bhutan is predominantly dependent on agriculture, and the subsistence sector constitutes over 90 per cent of its total output. Like Nepal in many ways Bhutan is also heavily dependent on the Indian economy. Her monetary policy is in fact tied with the Indian monetary policy. Both Bhutanese ngultrum and Indian rupee are legal tender and exchanged one for one. As a natural trading partner, a major portion of export and import are done with India. With the help of migrant workers and expertise from India, Bhutan produces electricity only to serve the market of the former economy, while 70 per cent of the populations in the latter economy do not have access to electricity and depend on forest woods for energy (Encyclopaedia of Nations, 2011).

After partial relinquishment of monarchical power through political reform in 1998, Bhutan has implemented some remarkable economic reforms. The state monopoly in petroleum distribution has been abandoned, private participation in banking and cement manufacturing has been allowed, and the Government Power Department has been transformed into Bhutan Power Corporation in 2002. In her tenth five-year plan (2011-2014) priority has been given for developing skilled human resources and broadening the tax base to reduce dependence on foreign resources. Despite all these attempts, the economy is still marked by detailed controls in various sectors including trade, labour, finance, and industrial licensing, which in turn inhibit foreign investment in the economy.

2.3.3 Policy Reforms in India

The largest economy in this region with US$ 1.53 trillion GDP, which is in fact the fourth largest economy in the world in terms of the purchasing power parity measures of GDP, remained closed for a long period of time after its independence in 1948 to the outside world, and initiated its economic reform only in the late seventies by introducing an open general license for imports. The liberalization program gained substantial momentum in the early nineties, and this period can be termed as her true reform era. Before reform, India followed protectionist policies and the economy was regulated along the soviet style. Major sectors of the economy then were under public control and central planners gave priority to import substitution policies to build up its industrial base. The outcome of such polices was not rewarding when she found her growth rate substantially below than that achieved by some other Asian economies like China, Japan, and South Korea.

Through the economic liberalization program of the early nineties, tariffs were substantially reduced (for example, average tariff in 1990 was 82 per cent which sharply came down to 12 per cent in 2009), public monopolies from many sectors were withdrawn, and financial sector became even more liberalized. Outward oriented economic reform of the Nineties helped India achieve a respectable growth rate for the next decade. Reliance on external assistance has substantially been reduced and the debt service ratio came down to 4.4 per cent of GDP in 2008-09 which was 35.3 per cent at the beginning of the reform in 1991. However, the beneficial effects of liberalization have not been widespread and remain concentrated among the urban population. Widespread poverty is still a major concern for the Indian economy. Even the government of India recognizes that 37 per cent of her population lives below the international poverty line when the line is calculated as $ 1.25 PPP per day.

2.3.4 Policy Reforms in the Maldives

This small island economy, despite being devastated by the 2004 tsunami, is growing at around 7.5 per cent over the past decade. However, the onset of the recent global economic crisis that started in 2007 adversely has affected the economy by reducing per capita GDP growth rate by 4.4 per cent in 2008-09. The economy's significant income and revenue generating sector, tourism, was the hardest hit and is considered responsible for the slowdown of the Maldives' economy.

Through economic reform programs beginning in 1989, the government of the Maldives withdrew quotas and opened up the private sector, especially for the export oriented industries. Currently an economic recovery program initiated in 2009 with the help of the Asian Development Bank (ADB) is under implementation and aims at reducing subsidies, broadening tax base, and aligning public expenditure with available resources. The International Monetary Fund (IMF) has also pledged over $92 billion to avert the fiscal and external imbalances. Overcoming capacity constraints and implementing fiscal reforms continue to be the major challenges for the Maldives in her development effort.

2.3.5 Policy Reforms in Nepal

Severely constrained by the absence of adequate physical and social infra-structure, the Nepalese economy is heavily dependent on foreign assistance for development. More than 50 per cent of her development budget is financed by the foreign aid. In addition to SAFTA, she has bilateral trade pact with India and 43 per cent of her export market is in India. Despite power shortage and import of power from other countries, Nepal exported

95 GWh (gig watt hour) electricity to India in 2001 (www.en.wikipedia.org/wiki/Nepal, accessed on May 11, 2012).

Nepal has passed through three stages of policy changes in the post-war period: a free trade regime (1923 – 1956), followed by a protectionist regime (1956 – 1985), and then again outward looking policy from 1986 onward. Her recent liberalization initiatives include simplifying industrial licensing regime and foreign investment procedure, making Nepalese rupee convertible, and privatizing some important state owned enterprises. Liberalization of import regime and export incentive, like the Generalized System of Preference (GSP) facilities from developed countries, has helped Nepal to intensify her export activities in some areas, like jewellery production.

2.3.6 Policy Reforms in Pakistan

After independence from the British Empire in 1947, Pakistan was following a mixed-economy approach by establishing state control on the power and energy, manufacturing, infrastructure and networks, and relegating the rest of the economic activities to the private sector. The liberalization was expedited in the 1960s under the military government, but concentration of asset ownership and inequality pattern exacerbated. The policy stance was reversed in 1973 under the Bhutto government. Nationalization program of the key industries again emerged, but was short-lived, as the military government again seized power in 1977 and resumed liberalization. The subsequent democratically elected government in 1990 intensified the reform measures by freeing the exchange rate, interest rate, energy prices, and curbing credit control.

Security concerns and political turmoil in the recent decades have created so much uncertainty that FDI flow to this region has dropped from a high level $ 8.4 billion in 2007 to a dismal $3.5 billion in 2010. Along with the reduced FDI flow, massive amount of capital outflows are also taking place, especially toward the Gulf region. Increasing political uncertainty has proved expensive for the economy of Pakistan, as it is facing lower credit rating from international ratings agencies like S&P and Moody[5], thus increasing the cost of collecting funds from abroad. Protection or insuring against Pakistan's sovereign debt, known as credit default swap (CDS), now trades at 1800 basis points[6], which is considered by many investors as a sign of bankruptcy.

2.3.7 Policy Reform in Sri Lanka

After the demise of the socialistic era in 1977, Sri Lanka has actively pursued deregulation, privatization, and market oriented policies. Major policy reforms in Sri Lanka that had significant impact on the economy are divided into four sub-periods in Bandara and Karunaratne (2010). These are 1978 – 1981, 1981 – 1988, 1988 – 1993, and 1993 – 1997. The initial reform period was marked by the dramatic rise in the intermediate input imports and the inflow of foreign direct investment. The economy was also transforming from the import substitution to the export oriented industrialization. A second wave of reform package was introduced by the Premadasa government in 1989-90 paying special attention to facilitate investment and export activities. In the fourth sub-period, a left-wing dominated government came to power in 1994 but promised to continue the reform measure in line with the previous government, thus creating a period of policy convergence[7]. By the turn of the century, the contribution of the private sector to the manufacturing employment has risen from 50 per cent to 94 per cent (Bandara, 2004).

All these policy reforms have gradually diversified the economic structure of Sri Lanka from a predominantly plantation based economy which contributed 93 per cent of her total export in 1970 (Central Bank of Sri Lanka, 1998), to a more diversified economy with insurance and banking, telecommunications, apparels and textiles, food processing and beverage sectors. Despite some fluctuations in output arising from the insurgency

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[5] Standard & Poor has reduced Pakistan's credit ratings from B to CCC plus, while Moody from stable to negative (http://www.economist.com/topics/pakistan, retrieved on August 4, 2011).

[6] A basis point is $^{1}/_{100}$ per cent.

[7] Athukorala (2012), however, shows that there has been significant backsliding from the liberalization reforms in Sri Lanka about the beginning of the decade.

problem and political unrest, the export oriented economic strategy has yielded her a 5.2 per cent GDP growth rate over the past decade. The major challenge for the Sri Lankan government is to keep under control its huge public debt, which has already surpassed 100 per cent of her GDP. However, the end of the long lasting civil war in May 2009 is giving her peace dividends by invigorating the tourism industry, making buoyant the stock exchange, and increasing the FDI inflow.

In sum, the export-led growth strategy has become a key policy tool for each country in the region. Amid the global economic slowdown that started in 2008, South Asian economies are doing moderately well compared to the other regions of the world. While the Western European economies are struggling to maintain positive growth in their per capita output, and experiencing protracted period of high unemployment, South Asia have managed to attain a respectable 5.4 per cent GDP growth rate in 2009. The resilience of the South Asian countries comes from their ability to explore alternative high growth economies of Asia in the face of shrinking market in the western hemisphere. However, it should be kept in mind that, since India represents a major share of economic activity in the region, various indicators of the region are heavily influenced by her activity and fluctuations in the smaller countries of the region remains hidden at the aggregate level.

2.4 Proliferation of Preferential Agreements, and the Rationale for Regional Integration in South Asia

2.4.1 Proliferation of Preferential Agreements

In spite of the concerns raised by some economists that regionalism will lead to a fragmented world risking the futures of the much desired multilateral system, preferential trading blocs are spreading rapidly in various parts of the world. Crawford and Fiorentino (2005) see regionalism as an insurance against the possibility of the failure of the multilateral trade negotiation. As trade talks fail to make progress at the

WTO[8], nations that are not party to any trade bloc feel the threat of trade diversion originating from other blocs. For example, if two countries A and B trade independently with a third country C and A forms a trade bloc with C, then it is in B's interest to negotiate a free trade agreement (FTA) with C to avoid possible trade diversion.

The inspiration for creating new blocs by the left over countries has been termed 'domino regionalism' or 'contagious FTAs' by Baldwin and Jaimovich (2010). They argue that the proliferation of trading blocs is more of a challenge than threat to the multilateral trading system. A total of 570 preferential trade agreements have been reported to the WTO since 1948 to 2007 (Hufbauer and Schott 2009). WTO-approved minor derogation from its non-discriminatory rule is now being practiced by numerous blocs all over the world. Sometimes regionalism spreads and countries sign FTAs not based on economic rationales, but by simply observing that others are doing so, which Bhagwati (1991) calls the bandwagon effect of regionalism. While the domino effect arises as a counter measure to tackle trade diversion, the bandwagon effect reflects a mimicking tendency.

At present three highly integrated regions in the world – Western Europe, North America, and Southeast Asia – known as the global triad, dominate the world economy both in terms of their combined GDP and trade flow. About two-thirds of total trades are conducted internally within Western European countries, while the figures are 25 percent and 40 percent respectively for Southeast Asia and NAFTA region (Cumbers, 2009). The present trend in regionalization suggests that the share of regional trade as percentage of world trade will continue to grow in the near future. There are very few countries in the world now that do not participate in some kind of regional or free trade agreement. In fact, by 2002 all WTO members, including those who were in principle against regional blocs, like Japan, Republic of Korea, and China are now parties to at least one and many others to two or more such discriminatory trading agreements (Cernat, 2003).

[8] It is worth mentioning that only two rounds of negotiations at the multilateral forum have been completed in the past forty years or so.

The network of free trade agreements (FTAs) are growing in such a haphazard way that most of the FTAs are now overlapping and countries parties to the blocs are now termed as “hub” or “spoke” depending on their position in the trade relationship. Countries signatory to a single bloc and with no preferential trade relation with other countries fall under the spoke category. A country can turn itself into a hub status as soon as she builds up trade relationship with another non-member country. Analysing welfare effects of such a hub and spoke system covering all countries around the world is a daunting task. Yuen (2007) analyses the implication of a triangular trade relationship between Singapore, Japan, and the USA economy in a hub-spoke framework. Singapore is found to be better off by playing a hub strategy, while the remaining two countries lose from their spoke status, thus providing incentive for these latter two countries to become a hub and minimize their loss.

Economists question whether the proliferation of preferential trading blocs help or hinder the much desirable global free trade. The incentive to reduce external tariffs after the formation of regional trading agreements (RTAs) does not signal that regionalism is always conducive to multilateralism. It is quite possible that members lose their interest to enter into multilateral negotiation once they feel that regionalism is serving their purpose. Moreover, gainers from regional trade liberalization, who fear that further liberalization will erode their competitiveness, create political pressure against broad based liberalization. For example, cement producers in Bangladesh and limestone producers in India can collaborate under an RTA for industrial location to capture the economy of scale opportunity by producing for the regional market and can still feel protected from outside competition.

2.4.2 Rationale for Regional Integration in South Asia

As the countries of the South Asia region were opening up their economies through unilateral liberalization in the early eighties, the idea of regional cooperation also came into the minds of the regional leaders. Interest for forming a preferential trading bloc in the region was based on the following grounds. First, in most of these countries agriculture constitutes an important sector of the economy and a significant portion of labour force is still engaged in the agricultural sector. Agricultural products like tea from Sri Lanka, Bangladesh and Pakistan; fish from Maldives, Bangladesh, and Sri Lanka; fruits from Bhutan and Pakistan, are some prominent export items from South Asia. Developed countries in the West, especially the EU, Japan, and the USA treat agriculture as their 'sensitive' sector and openly discriminate against agricultural imports to save their own jobs and avert domestic political tensions. Provisions of subsidies and export credit for agricultural commodities are quite common in these countries. It may be argued that taxpayers' money are transferred from developed to developing countries with their agricultural exports. Be it true, this is however an inefficient way of transferring income by distorting production structure, and the price gain the consumers of the developing countries enjoy thereby is minimal. There is hardly any sign, on the part of the developed countries, to abandon their current agricultural policies. Regional market expansion could be an alternative option for the developing South Asia to bring life to their agricultural sector.

Second, in case of the manufacturing sector, textile and readymade garments in South Asia have flourished by this time to a position from where it can control a significant portion of the world market. Instead of competing with each other in the same export market for the same commodity to the detriment of each other, they can take cooperative measures to ensure regional interest. The ability to source inputs at lower costs in the post-multifibre agreement (MFA) era is a crucial factor to remain competitive in the world market. Proponents of the regional integration thus believe that economic cooperation in South Asia will create a virtuous circle of intra-regional trade flow in raw materials and extra-regional trade in processed products.

Third, integration among developing countries is considered as an effective tool against the non-tariff barriers (NTBs) practiced by the developed counties. Developed countries, for example, maintain a high level of standard and regulation while importing commodities, which act as a non-tariff barrier for the less developed countries, since in many cases they do not have adequate capacity to meet these standards. South Asian economies are not far apart in terms of their level of development and it will be easier for them to devise standards which all of them can fulfil and thus increase trade flow among them. SAARC members have ratified the establishment of the South Asian Regional Standard Organization (SARSO) in August 2011 (Press Release, SAARC Secretariat; August 30, 2011) and are trying hard to harmonize standards in the areas of jute, textile, leather, and building materials. Once implemented, these measures are expected to result in increased trade flows of these commodities within the region.

Against the optimism about the preferential agreement in South Asia mentioned above, there are some hard realities that make the relevance of SAFTA questionable. Beginning in the eighties and the nineties, the tariff structure of the South Asian countries has been substantially rationalized through their unilateral reform measures, and the major economies in this region are now actively pursuing preferential agreements with countries outside the region or forming sub-regional blocs within the region. India has bilateral agreements with Nepal and Sri Lanka, Pakistan has a bilateral agreement with Sri Lanka, and five of the South Asian countries are now parties to the BIMSTEC-FTA (Bay of Bengal Initiative for Multi-sectoral Technical Cooperation Free Trade Area). India has concluded a total of 11 FTAs and 22 such are under negotiation. Similarly, Pakistan, Bangladesh, and Sri Lanka have concluded 8, 5, and 9 FTAs, and some are under negotiation (www.unescap.org/tid/, accessed May 2013). In many cases these non-SAFTA blocs are more liberal than SAFTA. In case of the Sri Lanka-India free trade agreement (SIFTA), for example, 13.7 per cent of the total trade falls under the sensitive lists, and this figure is 42 per cent under the SAFTA. Similarly, the BIMSTEC-FTA goes beyond the SAFTA provision by incorporating the investment measures and services agreement and allowing for fast-track liberalization (Mel, 2007).

These developments (that is, the engagement of the SAFTA members with other trading blocs) are taking place because of the perverse trade costs picture of the South Asian countries against other regions that defy the distance logic. As Table 2.3 shows, both the cost of export and the cost to import are significantly higher in South Asia relative to the other regions. While the shipment of a container to the OECD countries costs about 1059 US dollars and the shipment time is 11 days, these figures are 1512 US dollars and 32 days respectively for South Asia. Similarly, except for the Sub-Saharan Africa, the situation is not very different when the import costs are compared between South Asia and other regions. The higher costs of trade in South Asia are reflections of the region's inadequate infrastructure and logistics, complicated bureaucracy, and lack of transparency in business dealings. Thus mere tariff concession is not expected to bring dynamism in the intra-regional trade in South Asia and what is more important is the progress in these other non-tariff areas.

Table 2.3: Trading Costs across Borders

Indicator	East Asia and Pacific	OECD	Latin America and the Caribbean	South Asia	Sub-Saharan Africa
Cost to Export (US Dollars per Container)	889.8	1058.7	1228.3	1511.6	1961.5
Cost to Import (US Dollars per Container)	934.7	1106.3	1487.9	1744.5	2491.8
Time to Export (Days)	22.7	10.9	18.0	32.3	32.3
Time to Export (Days)	24.1	11.4	20.1	32.5	38.2

Source: <http://www.unescap.org/tid/projects/tfforum12-s2-saarc.pdf>, accessed on October 17, 2013)

2.5 Intra-regional Trade and Regional Integration in South Asia

2.5.1 Changing Pattern of Regional Trade Flow

Compared to other regions of the world, South Asia, solely because of non-economic and political reasons, has not put much effort to materialize the potential gains from economic cooperation. World Bank (2004) shows that intra-regional trade in South Asia is more discriminated against by the countries in the region compared to trade with the rest of the world. Back in 1948 intra-regional trade in South Asia was about 19 per cent of total trade, which by 1974 has been reduced to less than 4 per cent and remains so for the last three decades. Existence of protectionist sentiment among the developed nations might be one reason for the higher level of integration at the beginning, but it certainly reflected low trade barriers within South Asia. Inward looking policies adopted subsequently by the South Asian countries after their independence created the ebb in the regional trade flow.

Apart from economic policies, political tensions among some of the countries in this region, especially between India and Pakistan, are causing obstacles toward regional integration. Unresolved border problem, cross-border issues like India's Tamil problem with Sri Lanka, and water sharing problem of common rivers with Bangladesh, cross-border terrorism issues are contributing to this tension. In accordance with Dossani *et al.* (2010) security and development issues are interrelated, and South Asian countries place more emphasis on security issues than development issues. Some necessary conditions for regionalism to succeed, such as intention, resolving differences of domestic policies and institutions among the member states are absent in South Asia (Dubey, 2010). Observing the current state of these countries and their historical relations, Dossani *et al*. (2010) question whether South Asia as a region does exist.

One might think that it is natural for a set of geographically proximate countries to trade more with one another. Deardorff (2001), however, shows that social network can reduce the cost of trade and undermine the law of comparative advantage causing trade to flow in directions not predicted by traditional trade theories. If it happens, for example, that a larger portion of population from Bangladesh is migrated and settled in the USA than in Nepal, the network effect in terms of exploring market opportunities will be stronger between the US and Bangladesh. As a result, the real cost of doing business or trade cost will be lower for this latter pair of countries. This has in fact been the case for most of the South Asian countries in explaining their changed pattern of trade. Reduced trade costs among distant countries have transformed the local comparative advantage into a global comparative advantage phenomenon.

The changing pattern of trade flow within the region is shown in Table 2.4 and is summarized in the accompanying Figure 2.5 below. It is clear from a cursory view of the table and the figure that the smaller economies of South Asia – especially, Nepal, Sri Lanka, and Bangladesh – have become more regionally oriented over time. Nepal, for example, has increased her regional average trade from 23 per cent in the eighties to 56 per cent in the recent decade, while Sri Lanka has shown an improvement from 6 per cent of total trade to over 15 per cent over the same period. For Bangladesh, these figures are 5 per cent and 10 per cent respectively. The two dominant economies of India and Pakistan remain indifferent by conducting only about 2 per cent of their total trade within the region for the past three decades. Opening up of these two economies and making them more regionally integrated will have enormous impact on the trade flow of this region.

Table 2.4: Structure of Regional Trade in South Asia

(Values in million US dollars)

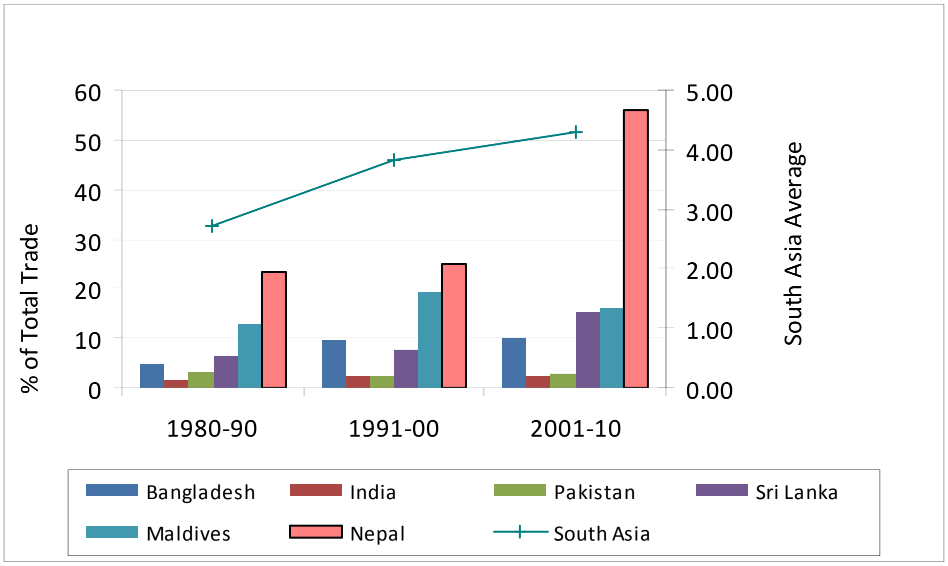
Country	Period (Avg)	Regional Import	Total Import	% of Total	Regional Export	Total Export	% of Total	Regional Trade	Total Trade	% of Total
Bangladesh	1980-90	119.31	2798.08	4.26	65.10	1021.55	6.37	184.41	3819.63	4.83
	1991-00	834.38	6103.49	13.67	74.68	3263.76	2.29	909.06	9367.24	9.70
	2001-10	2396.09	15998.09	14.98	234.19	10368.11	2.26	2630.28	26366.19	9.98
India	1980-90	106.95	16777.89	0.64	316.08	10424.74	3.03	423.02	27202.63	1.56
	1991-00	242.02	34130.10	0.71	1293.47	29200.14	4.43	1535.49	63330.24	2.42
	2001-10	1192.05	172472.96	0.69	5670.40	115581.00	4.91	6862.45	288053.96	2.38
Pakistan	1980-90	110.63	5979.01	1.85	151.26	3508.06	4.31	261.89	9487.07	2.76
	1991-00	191.73	10173.64	1.88	275.12	7952.27	3.46	466.86	18125.91	2.58
	2001-10	1048.49	27011.28	3.88	569.32	15521.08	3.67	1617.81	42532.36	3.80
Sri Lanka	1980-90	134.34	2006.20	6.70	71.86	1291.48	5.56	206.20	3297.68	6.25
	1991-00	543.05	4848.10	11.20	105.13	3823.20	2.75	648.18	8671.30	7.47
	2001-10	1983.02	9633.41	20.58	460.50	6525.35	7.06	2443.52	16158.76	15.12
Nepal	1980-90	77.08	357.19	21.58	37.38	135.24	27.64	114.45	492.43	23.24
	1991-00	263.13	1011.30	26.02	94.50	414.97	22.77	357.63	1426.27	25.07
	2001-10	1262.57	2335.83	54.05	462.31	749.29	61.70	1724.88	3085.11	55.91
Bhutan	1980-90	N/A	84.36	N/A	39.32	N/A	N/A	N/A	123.68	N/A
	1991-00	N/A	131.75	N/A	93.36	N/A	N/A	N/A	225.11	N/A
	2001-10	N/A	424.61	N/A	347.07	N/A	N/A	N/A	771.68	N/A
Maldives	1980-90	11.03	89.37	12.34	4.04	26.30	15.37	15.07	115.68	13.03
	1991-00	55.24	291.49	18.95	11.59	56.99	20.34	66.83	348.48	19.18
	2001-10	135.99	822.70	16.53	17.68	121.48	14.55	153.67	944.18	16.28
South Asia	1980-90	564.79	28367.12	1.99	644.88	16782.09	3.84	1209.66	45149.22	2.70
	1991-00	2129.55	56689.86	3.76	1854.48	44804.68	4.14	3984.04	101494.55	3.84
	2001-10	8018.20	228698.8	3.51	7414.41	149213.37	4.97	15432.60	377912.24	4.31

Source: Author's calculation based on IMF's Direction of Trade Statistics (Online version, accessed on November 7, 2011)

Note:

- *Figures are arithmetic mean over the period indicated in column two*
- *N/A: Not available.*
- *Figures for South Asia average excludes Bhutan*

Figure 2.5: Intra-Regional Trades in South Asia



Source: Author (Based on Table 2.4).

Bilateral trade flows between the large two partners are suffering from what is termed by Eichengreen and Irwin (1996) as the 'hysteresis' effect of bilateral trade flow whereby the history of previous trade flows determine the current trade pattern. The effect seems reasonable for India and Pakistan, because once exporters incur sunk cost to develop distribution network in the foreign market, they need to exploit the market for a long period of time to recoup profit. Perception of future disruptions in the relationship (war or political tensions) discourages them to take such investment expenditures. To the extent that regional bonding creates political stability (as has been the case for France and Germany in the EU), it might help intra-regional trade to flourish.

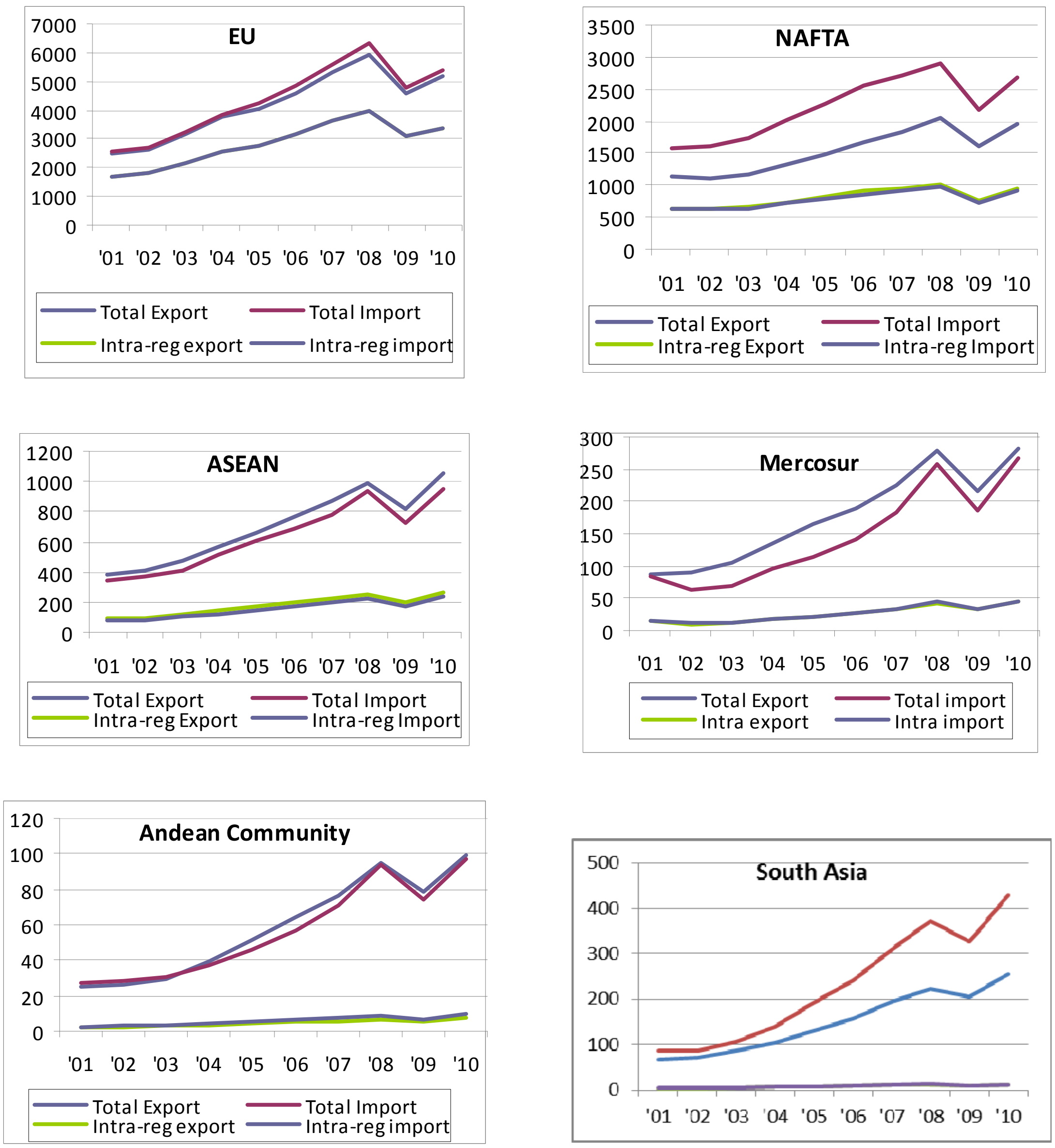
The fact that a small portion of trade occurs within the region has led some trade theorists (e.g. Panagaraya 1996, and Pitigala, 2005) to conclude that the countries in this region are not natural trading partners, hence the possibilities of trade diversion from regional integration is substantial. However Bhagwati and Panagariya (1996) offer a systematic analysis showing that the amounts of pre-bloc trade among the members have no role to play in the welfare implications of forming a discriminatory trading area. In addition to that, a large volume of trade in South Asia occurs informally through the extensive and naturally porous border region. If these unofficial trade figures are taken into consideration as well as the fact that official trade has increased by this time, then the countries may look more like natural trading partners.

Moreover, as the nature of production and trade structure are changing throughout the world, the prospect of trade expansion through regional cooperation seems promising. Countries, especially in Asia, are now positioning themselves in the global supply chain to export intermediate components. Athukorala and Yamashita (2008) find that fragmentation trade is growing at a faster rate than total world manufacturing trade, and making intra-regional dependence more important than ever. However, South Asian countries are yet to exploit the opportunity of gaining from the international supply chain through regional integration.

It might be illuminating at this point to compare the performance of South Asia with some other major regional groupings. Inspection of the total trade (that is, import plus export) trend during the past ten years for the EU, NAFTA, ASEAN, MERCOSUR, and the Andean Community, shown in Figure 2.6, reveals two notable points. First, all of these blocs seem to have reached a saturated point from where it is difficult for them to further increase the regional share in their total trade, as their total trade and regional trade are growing at the same rate. In the last decade, the share of regional trade in total trade for the EU has remained stable in the range of 64 per cent to 68 per cent. For NAFTA, the range is 40 per cent to 46 per cent, and for ASEAN, the range is 23 to 25. For the Southern Common Market, MERCOSUR, the range is bit lower at 14 per cent to 18 per cent, and for the Andean Community it is much lower at the 9 per cent to 11 per cent range. In fact, of late, these groupings are experiencing slightly downward pressure in their regional trade share.

The second important point to note is that in response to the recent global economic fluctuations the regional trades of these blocs are showing stable behaviour compared to the their total trades. All portions of Figure 2.6 show that in spite of the recent bumpy ride in the total trade flows, regional trades have been comparatively smooth. The regional trades also have been more balanced compared to their total trade, which is confirmed by the coincidence of the regional export and import curves at the bottom of each figures. So, regional integration can be expected to provide a cushion against the turmoil in the world trading environment.

Figure 2.6: Trends in Total and Regional Trade Flows (Selected Regions)



Source: Constructed from the WTO data

Note: Data are in billions of US dollars shown along the vertical axes, and the horizontal axes indicate years

2.5.2 Free Trade Area in South Asia

Rapid expansions of regional trade in the European, American, and the East Asian countries have created adverse trade diversion possibilities for the South Asian countries. The formation of the free trade bloc in South Asia can be thought of as a strategic response, intended to avoid the detrimental trade diversion effects of the other trading blocs. The stepping stone for preferential trade liberalization was set up when the South Asian Association for Regional Cooperation (SAARC) was established in December 1985 in a summit meeting in Dhaka. In addition to trade, a wide range of area of cooperation, spanning from socio-economic to cultural fields, was being sought for through this organization. To strengthen economic ties among the member nations, the governments of the region established the SAARC Preferential Trade Area (SAPTA) in 1993 and after four rounds of successful negotiation converted it into the free trade agreement, SAFTA, in 2004 which is in operation since January 2006.

SAFTA is designed to overcome the limited scope of the SAPTA and its major objectives are to increase fair competition among the members as well as raise the level of trade flow within the region. Economically weak members' interests in the agreement are taken care of by conceding special treatments for the LDC members and providing for safeguard measures in the agreement. A list of five instruments is devised in the agreement to achieve the SAFTA objectives:

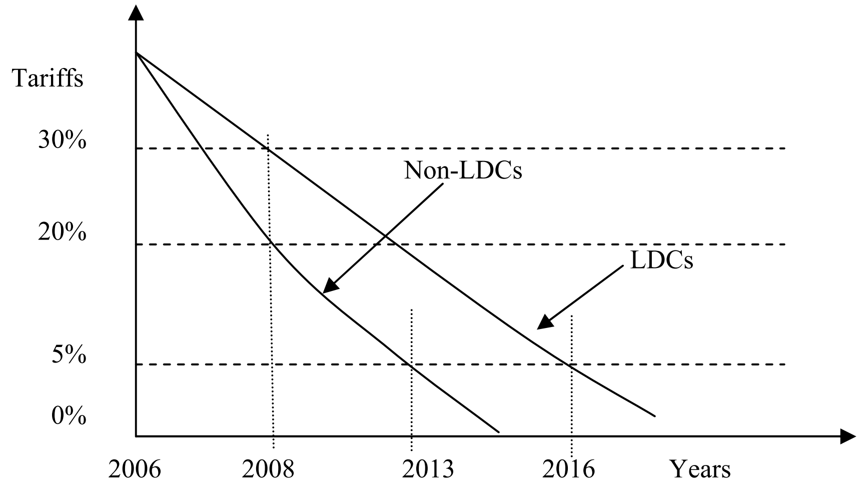
1. Trade Liberalization Program
2. Safeguard Measures
3. Institutional Arrangements
4. Dispute Settlement Mechanisms, and
5. Rules of Origin

In addition to these measures, any other instruments could be resorted to if the members agree. The trade liberalization program provides a roadmap for achieving the regional free trade area. According to the program, the non-LDC members were supposed to reduce their existing tariff levels to 20 per cent in two years after the SAFTA became operational in 2006, while the LDC members were expected to reduce their existing tariff levels to 30 per cent in the same time period. If the existing tariffs for some products happened to be below the target levels, then the former countries would have to reduce tariffs by 10 per cent each year and the latter countries by 5 per cent each year. After these initial two years, the non-LDC members have another five years, and the LDC members another eight years to reduce their tariff levels to the 0 – 5 per cent range, which period is now ongoing for both sets of countries. Of course, there are options for reducing tariffs at more accelerated rates than the guideline suggests if the members prefer to do so. Figure 2.7 provides an outline of the tariff elimination process for the LDC and non-LDC members.

Available data from the World Trade Organization (WTO) on tariff structure for the member countries show that Sri Lanka is fast approaching the target by bringing down most of her tariff lines below 10 per cent, while for Bangladesh many tariff lines still attract 20 to 25 per cent import duties. Nepal has achieved 5 to 15 per cent tariff range in many products and for Maldives the range remains wider at 15 to 25 per cent. India and Pakistan do not provide preferential tariff data to the WTO, but their MFN rates for many items fall within the 5 to 25 per cent range. All these countries have reduced their tariff levels for the SAFTA-eligible products to meet the first slab of the guideline. Since they are pursuing unilateral and multilateral liberalization at the same time, the margin of preference in many cases is getting tighter, falling below 10 per cent.

Should trade liberalization turns out to be seriously damaging for some products in some countries, safeguard measures are there to protect them from severe injuries. Based on the decision of some competing authorities that further import of the commodity may cause irreversible damage to the competing firm, the affected country can temporarily deny tariff concession for the product. The safeguard measure cannot be applied against LDC members if their total export of the product does not exceed 6 per cent of the total import of the product for the importers. It is conceivable that indiscriminate use of the safeguard provision may cause tension among the trading partners.

Figure 2.7 Tariff Reduction Guideline in SAFTA



Source: Author's construction based on SAFTA documentation.

The major institution created through the agreement is the SAFTA ministerial council (SMC), which helps with the administration and implementation of the contract. The SMC is formed by taking trade or commerce ministers from each member state and they meet at least once a year. Their activities are often supported by another technical body known as committee of experts (COE) which also gets personnel from each member state who are specialists in trade related matters. The COE meets at least every six months and reports to the SMC. On the top of these two institutions resides the SAARC secretariat that provides secretarial supports to both the SMC and the COE to properly discharge their duties.

Any dispute that may arise from interpretation or application of the agreement can be settled through bilateral consultation or referred to the committee of experts (COE). If consultation fails to settle the dispute within 60 days, the COE investigates into the dispute and makes recommendation often with the help of a specialist who is from countries other than the disputing ones. The decision of the COE can be appealed against and referred to the SMC, which may take another 60 days to decide whether to modify or reverse the COE recommendation. After the final decision, the offender country has another 30 days to implement the recommendation. If it fails to address the issue within

90 days, the complaining party gets the right to withdraw concession of equivalent magnitude from the transgressor. The whole process of the dispute settlement can thus take up to one year. The incentive for adhering to the agreement is not strong enough and one can misuse the agreement but receive only a tit for tat penalty after a lengthy process of dispute settlement. There is also an exit mechanism. Any dissatisfied state can get relieve of the contract by notifying the COE and the SAARC Secretariat.

2.5.3 The Rules of Origin Issue

When trade barriers of the members with the outside countries vary widely, the possibility of trade deflection arises. Non-members can then take advantage of the varying tariff structure of the members by re-routing their exports from the low- to high-barrier member countries. In such cases the free trade area tends toward a custom union with their external tariffs effectively equal to the tariffs of the most liberal member. To avoid the trade deflection problem, implementations of rules of origin have been an integral part of any free trade agreement. Since in many countries goods are produced with a mixture of both the domestic inputs and inputs imported from other countries, it often becomes problematic to determine the origin of the product. Substantial amount of transformation of a product is required to make it eligible to be considered as originating from a country. According to the International Trade Centre (1999) guideline, when the value added for a product is substantial and it changes tariff classification heading at the six-digit HS (Harmonized System) level, the product is considered as made in the country where the transformation has taken place.

A major obstacle in implementing the SAFTA dream lies in its vague Rules of Origin (ROO) and the attendant complex administrative procedure, which discourages firms to utilize the FTA concessions. The current ROO requires that for a product to be eligible for SAFTA preference at least 40% (the figure is 35% for Sri Lanka and 30% for other South Asian LDCs) of the value addition should occur within the country (SAFTA Agreement, Annex-IV). At the same time, to enjoy SAFTA concession the product should undergo substantial amount of manufacturing process so that it changes its tariff heading at 4-digit level Harmonized Code System. South Asia's neighbour region, Southeast Asia, has been more lenient in formulating its ROO by requiring 40 per cent local content or value added which includes regional accumulation. This implies that any product valued at, e.g. $10, will enjoy regional preference if the product is made using inputs worth $4 from any member country of the region.

Countries that heavily depend on imported raw materials for their major export items (this is the case especially for small open economies those export manufacturing items and have undiversified industrial structure) are likely to suffer the most from the stringent ROO. Because of increased cost, these countries find themselves in a competitive disadvantage position vis-à-vis other large countries of the region that have their own extensive resource base. The local content rules are designed to prevent trade deflections and improve the regional content of trade flow. But because of complex method of implementation, ROO often turns out as a trade barrier. Less stringent rule will help not only to increase trade among the members, but at the same time to boost trade flows with third countries.

The rules of origin issue have been made more prohibitive in South Asia by adding rules of destination or port of landing provisions. India for instance allows Sri Lanka to export tea in her territory through four designated ports and Bangladesh to export chemicals and drugs only through three land customs. Other members also use similar port of entry restriction which severely increases cost of trade and encourages illegal trades. Preference for imposing such restriction also reflects inadequate administrative capacity on the part of the member countries.

2.5.4 Menacing List of Sensitive Items

Existence of lengthy lists of sensitive commodities that are not eligible for the SAFTA concessions, also limits the effectiveness of the agreement. Annex-II of the SAFTA agreement focuses attention on tariff lines that are excluded from the regional concession by including them into sensitive or negative lists. It is estimated in a study that 53 per cent of the total imports in South Asia is subjected to the negative lists (Weerakoon and Tennakoon, 2006). These lists are, however, updated or reviewed within four years by the SAFTA ministerial council to make them more concise. A summary of the initial negative list and their subsequent revisions submitted to the

SAARC secretariat by the member states is given in Table 2.5 below. The original lists are based on HS 2002 nomenclature while the revised version follows HS 2007 version. Some countries, like Sri Lanka and Maldives, have increased the number of items in their revised version of the sensitive lists.

Table 2.5: Items in the Negative/ Sensitive List

Countries	Number of Tariff lines for LDCs		Number of Tariff Lines for Non-LDCs	
	Original	Revised	Original	Revised
Bangladesh	1249	1233	1254	1254
Bhutan	137	--	137	--
India	763	480	884	868
Maldives	671	681	671	681
Nepal	1335	1257	1335	1257
Pakistan	1183	1169	1183	1169
Sri Lanka	1065	1707	1065	1707

Note: -- not provided by the respective countries

Source: Retrieved from <http://www.saarc-sec.org > on September 7, 2011

Members can maintain more rigorous sensitive list against other non-LDC members, or can publish the same sensitive list for both the non-LDC and the LDC members. Bhutan, the Maldives, Nepal, and Pakistan have submitted consolidated lists not distinguishing between LDC and non-LDC members, while Bangladesh and India maintain separate lists for the two sets of countries. The magnitude of numbers in the table show that long lists of tariff lines remain outside the FTA benefits. More important than the sheer size of the tariff lines under the restrictive category is the fact that many goods of export and import interests fall within this no-concession region.

It is frustrating to note that many items simultaneously appear in the top ten export- and import- items, reported in the Appendix to Chapter 2, and the lists of sensitive items expressed by the member states, which are voluminous and not reproduced here on space consideration. Almost all commodities of export and import interest fall in the sensitive lists. Rhetoric of trade liberalization by the South Asian leaders stumbles over their extensive sensitive lists and the shallowness of the agreement becomes apparent. When only a few tariff lines account for a large portion of the members' trade, it makes no sense to maintain such lengthy sensitive lists and many items can be pruned from these lists without jeopardizing national interests.

2.6 Concluding Remarks

After providing a brief overview of the economic fundamentals of the South Asian countries, this chapter provides a context within which regionalism has spread all over the world, and how South Asia is facing this challenge of altered trade environment. All of the countries in the region have become more integrated with the world economy over time, but their focus of trade remains outside the region. As long as other parts of the world are pursuing regionalism, it is pertinent to investigate the payoff from preferential liberalization in South Asia. Moreover, slow progress in multilateral negotiation implies that to remain competitive against other region of the world there is no other option but to follow the path of liberalization, either on a unilateral or a broader regional basis.

South Asian countries have opted for similar types of policy reforms regarding privatization and deregulation in the key sectors of the economy. Liberalized trade regime and domestic policy reforms have raised output in each country, but additional reforms and safety measures are necessary to ensure that the benefits of growth reach the poorest segment of the society. Experiences of other regional blocs show that a simple liberalization program without paying attention to some other important areas can open up opportunities for particular sections of the populations while disadvantaging the others. In case of NAFTA, for example, it has been shown that regional integration has brought fortune for traders and business persons of all partner countries while poor small farmers have faced income loss because of low price for their products and the working class has suffered job loss (Levy and Winbergen, 1994). To make the beneficial effects of liberalization widespread, investment in education, government supported training program for skill up-gradation and substantial amounts of investment in infrastructure are essential.

Some key points that come out of the analysis of the background on regional trade liberalization are that a large portion of world trade is concentrated within some forms of blocs, which suggest that a practical way to increase trade of the South Asian countries may be to strengthen regional cooperation and utilize the unexploited opportunities. The current state of the preferential trade agreement is severely constrained by the presence of lengthy negative lists and the practice of non-tariff measures. Getting rid of these two stumbling blocks will have a significant impact on regional welfare and trade flows. Low level of living standard, expressed in various basic economic indicators, warrant that to be meaningful integration should substantially increase the overall welfare and evenly spread it over the region. Achieving productivity growth are important for aiding catching up with the developed countries. The impact of regional integration in attaining these three inter-related objectives of trade flow, productivity, and welfare in the contest of South Asia are examined in the subsequent chapters.

CHAPTER 3

REGIONAL INTEGRATION AND TRADE FLOW

3.1 Introduction

Along with other factors like demand structure and cost differences of the trading partners, trade policies also have roles to play in determining bilateral trade flows (Baier and Bergstrand 2007, 2009; Wang *et al.* 2010). Contrary to the trade patterns observed in other parts of the world, where geographic and cultural proximity play major roles in intra-regional trades, South Asian countries trade less with each other than they do with countries outside of the region. Like other regional blocs, a major goal of regional integration policies in South Asia has been to bring momentum in the intra-regional trade flows. The purpose of this chapter is to investigate the efficacy of the preferential trade agreement in changing the observed trade pattern by identifying the determinants of bilateral trade flows among the South Asian countries using econometric techniques, as well as supportive qualitative economic analysis.

Since a free trade agreement is already in place from 2006 in South Asia, though in its nascent stage, some data are available by now to provide an ex-post evaluation of the performance of this bloc in terms of its creating additional trade flow for the region and to surmise on its future potential. In analysing the trade-flow effects of the SAFTA existing studies (such as Hassan, 2001, and Dayal *et al.* 2008) resort to some kinds of ex-ante or counterfactual experiments. When tariffs are assumed zero, these models predict positive changes in trade flows among the members. However, as the actual data are used in this study, where tariff concessions are not only meagre but also offset by the complicated rules of origin and with a large number of items in the negative lists, no empirical support for a trade creating SAFTA is found.

In contrast to the existing literature on regional integration where only the potential for increasing intra-regional trades among the members in the post-agreement periods is investigated, the current study examines the changes in trade flow pattern between the

South Asian countries and the rest of the world in the post-SAFTA period as well. Moreover, how countries of various economic sizes are affected by the agreement is also examined. Several panel strategies are used to check the sensitivity of the results against the assumptions of the estimation strategies. These new findings should provide information for policymakers in South Asia to use in reformulating their trade policies.

The rest of the chapter proceeds as follows. Section 3.2 reviews the current literature on the changing pattern of trade arising from preferential trade liberalization. Studies from both within and outside of South Asia are considered in this section. Section 3.3 elaborates on the data and methodology used to evaluate the performance of the South Asia's free trade agreement. Estimation of the model and discussion of the results are contained in Section 3.4. Section 3.5 concludes this chapter with few remarks.

3.2 Review of Related Literature

3.2.1 An Overview

To grasp the mechanism of bilateral trade flows, researchers often resort to gravity type of models in which trade flows are assumed to be dependent directly on economic size of the trading partners and inversely with their distance. In order to incorporate the effects of preferential trade, some dummies are usually introduced to capture the differential treatment of trade between the partner countries. In spite of the expectation that discriminatory tariffs and other barriers will increase regional trade relative to trade with outsiders, World Bank (2004) argues that forming a regional trading agreement (RTA) does not automatically lead to increased amount of intra-regional trade flows. This may be the case, for example, when major firms of the region producing tradable commodities successfully lobby to keep their industries outside the domain of the FTA concession or persuade the respective governments to include their products in the repository of sensitive lists.

Regional integration may also reduce the marginal economic cost of protection as well as the marginal political benefit of external protection. Freund and Ornelas (2010) argue that the incentive to reduce external tariffs is higher in a FTA than in a custom union

(CU). In a CU the joint determination of the external tariff is higher, because that implies higher preferential margins for each member. It is also found that, along with the formation of FTAs, members successfully reduce their unilateral and MFN tariffs, activities that increase overall trade instead of regional trade. Several factors are responsible for this tendency. Richardson (1993) emphasizes the motivation of reducing the trade diversion cost of integration, while Ornelas (2005) points out the role of competition in an oligopolistic market setup and Grossman and Helpman (1994) shows the reduced political economy motivation for external protection.

Classical trade theories of Ricardo and Heckscher-Ohlin explain the pattern of trade among nations based on some simplifying assumptions as in two countries – two goods – two factors models. Theoretically they behave well in lower dimensions. However, when the number of goods, countries, and factors are increased to a more realistic level, these models exhibit abrupt behaviour in response to various types of shocks. Deardorff (1998), for example, shows that if the number of goods is more than the number of factors, then production and trade patterns become indeterminate in the Heckscher-Ohlin model, in the sense that many such trade patterns are consistent with an identical price ratio. Moreover, as trade costs are taken into account, production and trade show 'hypersensitive' behaviour with respect to changes in trade costs. Even a slight change in the trade cost can result in new products being included in the trade basket while some other products get disappear from the trade scene.

Classical models also fail to fully explain the pattern and amount of trade observed in the real world data. The fact that many countries trade with each other in substantial amounts, in spite of their similar factor endowment, goes against the prediction of the classical trade theories. Krugman (1980) and Helpman and Krugman (1985) introduced new trade theory models that incorporate economy of scale and product differentiation in a monopolistically competitive market setting to explain the observed cross-hauling and intra-industry trade. Of late, gravity types of model, pioneered by Tinbergen (1962) and Pöyhönen (1963) have been found to explain the empirical trade flow rather well, and they can also be used to test the validity of alternative trade theories. For example, the Linder hypothesis that the trade of manufactured commodities between two countries is inversely related with their per capita income has been tested with gravity models in Bergson (1985), and in Thurbsy and Thursby (1987).

Empirical evidence regarding the effects of RTAs on bilateral trade is mixed and tends to depend on the characteristics of the member countries. The instability of the RTA coefficients across cases is highlighted in Cipollina and Salvatici (2010) and similar findings are also reported in Word Bank (2005). Because of the wide range of available estimates of the trade effects of RTAs, Cipollina and Salvatici (2010) use a meta-analysis technique to investigate the true effects of RTAs. Meta-analysis is an appealing technique for combining numerous empirical results on a specific area of research and then getting a combined result. Utilizing a total of 1827 estimates available over 85 previous studies their kernel density estimate produces a significant mean value of 0.59 implying that, amid variability of estimates, preferential agreements considered as a whole have positive effects on trade flows for the members. Pooling all the previous estimates, the meta-regression yields a 10 per cent positive effect on the trade within the RTAs when the fixed effects estimation method is applied, while a 65 per cent effect is found for the random effects method, both significant at the conventional 5 per cent level. Frankel *et al.* (1996) is ambiguous about the impact of RTAs, as the relevant coefficients in their study are found insignificant, but Wonnacott (1996) is more optimistic about the positive effects of RTA by stating that under scale economies RTA can lead to welfare improvement even in the presence of trade diversion.

Examining a set of seven RTAs, Carrère (2006) finds that trade flows among members rise with integration, but it comes at the expense of non-members facing trade diversion. Baier and Bergstrand (2007) contend that traditional estimates of the trade effects of RTAs are biased downward as members are often selected endogenously. Their revised estimate suggests that trade flows among the members rise by 50 to 100 percent over a sufficiently long period of time as the bias factors are corrected. However, effects on non-members' trade pattern or the welfare implication thereof are not considered in their study. Moreover, though a total of 96 countries are considered for the analysis, general equilibrium comparative static effects on the trading partners are missing.

Gains and losses from an agreement are often not equally shared among the members. Vicard (2011) examine which country pair gains more from regional integration by introducing interaction variables between country specific economic characteristics and the RTA dummy. The size and distribution of GDP between members are found crucial in determining trade flows in case of trade between North-North, and also between South-South. When the trading partners are large and symmetric with respect to these two aspects of size and GDP distribution, and the rest of the countries are small and asymmetric, trade effects are stronger.

Apart from the general findings on the effects of discriminatory trade regimes mentioned above, some region-specific studies are also available in the literature. Major conclusions reached by some of these literatures are given below to place the current research in a proper perspective.

3.2.2 Literature on Trade Flows: Studies on Regions outside of South Asia

The European Union is the most prominent of all the regional blocs in terms of the depth and breadth of integration it has attained so far. In addition to trade liberalization in final goods, member states also allow for cross-border flow of factors of production like labour and capital. There are also higher degrees of monetary and fiscal coordination among the member states. European commission (1997) investigates the trade creation and trade diversion effects of the single market program (SMP) in Europe. These issues are examined empirically for 15 three-digit SITC sectors using both an econometric and the general equilibrium methods. The study shows that in most of the sectors the EU market has been more open leading to trade creation instead of trade diversion. In addition to higher trade flows, the SMP program has contributed to improved competitiveness. After the program was launched in 1992, the cost-price margin has fallen by 3.9 per cent across these sectors. Glick and Rose (2002) narrow down the investigation to the effects of the monetary union on trade flows and find almost doubling of the overall trade flow from this source only.

Considerations of changes in trade flow patterns for the South Asian countries that are likely to arise from the creation of NAFTA are also important and deserve special attention, as this North American trade bloc includes Mexico, a developing country, along with two other developed countries of the United States and Canada. Both the USA and Canada are the major markets for the South Asian countries, especially for the textile products and Mexico is also an exporter of this product in the world market, suggesting that Mexican textile and similar other products will replace third countries' products in the NAFTA market. Fukao *et al.* (2003) investigate the trade diversion possibilities in NAFTA by a partial equilibrium framework running 70 regressions for various harmonized system (HS) 2-digit level commodities. Textile is found to be one of the 15 categories of the products that strongly respond to tariff preferences, while some other products like motor cars and vehicles do not respond much. The presence of outsourcing and FDI activities tends to dominate the trade pattern in case of these latter commodities.

To counter the economic dominance of Mexico that is now allied with the USA and Canada, other countries in the central American region put effort to integrate themselves by removing internal barriers to trade and establishing an integrated regional industrial development policy. To this end they brought life to the CACM (Central American Common Market) that was established long before in 1958, but was impeded by occasional military conflicts in the region. Taking the six Central American countries of Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama, Gordillio *et al.* (2010) analyse the impact of physical barriers on regional trade. The strengths of connectivity between these countries are measured by a Euclidian distance factor adjusted for real average transport time. With a partially constrained augmented gravity model, the authors show that if these countries could reduce their existing distance to the benchmark level of the EU, the intra-regional export would double, export to the US and the EU would rise by one-third of the current level, and at the same time could accumulate trade benefit through the dissipation of inefficiencies.

On the southern front, Argentina, Brazil, Paraguay and Uruguay formed the free trade bloc Mercosur in 1991 by signing the Treaty of Asuncion. By this time they have been able to transform it into a custom union and are working toward giving it a common market status by allowing free movement of manpower and capital across member states. Trade diverting effects and the associated welfare cost of Mercosur is explained in Yeats (1997) who combines information from a regional orientation index and the revealed comparative advantage index to show that this bloc has produced inefficient trade pattern for the members. Sectors experiencing rapid growth in intra-regional trade are found to be capital intensive with low competitive advantage but surviving in a regionally protected market. The opening up of the southern-cone market has substantially increased the big member Brazil's manufacturing export within the region and a similar trend can be expected of India in case of South Asia.

South Asia took much of its inspiration from the success story of the neighbour region Southeast Asia that formed the ASEAN free trade bloc, by forming AFTA (Association of South East Asian Nation's Free Trade Area) in 1992. According to a study of Bun *et al.* (2007), it is shown that an enormous increase in bilateral trade flow within this region is not merely driven by economic growth of this region, but in fact a consequence of its regional integration policy. More particularly, within an extended gravity model that accounts for unobserved heterogeneity, they show that AFTA has contributed to 9 per cent bilateral export growth per annum within the region after the inception of the free trade agreement. Sawyer *et al.* (2010) explain that a large portion of the increased intra-Southeast Asian trade represents intra-industry trade. The rising share of manufacturing export and increasing research and development expenditure along with increasing openness of the region are supporting the fragmented production structure in this region.

3.2.3 Literature on Trade Flow: South Asian Context

Literature on the impact of regional trade liberalization, especially on trade flows, in the context of South Asia is rather paltry. Hassan (2001) proclaims to be the first to apply the gravity type of model to evaluate the viability of a South Asian free trade bloc[9]. The current level of intra-regional trade in the region is found to be less than that predicted by his model. The result should be taken with a grain of salt as the author includes, among the set of explanatory variables, both log of per capita GDP and log of total GDP

[9] Srinivasan and Canonero (1995), Rajpakse and Arunatilke (1997), and Samaratunga (1999) also apply gravity models for assessing the impact of regional integration in South Asia.

which are highly correlated (the correlation matrix reported by the author indeed produces the 0.60 correlation coefficient for these two variables). Similarly Filippini and Molini (2003) mingle collinear variables in their analysis of East Asian trade flows by incorporating both log of total GDP and log of population among the regressors and obtain a significantly negative coefficient for the population variable, which means that as the economies grow larger in terms of their population size, their bilateral trade falls.

Rahman *et al.* (2006) follow the two-stage regression method suggested by Coulibali (2004) to assess the impact of the South Asian and other RTAs on bilateral trade flows. Coefficients of only the time varying variables are estimated with a Tobit regression in the first stage, while in the second stage coefficients of both time varying and time unvarying variables are estimated with the least square method, and then respective coefficients from these two stages are added together to evaluate their impact on bilateral exports. Since the data period covered in the study is 1991 to 2003, three years before SAFTA became operative, the regional dummy of their study is pointing at the intra-bloc trade creation possibility of the previous SAPTA (South Asian Preferential Trade Agreement) regime that lasted from 1995 to 2004. Moreover, in the absence of additional dummies, their suggestion about trade diverting South Asian bloc is only hypothetical. Though SAPTA is found to be intra-bloc trade creating in the overall sense, country specific effects are mixed: Bangladesh, India and Pakistan experiencing intra-bloc trade creation and the rest suffering a negative effect in their bilateral trade flows. However, as we examine Figure 3.1 later, we see that for all of the South Asian countries (country code 1 to 5 in the figure) their trades with the rest of the world (country code 6) are growing faster than their intra-bloc trade, which makes us suspicious of overall effectiveness of the bloc.

Dayal et al (2008) estimate the trade potential in South Asia on the basis of a fixed effect gravity equation with GDP, population, distances and weighted average of tariffs, all in log form, including border and language dummies as determinants of bilateral trade. The unrealized trade opportunity is calculated as the difference between the predicted trade from the estimated equation when all variables are set at their average values during the sample period and when tariffs are set to zero but all other variables retain their average values. Their estimates vary between – 66 per cent for trade between Sri Lanka and the Maldives to 100 per cent for trade between Bhutan and Maldives. Their findings of – 11 per cent trade potential between India and Sri Lanka is at odds with reality, as these later two countries are experiencing one of the highest increase in bilateral trade flows in the region, especially during the past decades. Their predicted average trade potential figure of 55.7 per cent for the region as a whole is also uncertain, as the trade creation and trade diversion possibilities of such instant complete trade liberalization or the productivity implication thereof are not taken into consideration, let alone the possibility of implementing such reform measure in the absence of political willingness and bureaucratic complication.

Weerakoon (2010) considers the shallowness of integration as the root cause of low intra-regional trade flow in South Asia and expresses concern that SAFTA might be upstaged by other sub-regional or bilateral initiatives of the members. The author points out that only 8.4 per cent of the LDC tariff lines and 6.2 per cent of the non-LDC tariff lines fall under the tariff concession scheme. When the complicated nature of bureaucracy that the legal trade channel faces is considered, this small concession has no significant impact on the intra-regional trade flows. Slow progress of SAFTA is forcing the members to take alternative routes of liberalization. Bangladesh, India and Pakistan all are now looking eastward to increase their trade flows, and on the sub-regional front India has established bilateral agreement with Nepal, Bhutan, and Sri Lanka, while Pakistan has made such agreement with Sri Lanka, and Bangladesh is in the process of negotiating an FTA with India. The fear of falling back of SAFTA in the sideline arises because these alternative agreements are more open in terms of providing their concessions.

The intensity of trade relationship between the South Asian countries with special emphasis on India is analysed in Raghuramapatruni (2011). Based on the revealed comparative advantage (RCA) index, the author identifies potential commodity groups that could contribute toward enhancing regional trade flows in South Asia. The trade intensity of India with the South Asian countries, calculated for the period 2000 to 2009, shows that the index reached a top of 12.27 per cent in 2003 but then monotonically dropped to 5.54 per cent in 2009. India's recent trade reform along with her increasing ties with the rest of the world, especially with the industrialized countries, is responsible for such change in the trade intensity pattern.

From the comparative advantage perspective, after examining thirteen broad SITC categories, the author concludes that Bangladesh and Sri Lanka have a strong competitive position in clothing (SITC 84) with calculated revealed comparative advantages of 31.46 and 18.13 respectively. On the other hand, India and Pakistan are enjoying competitive advantages in machinery-transport equipment sector (SITC 75) with a RCA value of 3.78 and textile sector (SITC 26) with a RCA of 22.65 respectively. Competitive advantages in similar product groups, like agricultural commodities for Sri Lanka and India, textile for Pakistan and India, and clothing for Bangladesh and Sri Lanka, highlight the need for regional export diversifications or creation of intra-industry trade as vital for success of the South Asian regional trading bloc.

The shortcomings of the current literature relating to the evaluation of the South Asian free trade area are reflected in their inability to incorporate time-series properties of the data and the ad hoc or the ex-ante nature of their analysis. After a thorough preliminary data analysis and checking for the panel stationary property of the series, this chapter specifies a suitable version of the gravity model and examines it with a number of panel estimation methods to assess the ex-post consequences of the regional integration initiative for the South Asian countries. The empirical results thus obtained are expected to provide an improvement over the existing results on the effect of SAFTA on regional trade integration. Reliable results on the trade effects of integration are important, as the decision to join for new members or carrying out the liberalization process further to achieve deeper integration hinge on these crucial estimates.

3.3 Data and Methodology

3.3.1 Description of the Data

A multi-country panel dataset comprising the South Asian countries and the rest of the world over the period 1981-2010 is used in this chapter. Because of the panel nature, where the same units are observed repeatedly over times, certain unobserved characteristics associated with the cross-section units remain unchanged over time. It is now legitimate to experiment with such things like what happens to Bangladesh exports as the population of India rise, which is not possible for a simple independently pooled series where new individuals or units appear in each period. In analysing the impact of RTAs on bilateral trade flows, panel data are considered more appropriate as they allow for unobserved heterogeneity to be modelled and thus avoid omitted variable bias and endogenity problem (Bun *et al.* 2007). Panel features of the data also enable us to apply a variety of panel techniques in the estimation procedure. With the panel structure of the data, a sufficient number of cross sections, even over a shorter period of time, will allow us to study the dynamic behaviour of the data (Yaffee, 2005).

In addition to trading with each other, all of the South Asian countries have both export and import flows with many countries outside the region. Current literature while analysing the nature of trade flows in South Asia, considers only a selected set of countries that usually include major trading partners for a particular year. In so doing, some countries outside the region are naturally left out, and thus, while making decisions regarding trade creation and trade diversion effects, the estimation tends to be prone to measurement error. Moreover the structure of major trading partners shifts over time, complicating the situation further. To avoid these types of problems, all of the non-member countries have been lumped into an aggregated entity termed as the rest of the world (RW) for the purposes of the thesis. We thus have a total of 8 countries (including the RW) observed over 30 years giving us a total bilateral trade flows of 1680 (= no of countries×(1 – no of countries)×time) and this is the sample size. These observations are recorded as stacked blocs of cross sections, each bloc consisting of 30 periods. Thus there are 56 such blocs one stacked over the other.

After a thorough examination of the data it is found that one of the smallest members of South Asia, namely Bhutan, lacks bilateral data on some required variables, and the magnitude of the two other smaller countries, Nepal and Maldives, are relatively tiny compared to the other countries of South Asia. When these three countries are grouped together into the rest of South Asia (RS) region, the dataset behaves comparatively well in terms of the normality of distribution, perverse behaviour of outliers in the data and their panel unit roots property. So in the final analysis the panel data is constructed with six regions, comprising India, Bangladesh, Pakistan, Sri Lanka, Rest of South Asia, and Rest of the World, whose bilateral trade patterns are observed over the past thirty years, from 1981 to 2010. Data before this period are either not available for many of the countries in the region or their quality cannot be relied upon. The time dimension of the data has been nested into the cross section here, though the reverse could be done without affecting the result. A glimpse of the structure of the data matrix is provided in Table A3.1 in the appendix section.

In case of gravity models of trade related analysis zero bilateral trade flows are often a problem as log of zero becomes undefined. In such cases approaches like that suggested in Silva and Tenreyro (2006) can be followed. They suggest a Poisson regression where the variables are used in level and observation with larger variances are given less weight in the estimation procedure to estimate the gravity equation efficiently. South Asian countries have bilateral trade flow each year in the sample period. They do not, however, have trade with some countries in the rest of the world (ROW). Since these other countries are aggregated into the ROW, the problem of zero trade flow does not arise here[10].

The purpose of aggregation here is to limit the number of observation to a manageable level. In the absence of aggregation the potential number of bilateral export-flow observations for 30 years and 195 countries of the world will be 195×(195-194)×30 or 1,134,900. Some of these observations cannot be excluded on the ground that these countries do not trade with each other (zero trade flows). It is quite natural for them not to trade given their bilateral distance and other determinants of trade, and excluding them will induce bias in the parameter estimates.

In literature gravity models of trade are usually estimated using data aggregated in two directions: (1) Commodity level aggregation (such as total export, total import or total

[10] Using all countries in the ROW individually in the dataset, however, may produce different coefficient estimates.

trade flows and commodity specific or sector specific trade flows, as in DeRosa and Gilbert, 2006), and (2) Geographic aggregation (such as county, state, province or national level data). State and province level data are used in McCallum (1995) and Anderson and Wincoop (2003), where state and province level income and distances are used. Studies based on national level data use nation level aggregates. Harris and Mátyás (1998) use the European Union region as a proxy for the rest of the world in their gravity model while examining trade flow between the APEC countries.

Bilateral trade flows can be measured by either import or export data as one's import represents other's export. However differences arises due to the fact that import data are recorded at c.i.f. (cost, insurance, and freight) value which includes transportation and insurance costs, while export figures are f.o.b. (free on board) values. For this reason, for example, when we look at the bilateral trade flow data, we see that Sri Lanka imported 2452 million US dollar from India in 2010, but India exported 2229 US dollar to Sri Lanka during the same period in the same data source, IMF's Direction of Trade Statistics. So, we have to choose between these two indicators as measures of bilateral trade flows. Use of import data may produce correlation between the error term and the distance variable in the presence of transportation costs, thus making the estimation results inconsistent. Moreover, to avoid taxes, imports are often misreported with the help of corrupt custom officials which again creates measurement problem. Export figures seem innocuous from that perspective, and hence used here as a measure of bilateral trade flow.

The data on the relevant variables for estimating the trade flow equation are from various secondary sources. Many of the important historical data bases including International Monetary Fund's Direction of Trade statistics, International Financial Statistics, and data from national sources are maintained by the Datastream, which is subscribed and hence available from the Curtin University. The bilateral trade flow data have been obtained from the IMF's Direction of Trade Statistic database. Import figures are expressed c.i.f. (cost, insurance, and freight) while export figures are in f.o.b. (free on board), both of these are in millions of current US dollars. The conversion rate for national currencies and the US dollars are obtained from the International Financial

Statistics. Exchange rates are expressed as the amount of national currencies per unit of US dollar. So increases in exchange rates imply devaluation or depreciation of national currencies, while the reverse overvalues or appreciates the home currency. Moreover, as the variables are in log form, their changes indicate relative or percentage changes of the relevant variables.

The great circle measures of distance between major cities of various countries are computed from their latitude and longitude information. This type of distance measure is available in a geological distance data file maintained by the CEPII (Centre d'Etudes Prospectives et d'Informations Internationales) on line at www.cepii.fr/../distance.htm. Nominal GDP data for all the countries measured in millions of current US dollars are from the World Development Indicators. Consideration of nominal instead of real GDP is due to several reasons. First, instead of imposing coefficient restrictions on the price variables, which happens when the real measure is used, we allow the coefficients of the price variables to be estimated freely. Inclusion of the price variables ensures that fluctuations in prices are controlled for, but in a more data driven way. Second, since we are explaining bilateral trade flows measured in millions of the current US dollars, GDP in the same unit as explanatory variable seems logically a better candidate than GDP in another year's currency. Third, Andrew *et al.* (1987) argue that, real GDP is often difficult to measure and in the context of errors in variable model, there is no significant statistical advantage to utilizing estimated real GDP vector over readily available nominal GDP vector. Finally, and more importantly, it is the nominal GDP that appear in the gravity equation derived theoretically in Anderson and Wincoop (2003).

Exchange rates, domestic and foreign prices are from the International Financial Statistics (IFS) database. Regarding prices, it seems relevant to include bilateral export and import price indices. Since these figures on bilateral basis are not available, GDP deflators of the respective countries are used as their proxy in this chapter. Consideration of the three small South Asian countries as rest of South Asia (RS) and aggregating all trading partners outside of South Asia as rest of the world (RW) require us to construct some variables for these country sets. When it comes to the aggregated regions, simple averages of relevant variables are used to generate the price level, exchange rate and distance with bilateral partners, while the economic sizes are calculated as the sum of the GDPs of the constituent countries. Given the dataset, the next step is to find a suitable technique for estimating the parameters of the model that will enable us to make decisions about the maintained hypothesis about the population parameters.

3.3.2 Methodology

The basic idea of the gravity model in the context of bilateral trade flow stems from the analogy of the law of gravity in physics. The idea that the amount of trade flow between two countries depends directly on the sizes of their economic activity and inversely with the distance between them, is first independently pioneered by Tinbergen (1962) and Pöyhönen (1963) which is later augmented by some other variables like common language, common border, types of government, colonial links, and so on. The extended version of the model can be succinctly represented as

$$(3.1) \qquad X_{ij} = \beta_0 Y_i^{\beta_1} Y_j^{\beta_2} D_{ij}^{\beta_3} A_{ij}^{\beta_4} u_{ij} \qquad i \neq j$$

where X_{ij} is the dollar value of export from country i to country j, Y_i and Y_j are dollar value of nominal GDP of country i and j respectively. Nominal scales for these variables are chosen following literature, such as Bergstrand, *et al*. (2013) and Shepherd (2012). D_{ij} is the physical distance between the two trading partners measured in great circles. A_{ij} stands for some other factors that may help or hinder bilateral trade flows.

The augmented gravity equation (3.1) is usually estimated in logarithmic forms of the variables, utilizing cross-section or panel data. It is well known by now, thanks to the recent advances in time series analysis that many time series macroeconomic variables, even in their log form are likely to suffer from non-stationary problem, and hence it is preferable to estimate the model in growth form. When the log form of the model is first-differenced to get the growth rates of the relevant variables, the country-fixed effects are eliminated and the time trend is absorbed into the constant term.

Moreover, to make the model suitable for prediction, it should have some theoretical underpinnings. Estimating an atheoretical model can lead to serious problems regarding the interpretation of the model. McCallum (1995) measures the border effect for trades between the United States and Canada with an atheoretical gravity model and obtains an implausibly high border effect, known in trade literature as the border puzzle. More reliable estimates of the border effect are found by Anderson and van Wincoop (2003) when they apply the gravity equation derived from a utility based theoretical model.

The search for a theoretical foundation for the gravity model is initiated by Anderson (1979) with the Armington assumption, where goods are assumed to be differentiated by country origin only. Later, Bergstrand (1990) and Anderson and van Wincoop (2003) extend the derivation of the gravity equation based on a more realistic monopolistic competition assumption. The detailed derivations in their studies show that price levels of the two countries ultimately enter the gravity equation. From that perspective, and taking direction from Feenstra (2004) and Cernat (2003), the following model is proffered here to capture the effect of regional integration on bilateral trade flows:

$$\text{(3.2)} \quad \Delta \ln X_{ij} = \beta_0 + \beta_1 \Delta \ln(Y_i + Y_j) + \beta_2 \Delta \ln(s_i s_j) + \beta_3 \Delta \ln P_i + \beta_4 \Delta \ln P_j + \beta_5 \Delta \ln E_t + \beta_6 RTA1 + \beta_7 RTA2 + \beta_8 RTA3 + u_{ij}$$

where among the additional variables (relative to the equation 3.1) used here, s_i and s_j represent the share of each country's GDP relative to their total GDP, that is, $s_i = (GDP_i / (GDP_i + GDP_j))$ and $s_j = (GDP_j / (GDP_i + GDP_j))$. Their product $s_i s_j$ is a measure of size dispersion between trading partners, first introduced in Helpman (1987). The index monotonically varies from 0 to 0.25 and can be considered as a measure of income convergence between the trading partners. It is expected that the more unequal the countries are in terms of income the lower is the amount of trade between them, given of course the other things. For a given total economic size, two countries of unequal size are expected to trade less than if they were more equal.

P_i and P_j are local and foreign prices of traded commodities respectively. In the absence of separate price levels for traded commodities in the published sources, two candidate variables that can be considered as their proxies are the GDP deflators and the Consumer price indexes (CPI) of the concerned countries. Since international trade includes both consumer and producer goods and the former covers both, the GDP deflator is used as the preferred proxy for the price level. Some studies (for example, Ethier 1973, Hooper and Kohlhagen 1978, Thursby and Thursby 1987, Ariccia, 1998, and Bahmani-Oskooee and Ratha, 2008, among others) find exchange rate variability to affect bilateral trade flow as well. Since national currencies of all the South Asian countries are not traded regularly in the financial markets but do so with the US dollars, the bilateral exchange rate has been calculated using a simple triangular relationship. If for example, the exchange rate between taka/dollar is 76 and rupee/dollar is 38, then taka/rupee exchange rate is computed as 2. In fact, if financial markets for these two currencies could be created, arbitrage would then bring the taka/rupee price to the level indicated above. For trade with the rest of the world, however, dollar exchange rates with each country's national exchange rates are considered.

To capture the trade creation and trade diversion consequences of regional integration the following three dummies are introduced in the regression equation (3.2) above. Direction of trade flow changes according to these dummies are indicated inside the braces.

(i) RTA1 = 1 if trading partners are in the same bloc, and 0 otherwise (bloc ➔ bloc).
(ii) RTA2 = 1 if importer belong to the bloc while the exporter to the RW, and 0 otherwise (RW ➔ bloc).
(iii) RTA3 = 1 if the exporter belong to the bloc and the importer to the rest of the world, and 0 otherwise (bloc ➔ RW).

Since the regional bloc SAFTA is operative from 2006, the regional dummy RTA1 gets the value 1 for the period from 2006 to 2010 and 0 in the remaining periods for trade between members, while for trade between members and non-members the dummy receives 0 for the whole sample period. Other dummies are constructed similarly. The first dummy is intended to capture the intra-bloc trade effect of the RTA, while the second and the third dummies encapsulate the bloc's effect on import from and export to the RW respectively.

The coefficients of these three dummies considered together inform us about the nature of trade flow following regional integration. If increased regional trade (i.e. positive coefficient of the RTA1 dummy) is accompanied by a fall in import from the RW (negative coefficient of the RTA2 dummy), the case of trade diversion arises. A positive coefficient of the latter dummy indicates trade creation. In the case where the second dummy is negative and outweighs the positive first dummy, we have pure trade diversion. Otherwise, the diversion is partial and represents a type of import trade diversion. On the other hand, if we substitute the coefficient of the second dummy with the third dummy in the previous interpretation, we have export trade diversion in which case the rest of the world (RW) attracts more exports from the bloc.

Existing studies on the effects of regional integration in South Asia do not control for the history of bilateral trade relationship in the trade flow equation (3.2), which may not be appropriate. Hence dynamics is introduced later into the model by including the lagged dependent variable among the covariates. The test of the hysteresis effects, as suggested by Eichengreen and Irwin (1996), is then performed in a generalized method of moments (GMM) framework to evaluate the importance of the previous trade relationship among the trading partners. The influence of history in determining trade means that failure to include lagged variables into the model is likely to make the estimates biased. However, once the model is made dynamic, simple OLS is inappropriate and hence a dynamic panel data approach, as suggested in Blundell and Bond (1998), is applied. This extension is considered in section 3.4.5 below.

3.4 Data Analysis, Estimation, Results, and Discussion

3.4.1 Preliminary Data Analysis

Before analysing the final model, it is appropriate to examine the data for some basic measures, like mean, standard deviation, skewness and excess kurtosis that will give a summary idea of the contents of the data. Later, these basic statistics are supplemented by some graphical analysis to uncover the underlying structure of the dataset, which will be valuable in evaluating the assumptions of the underlying model, testing for the model's specification validity, and selecting a parsimonious model. The key statistics of the relevant variables in their log form are contained in Table 3.1 below.

Table 3.1: Summary Statistics of the Variables

Variables	Mean	Standard Deviation	Coefficient of Variation	Skewness	Excess Kurtosis [a]	Normality Test [b]
$Log(X_{ij})$	4.63	3.62	0.78	-0.32	-0.23	26.29 (<0.01)
$Log(Y_i+Y_j)$	26.74	2.55	0.09	0.72	-0.81	382.07 (<0.01)
$Log(s_is_j)^c$	-2.46	3.44	1.39	-2.24	5.50	1631.56 (<0.01)
Log(Dist)	9.05	0.05	0.50	-0.57	1.83	105.72 (<0.01)
$Log(P_i)$	4.18	0.65	0.16	-0.44	-0.63	96.70 (<0.01)
$Log(P_j)$	4.18	0.65	0.16	-0.44	-0.63	96.70 (<0.01)
$Log(E_{ij})$	2.48	2.55	1.02	-1.78	4.77	639.56 (<0.01)

Notes:

[a] *Positive excess kurtosis is an indication of leptokurtic (slender with fat tail) distribution, while its negative value implies a platykurtic (broad with thin tail) distribution.*

[b] *Test for null hypothesis of normal distribution: chi square value (p-values in parenthesis)*

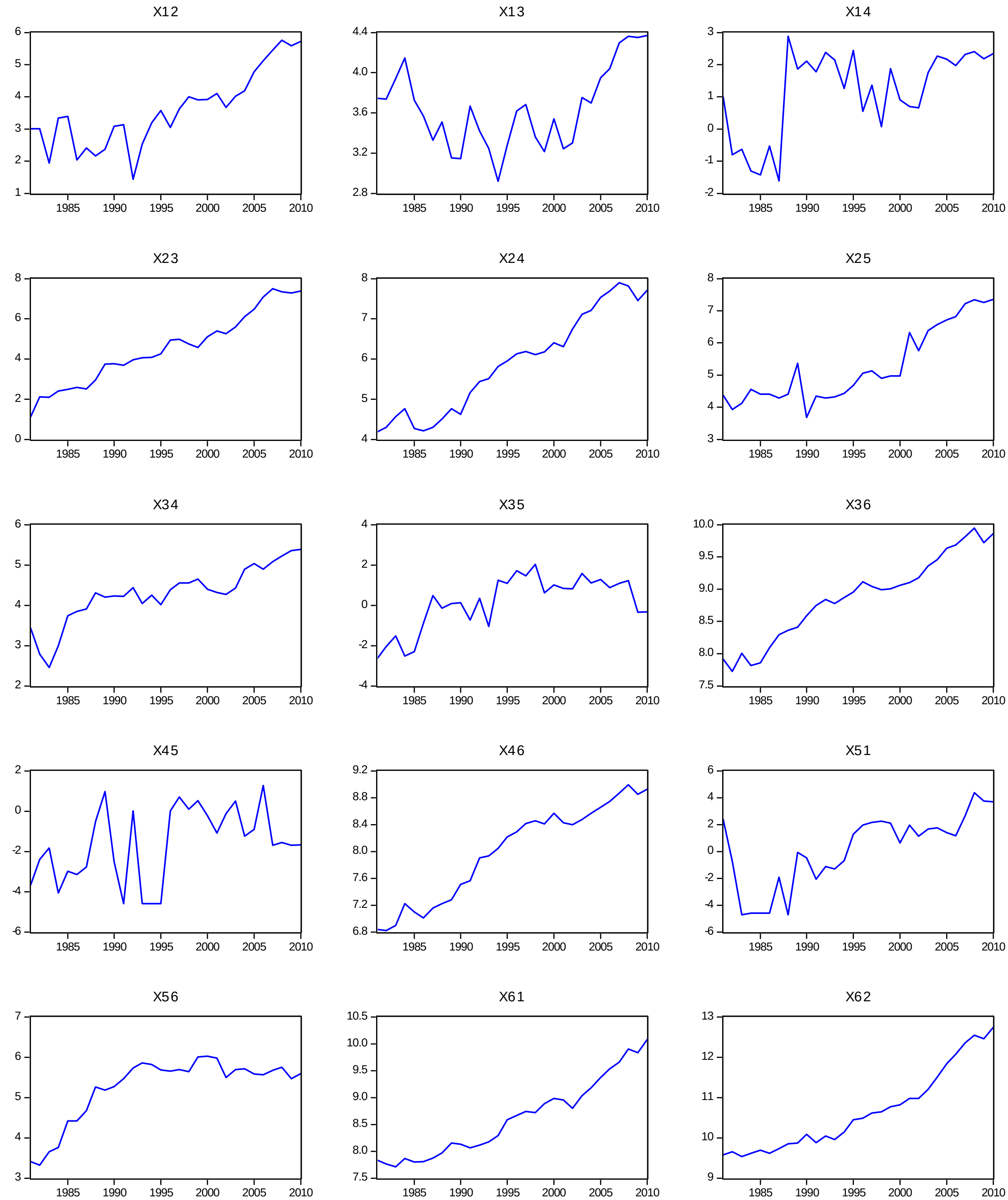
[c] *s_i and s_j are country i's and j's GDP share in total bilateral GDPs*

The panel data contains 900 observations. The overall mean for bilateral trade flows reported in Table 3.1 is about 103 (i.e. $e^{4.6318}$) million US dollars. The bilateral trade flow, of course, varies significantly as it incorporates highly dissimilar trading partners. These overly condensed or high density statistics of the table are however less informative as they do not reveal the case-wise pattern of trade evolution over time. So from that perspective, country pair specific trade patterns are presented in Figure 3.1, where various components of the figure reveal some interesting patterns.

First of all, when trade flows of the South Asian countries involve the rest of the world, there seem to be some definite rising trend in both directions (exports and imports), suggesting that they are getting more globally integrated over time. However, when it comes to bilateral trade with intra-bloc partners, volatility in trade flow is noticeable in most of the cases. The exceptions are a consistent upward bilateral trade flow between India-Bangladesh and India-Sri Lanka, the latter obviously reflecting the impact of the sub-regional trade agreement between these two countries. Finally, because of close relation, both political and economic, the amount of trade flow between India and Nepal is drifting upward over time. However, the other two countries, Maldives and Bhutan, have gone through ups and down bearing on their trade relationship with India, which has turned the overall trend of trade flow between India and rest of South Asia somewhat hazy in Figure 3.1 (X35 and X53 components).

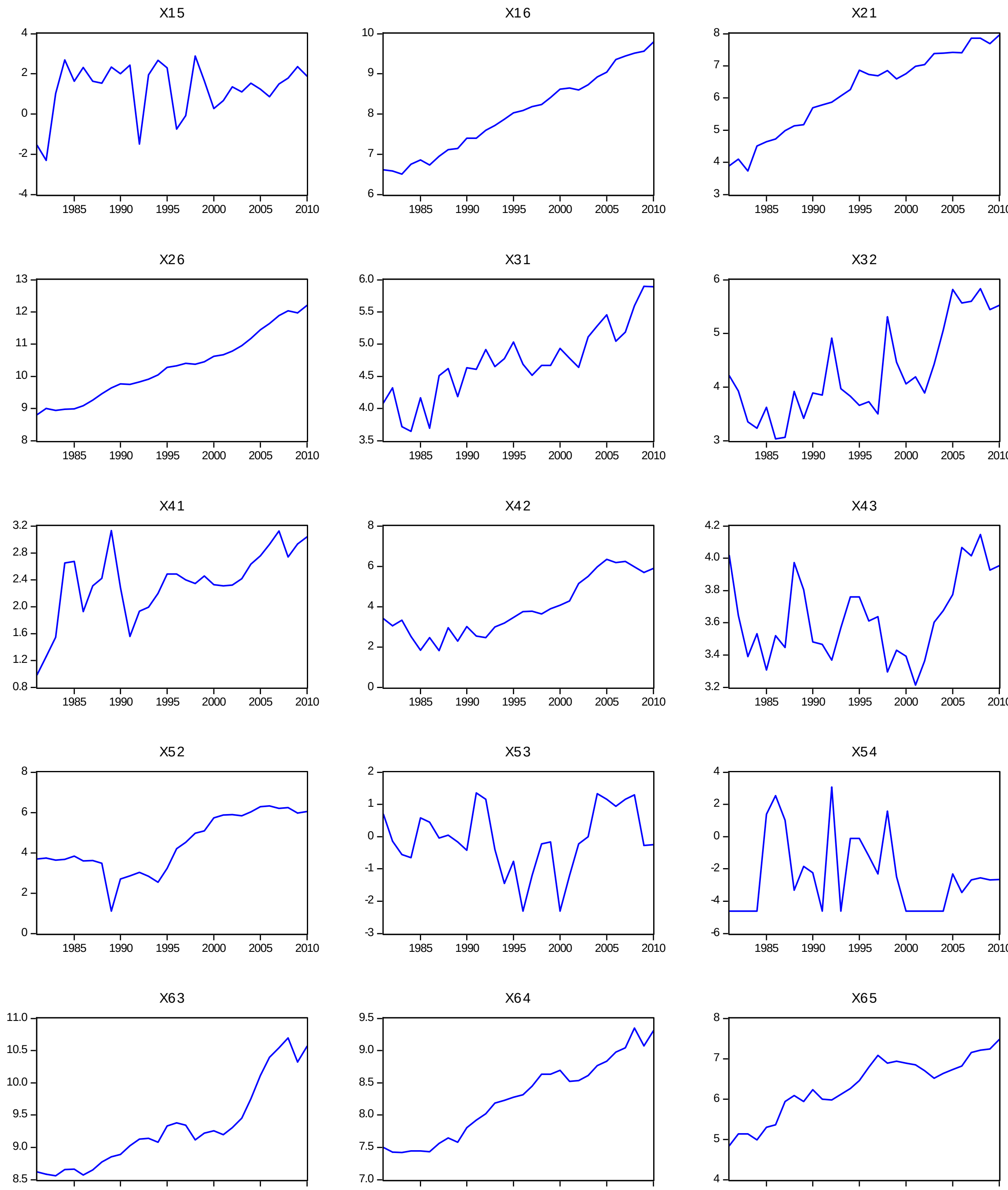
Pertaining to the shape of the distribution, three variables, namely, the GDP shares, distance, and exchange rates are leptokurtic, while the others are platykurtic. In terms of skewness, except for the aggregate income variable, all others are negatively skewed. Thus, we have an indication of non-normal distribution for these variables. A more formal Hansen-Doornik normality test, which takes into account both skewness and kurtosis, also confirms this conclusion in the last column of Table 3.1. The null hypotheses of normality are rejected at 1 per cent level of significance for all variables. We have two options to deal with the non-normality of the data, either rely on non-parametric test that does nor require normality assumption or analyse the result based on some kind of robust statistics. The later approach is followed here as robust statistics are still parametric and hence have more power than the former.

Figure 3.1: Time Series Patterns of Bilateral Exports for the Thirty Cross Sectional Units



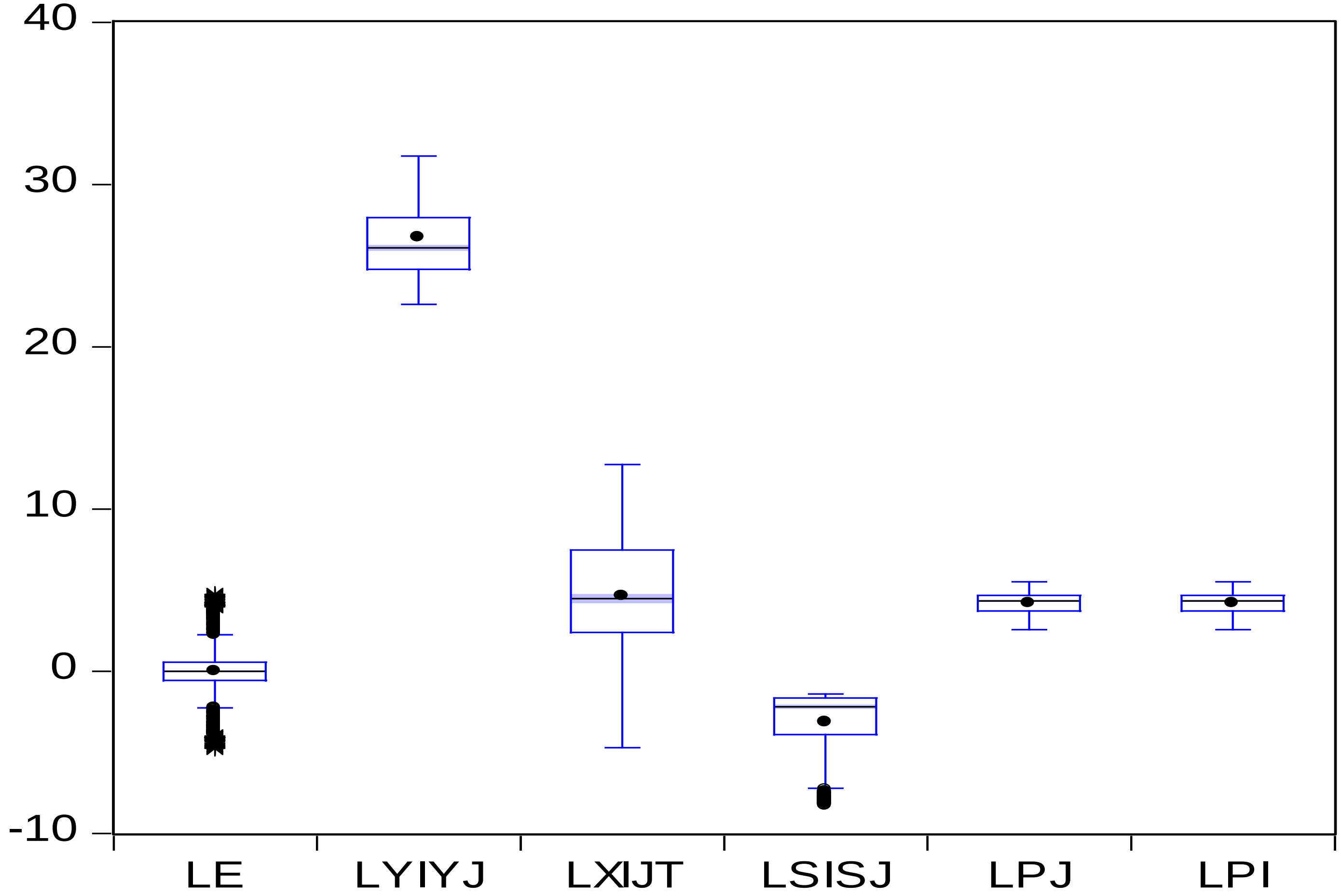
(Continued)

Figure 3.1 Continued



Note: X_{ij} = Export from i to j (i,j = 1,…,6); Codes: 1=BD, 2=IN, 3=PK, 4=SL, 5=RS, 6=RW

Figure 3.2: Boxplots of the Constructed Variables



Notes: LE – log of bilateral exchange rates, LYIYJ – log of overall GDP of the trading partners, LXIJT - log of bilateral exports, LSISJ – log of relative GDP shares, LPI & LPJ –log of respective partner's price levels.

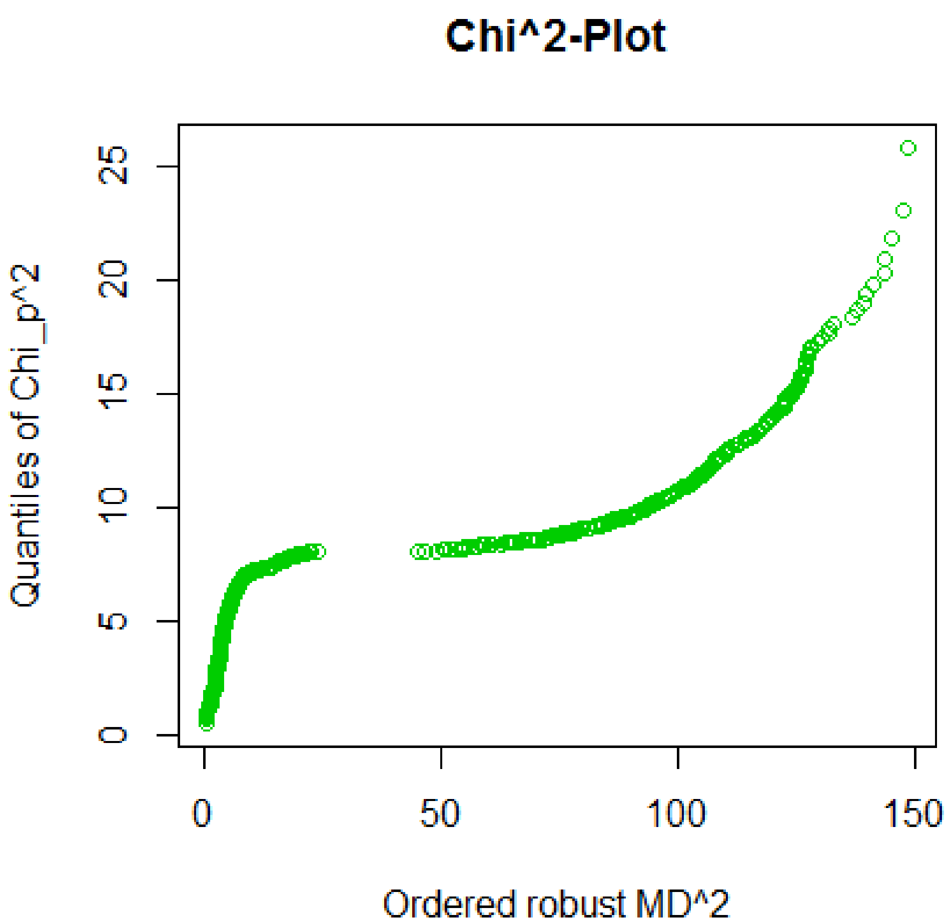


Figure 3.3: Chi-square plot of the data matrix including the dependent and all the explanatory variables excluding the RTA dummies.

Ten potential outliers (observation no):

869; 870; 867; 868; 866; 864; 865; 863;

862; and 810

Note: MD^2- Mahalanobis distance from

the center of the data;

Chi_p^2- Theoretically expected chi-square

values.

Source: The figure is derived with the help of the "mvoutlier" package implemented in R (version 1.13.1)

To understand the nature of data generation process further and have some idea about the presence of outliers in the data, boxplot of the relevant variables are presented in Figure 3.2. In a box plot (also known as box and whiskers plot) the box covers the values of the interquartile range of a series, while the whiskers extend up to 1.5 times the length of the box. Should any observation lie beyond the length of a whisker, we have some indication of an outlier. Swarms of observations at the ends of whiskers make the distribution fat tailed or non-normal. Examination of the variables in this plot also shows that expected pattern required by normal variables are missing and there are some univariate outliers in the data. Inspection of the figure points out some influential observations at the bottom end of the distribution of the $\log(s_i s_j)$ variable which is making it negatively skewed and outliers at the both end of the exchange rate variable are responsible for its fat-tailed behaviour.

Since we are dealing with multivariate data and univariate outliers don't necessarily appear as multivariate outliers, attempts are made to detect the presence of the latter type of anomaly in the multivariate chi-square plot of Figure 3.3. The figure utilizes the covariance matrix of the dataset and the Mahalanobis distance of each observation from the centre of the data, assuming a theoretical chi-square distribution with degrees of freedom equal to the number of the variables in the data matrix. An ideal multivariate normal plot would produce the dots along a 45-degree line and the values lying far away from the origin represent extreme observations. The gap in the data plot also indicates possible multivariate non-normality of the data (Garret, 1989). The plot detects the following observation number as the top ten influential members in the data:

869, 870, 867, 868, 866, 864, 865, 863, 862, and 810

However when the model is run excluding these observations, there is no significant change among the estimated parameters. Thus, these observations are retained in the final analysis. The departure from multivariate normality suggests using robust covariance matrix when making inferences from the data.

3.4.2 Time -Series Properties of the Data

We already have noted some indication of instability of mean and variance in the individual cross sections observed over time from Figure 3.1 above. More formal panel specific tests are employed in this section to firmly establish the time-series properties of the data. However, instead of relying on simple unit root test on the pooled series, various types of panel unit root test as suggested by Maddala and Wu (1999), Levin, Li and Chu (2002), Im, Pesaran and Shin (2003), and Hadri (2000), are employed here. These tests differ in terms of their null hypothesis (unit root versus no unit root), inclusion of deterministic terms (individual effect, trend, or none), and method of auto-correlation correction (lag or kernel based). Theoretically, panel unit root tests are multiple series unit root tests where the series are constructed for each cross-section element, and panel unit root decisions are based on average behaviour of the individual series. Summary results of the unit root tests on various variables are presented in Table 3.2, where except for the Hadri test that maintains no unit root in the null, all others assume the null hypothesis of unit root.

Test values reported in the third column of Table 3.2 depend on lag length or bandwidth selection method, both of which are optimally chosen by the computer program internally. The decision as to whether to include time trend and /or a constant term in the unit root auto regression equation has been guided here by the plot of the respective time series and suggestion from literature. The test- and p-values show that the log of the variables, in the panel context, can be safely assumed to be stationary at the conventional 5 per cent level of significance. Stable time series properties of the data allow us to use these variables in the trade flow equation estimation. Since these variables are found panel stationary in their log form, they were not first-differenced as suggested in equation (3.2). Over differencing stationary series will result in losing valuable long-term relationship information that is present in the level form of the data. Similarly co-integration and the accompanying error correction modelling were not applied, as these techniques are relevant to situation where variables are non-stationary of same order, say I(1), but their linear combination behaves like a stationary variable, that is the latter is integrated of lower order, say I(0).

Table 3.2: Panel Unit Root Test

Variables	Test Type	Statistic & Test Value	p-value
$Log(X_{ijt})$	Maddala-Wu (1999)	$\chi2$=201.49 [a]	< 0.0001
	Levin, Lin, and Chu (2002)	Z= -6.1741 [a]	< 0.0001
	Im, Pesaran and Shin (2003)	Z= -5.1312 [a]	< 0.0001
	Hadri (2000)	Z= 31.002 [a]	<0.0001
$Log(Y_i+Y_j)$	Maddala-Wu (1999)	$\chi2$=163.702 [a]	< 0.0001
	Levin, Lin, and Chu (2002)	Z= 13.316 [a]	< 0.0001
	Im, Pesaran and Shin (2003)	Z= 20.698 [a]	< 0.0001
	Hadri (2000)	Z= 97.810 [a]	<0.0001
$Log(Y_i/(Y_i+Y_j)$	Maddala-Wu (1999)	$\chi2$=129.598 [a]	< 0.0001
$\times(Y_j/(Y_i+Y_j)))$	Levin, Lin, and Chu (2002)	Z= 2.2563 [a]	0.0241
	Im, Pesaran and Shin (2003)	Z= 2.8799 [a]	0.0040
	Hadri (2000)	Z= 38.295 [a]	<0.0001
$Log(P_i)$	Maddala-Wu (1999)	$\chi2$=230.063 [b]	< 0.0001
	Levin, Lin, and Chu (2002)	Z= -8.7926 [b]	< 0.0001
	Im, Pesaran and Shin (2003)	Z= -3.7358 [b]	0.0002
	Hadri (2000)	Z= 54.7418 [b]	<0.0001
$Log(P_j)$	Maddala-Wu (1999)	$\chi2$=230.063 [b]	< 0.0001
	Levin, Lin, and Chu (2002)	Z= -8.7926 [b]	< 0.0001
	Im, Pesaran and Shin (2003)	Z= -3.7358 [b]	< 0.0001
	Hadri (2000)	Z= 54.7418 [b]	<0.0001
$Log(E_{ij})$	Maddala-Wu (1999)	$\chi2$=182.945 [b]	< 0.0001
	Levin, Lin, and Chu (2002)	Z= 3.0118 [b]	0.0026
	Im, Pesaran and Shin (2003)	Z= 3.3415 [b]	0.0008
	Hadri (2000)	Z= 54.2061 [b]	<0.0001

Notes:

a) *The estimated equation contains a drift (constant) term.*
b) *A trend term is included among the set of dependent variables in the auto-regressive equations.*

3.4.3 Empirical Model Selection

What concerns us in this subsection is whether the individual trade flow data are sufficiently homogenous to be considered as a pooled series. All the individual trade flow and other series over the sample period can be lumped together and simple OLS strategy can be pursued, if each individual cross section equation has similar coefficient structure. Giving a panel structure to the data is not important in this case as the OLS estimator is not sensitive to all possible permutations of the observations. However, the presence of country specific unobserved heterogeneity that may be correlated with the predictors of the model suggests the use of panel strategy in data analysis. Some such relevant country specific factors might be cultural similarities between two countries, quality of institutions, and ethnic relationship between the trading partners. First, to determine whether the data can be pooled together, the null model,

$$(3.3a) \qquad y_{it} = \alpha + \beta X_{it} + u_{it} \ ,$$

is tested against the alternative,

$$(3.3b) \qquad y_{it} = \alpha + \beta_{it} X_{it} + \mu_i + v_{it} \, ,$$

where the matrix X matrix contains all the variables listed in Table 3.2, except for the dependent variable log(X_{ijt}), which is represented in the above equation as y_{it}. In the pooled model (3.3a), the individual effects, μ_i , are not statistically distinguishable from one cross section to another (i.e. $\mu_i = 0$, for i = $1, \cdots, N$) and hence absorbed into the constant term. Should the restricted model (3.3a) substantially increase residual sum of squares compared to the alternative model (3.3b), we opt for panel technique. This comparison is done here with the following Fisher's statistic, as suggested in Kunst (2009):

$$(3.4) \qquad F = \frac{\left(ESS_R - ESS_U\right)/(N-1)}{ESS_U \,/[(T-1)N - K]}$$

where ESS_R and ESS_U are the error sum of squares obtained from the null (restricted) model and the alternative (unrestricted) model respectively. The test statistic follows a F-distribution with (N-1) and [(T-1)N-K] degrees of freedom under the validity of the null hypothesis. N, T and K represent the number of cross sections, the number of time periods, and the number of estimated parameters respectively. The two residual sum of squares calculated from equations (3.3a) and (3.3b) along with the estimated F-values extracted from equation (3.4) are shown in Table 3.3. When this statistic is compared with the critical value from its theoretical distribution, we have strong reason to prefer the alternative panel model (the p-value is close to zero in the last column of the table).

Equation (3.3b) allows for the presence of cross-section specific fixed effects in the data, which can be replaced by a random effect, if we like. In this case μ_i will not be fixed within cross sectional groups, but rather will have some specified distribution like, for example, $\mu_i \sim N\left(0, \sigma_\mu^2\right)$, which is correlated with the idiosyncratic error u_{it} within group i but independent across groups. In this latter case of the random effect alternative hypothesis, rejection of the null will provide sample evidence for the random effect model against the simple pooled model. Similar to the test against the fixed effect model, this test, reported in the last row of Table 3.3, also strongly rejects the pooled model hypothesis. So it seems appropriate to apply a panel strategy and select among the competing panel estimation methods.

Table 3.3: **Pool Test against Fixed and Random Effects**

Model	ESS	F-statistics	p-value
Pool	3289.6	H_0 against FE:	Less than 0.001
Fixed Effect	761.38	F = 99.02 H_0 against RE:	
Random Effect	788.8	F = 97.51	Less than 0.001

The choice between the fixed effect and the random effect estimator is a tricky one and often depends on the purpose of the study. Rodriguez (2008) provides five considerations for choosing between these two alternative estimators. First of all, researchers should base their analysis on fixed effect estimator when the primary interest lies in explaining group behaviour instead of the overall population performance. Secondly, the presence of correlation between the country-fixed term and some of the covariates makes the random effect estimator less reliable, but the fixed effect estimator still remains valid. Thirdly, a major problem with the fixed effect estimator is that it cannot estimate the coefficient of variables that are constant across all individuals in a group. So when parameter of interest lies in such variables like distance, a variable considered important in evaluating regional integration, the random effect estimator becomes indispensable. Fourthly, when we face multi-level hierarchical data, random effect model can be generalized to deal with this situation, whereas fixed effect estimator can be applied only to two-level data like longitudinal data. Finally, random effect estimator can also be generalized to allow for a random slope coefficient as well as the random intercept, thus enabling us to uncover the interaction between a covariate and the unobserved group specific characteristics.

A more formal Hausman test is also available (for example, in Greene, 2012) where the null hypothesis of the random effect is tested against the alternative of a fixed effect model and the decision is taken on the basis of the sample correlation between individual equation specific idiosyncratic error u_{it} and the predictors. If the correlation is statistically non-trivial, the null is rejected in favour of the alternative fixed-effect model, otherwise the random-effect model is chosen. In the presence of such correlation, one of the assumptions of the random-effects model is violated and consequently biased estimates are produced. The fixed-effect methodology gets rid of this non-orthogonal variables problem by mean-differencing all the variables and removing the unobserved as well as the observed time-fixed, country-specific variables from the model. To test for the hypothesis in the present context, both the random- and the fixed-effect models are run with the same set of explanatory variables, and their estimates fed into a Hausman test procedure to generate p-values of the test.

More specifically, we obtain the fixed effect and the random effect estimates of the model (3.3b) with log of bilateral trade flows as the dependent variable and all the time varying variables (i.e. the sum of bilateral GDPs, similarity index, both countries' price level and bilateral exchange rates, all in log form). Hausman test statistic is then obtained as

$$(3.5) \qquad H = (\hat{\beta}_{FE} - \hat{\beta}_{RE})'[\mathrm{var}(\hat{\beta}_{FE}) - \mathrm{var}(\hat{\beta}_{RE})]^{-1}(\hat{\beta}_{FE} - \hat{\beta}_{RE})$$

which is asymptotically chi-square distributed with degrees of freedom equal to the number of time varying variables. The test value produced in this way is 6.7058, which is chi-square distributed with 5 degrees of freedom and has a p-value of 0.2435, implying the preference for the null random effect model. Hausman's (1978) insight is that when the covariance between an efficient estimator (e.g. the random effect) and its difference from any other inefficient but consistent estimator (such as, the fixed effect) is near zero, then the efficient estimate is also consistent.

Further Diagnostics:

For a long time series with relatively small number of cross-section cases, cross-section dependence is often a problem (Baltagi, 2008). When bilateral trade flow patterns respond to common shocks like a global recession or if some kind of spatial diffusion effect is present, as often suggested by spatial models, then cross-section dependence can arise. The null hypothesis of no cross sectional dependence can be tested using either Breusch-Pagan Lagrange multiplier (LM) test or Pesaran's cross-section dependence (CD) test. Whether residuals are correlated across cross-section units are examined in these two tests. The LM test is based on squared residual correlation coefficients and is defined as

$$(3.6) \qquad LM = \sum_{i=1}^{n-1} \sum_{j=i+1}^{n} T\hat{\rho}_{ij}^2$$

where $\hat{\rho}_{ij}^2$ is the residual correlation coefficient between cross-section i and j and T is the number of observation in each category (balanced panel case). The test is chi-square distributed with n(n-1)/2 degrees of freedom. The test is an approximation for situations where we have small number of cross sections relative to the number of time periods, that is the test is time asymptotic, whereas the Pesaran's (2004) test can be applied to any number of cross sections with any number of time periods, that is it has asymptotic behaviour in both the time and space dimension. The statistic is calculated as

$$(3.7) \qquad CD = \sqrt{\frac{2}{n(n-1)}} \left[\sum_{i=1}^{n-1} \sum_{j=i+1}^{n} \sqrt{T}\,\hat{\rho}_{ij} \right]$$

The presence of cross-section dependence implies contemporaneous correlations and calls for the seemingly unrelated regression (SUR) estimation of the model. When these two tests are applied to the dataset at hand, their p-values reported in Table 3.4 give contradictory conclusions. The model obtains a green signal for cross-section independence from the Pesaran's CD test while alerts occur when we resort to the LM test. Since the data under investigation have the same dimension in both direction, LM test's time asymptotic properties are not obvious, but Pesaran's CD test still applies unambiguously. Moreover, when the model is estimated with the OLS and the SUR methods, the results are not much different (results not reported here). This indicates that the cross-section dependence is not a severe problem for this data. However, the Breusch-Pagan test for heteroskedasticity and the Breusch-Godfrey-Wooldridge test for autocorrelation in the idiosyncratic error in the model have low p-values suggesting the presence of both asynchronous variance across observations and their time dependencies. These results are summarized in Table 3.4.

Table 3.4: Diagnostic Test for Cross Sectional Dependence, Heteroskedasticity, and Serial Correlation

Diagnostics	Test Type	Test Statistics	p-values	Decision
Cross-section dependence	i) Pesaran's CD test	Z = 0.577	0.5639	No cross-section dependency
	ii) LM test	$\chi2 = 2506$	< 0.0001	Cross-section dependence
Heteroskedasticity	LM test	BP=1352	< 0.0001	Heteroskedastic error
Serial Correlation	BGW test	304.39	< 0.0001	Serially correlated error

Note: BGW refers to Breusch-Godfrey-Wooldridge test,

3.4.4 Analysis of the Results

Results from previous studies bearing on the effects of regional integration on trade flows have been one of among optimistic, pessimistic, or in-between depending on their datasets and methodologies. In this context, the findings of this section are expected to contribute input to the ongoing debate on the desirability of the SAFTA with respect to its efficacy in increasing intra-regional trade flows from a new perspective. Table 3.5 summarizes the major findings of the chapter on bilateral trade flow from different estimation perspectives. Column (3) and column (4) represent respectively the random effect and the panel general feasible GLS (PGLS) estimation of the equation (3.2) in its log form. While the random effect model exploits only the heteroskedastic information from the error, the PGLS is implemented in the context of both heteroskedastic and auto-correlated error structure. Incorporation of the covariance structure in the estimation process is thus likely to improve estimator performance, compared to the fixed effect and the random effect methods.

Column (5) reports the estimation results from the panel generalized methods of moments (PGMM) in the presence of an auto-regressive term. Since this model contains an additional variable, its estimates are not directly compared with the results from the other two estimation methods, and discussed separately in section 3.4.5 below in the dynamic panel context. Considerations of several estimation methods and models should provide a robustness check of the estimates under different assumptions about the nature of the regressors and the error term.

The PGLS estimation is conducted in two steps. Taking random effects into consideration, residual estimates are obtained from the OLS in the first step of the estimation process. A covariance matrix formed from these residuals is then used in the PGLS. The method allows for the error covariance structure to be unrestricted within any group of observations and thus the resulting estimator is robust against intra-group heteroskedasticity and serial correlation. The estimation procedure resembles the one that Wooldridge (2002) suggests for estimating unrestricted PGLS for panel model. When comparisons are made between the estimates obtained from the two estimation methods reported in column (3) and column (4) of Table 3.5, the sign of all coefficients is found to be the same with slight modifications in the magnitude of the parameter estimates. Notable changes are however observed in turning some of the coefficient estimates more precise and improving the multiple R-square value.

Table 3.5: Estimation Results

Dependent variable: log of bilateral exports, X_{ijt}

Variable (1)	Description of the Variables (2)	Estimation Methods: RE (One way, individual) (3)	PGLS (4)	System-GMM Estimate (5)
Constant	Intercept	- 29.01 (<0.001)	-27.16 (<0.001)	-4.5003 (0.0016)
$\log(X_{ij,t-1})$	Log of lagged export form i to j	--	--	0.8899 (<0.001)
$\log(Y_{it}+Y_{jt})$	Log of total GDP of the partners	1.5231 (<0.001)	1.2460 (<0.001)	0.1917 (<0.001)
$\log(s_{it}s_{jt})$	Log of similarity index	0.2827 (0.029)	0.2616 (0.016)	0.1122 (0.0025)
$\log(P_{it})$	Log of exporter's price index	-0.3153 (0.360)	-0.4075 (0.057)	-0.0502 (0.353)
$\log(P_{jt})$	Log of importer's price index	0.2697 (0.408)	0.3352 (0.201)	0.0708 (0.122)
$\log(E_{ijt})$	Log of bilateral exchange rates	0.5230 (0.024)	0.4221 (0.027)	-0.0075 (0.294)
$\log(D_{ij})$	Log of distance between trading partners	-0.8327 (0.133)	-0.1095 (0.761)	0.0250 (0.669)
RTA1	Regional dummy 1	-0.2158 (0.118)	-0.1225 (0.073)	-0.1010 (0.0542)
RTA2	Regional dummy 2	0.2281 (0.324)	0.1540 (0.029)	-0.0483 (0.334)
RTA3	Regional dummy 3	-0.3868 (0.252)	-0.0056 (0.953)	0.0514 (0.518)
Multiple R^2	Multiple correlation coefficient	0.78	0.83	--
Sargan Over identification test (chi-square with 433 df) (p-value)				0.2362

Note: Values in parenthesis are p-values based on robust standard errors.

The non-dummy explanatory control variables have been selected based on theory or guided by literature and their time-series properties. As basic gravity variables, the model includes, among others, the aggregate GDPs of the trading partners intending to capture the effect of economic size on bilateral trade flow. The pull of gravity is expected to be stronger, the higher the partners' aggregate economic size. Larger economies have capacity to export more or have more purchasing power to import. Moreover, larger economies permit production at levels to reap scale economies which is also an important determinant of trade according to the new trade theorists (Krugman, 1980, Helpman, 1981). The estimated coefficient of this theoretically important variable for the current dataset is found to be significantly positive with a p-value of lower than one per cent and has a magnitude of 1.52 (and 1.24 for the PGLS estimate in column 4), indicating that for a percentage change in the combined GDP of the trading partners, bilateral exports respond by around one and a half a percent. This strong response of bilateral exports to GDP is consistent with observed increasing outward orientation of the South Asian economies and their rising GDP growth in their post-reform era. The coefficient value of higher than one also implies that South Asian traded commodities have been in the income elastic range during the sample period.

Baldwin and Taglioni (2011) consider the size and significance of the GDP coefficient in the trade flow equation as an indicator of the extent to which bilateral trade flow can be taken as fragmented or parts and component flow in the overall trade. They argue that low and insignificant GDP coefficient is the characteristics of the factory Asian nations like Japan, Korea, Thailand, Malaysia and Taiwan. The rational for such outcome is that while GDPs are measured in value added terms, trade flows are measured on gross sales basis. Thus increase in auto parts import should be explained by the gross output of the automobile industry, not by its value added. Where parts trade is a dominant fraction of total trade, a country's import becomes a significant function of its own export and GDPs lose importance as determinants of trade flows. Parts and components trade is yet to be a noticeable feature in South Asia, and accordingly we get in our case a high and significant coefficient for the economic mass variable.

The second important control, the log of GDP shares of each country, is designed to capture the effect of similarity of economic size of the partner countries on their trade flows. Multiplicative form of the GDP share terms restricts the impacts of the share coefficients on trade flows for each partner to be equal, and this is quite reasonable. Positive coefficient of this variable is consistent with the hypothesis that countries trade more with each other if they are more similar in terms of their economic sizes. The estimated highly significant coefficient of this variable indicates that for every percentage point improvement toward equality in their income share, bilateral export increases by about 0.28 per cent (almost the same according to the panel GLS estimate). This finding is in line with economic theory and also conforms to other studies.

Size similarity between countries leads to preference similarity and overlapping demand (Linder, 1961), which is often responsible for creating bilateral trade in diversified manufacturing products. Wang *et al.* (2010) uses panel data from the OECD countries to examine the link between size similarity and bilateral trade. Their estimate of 0.85 indicates a higher trade flow response with respect to the similarity index for the developed countries compared the estimate obtained here for the South Asian dataset. Some other studies consider distribution of income within (instead of between) partner countries, but in that case interest centres around the changes in the structure of commodity flows. Darling et al (2004), for example, consider intra-country income allocation in a gravity model framework and find that growing inequality has positive effect on bilateral trade of luxury goods while negative effects on necessary commodities. Bohman and Nilsson (2007) find income distribution effects more pronounced for the developing countries compared to the developed countries.

In open economies with a flexible exchange rate policy, as has been the case with the South Asian countries, the bilateral exchange rates play an important role in determining the level of trade flows. Unfortunately most of the extended gravity model based studies performed on South Asian data, while explaining the impact of the regional free trade agreement on trade flows, lack this important variable. Presumably they are assuming that exchange rate does not fluctuate much in the sample period which is not true and influence of the exchange rate on trade flow is being picked up by other included variables in the model, especially when they are correlated with the exchange rate, thus biasing the estimate of the models parameters. With this apprehension in mind, it is decided in this analysis to include the log of exchange rate among the set of explanatory variables, and not surprisingly the parameter estimate of this variable is found to be of expected sign and highly statistically significant. For a one per cent increase in the bilateral exchange rate (devaluation or depreciation, as the case might be), for all countries in the sample considered together, bilateral export increases by about half a per cent.

The price variables also have their expected coefficient signs, but the own price is significant only at ten per cent level under the panel GLS, and the partners' price is not a significant variable in affecting bilateral export. The reason might be that, in the absence of data availability on export and import price indexes, the GDP deflators of the partner countries are used here as proxies, which have been at best blunt instruments. Moreover many obstacles to trade manifest themselves in price variables making the proxies less obvious. Granting for this weakness in the measurement of the price variables, it appears from the estimated figures that exporters' price have stronger influence on export than importers' price. These two coefficients are somewhat stronger in the panel GLS case. Balassa *et al.* (1989) estimate the export supply functions for Greece and Korea with a two stage least square method and find price elasticity estimate in the range of -1.01 for Greece to -1.05 for Korea. Manufactured items show higher price elasticities compared to the overall estimate for both countries. As they consider log of relative prices in their study, the elasticity estimates with respect to both partners' prices are in fact constrained to be the same but of opposite sign.

The estimated distance variable carries with it an expected negative coefficient, indicating that bilateral trade flow decreases with physical remoteness. The theory of gravity model and intuition suggest that geographic proximity should reduce trade costs and hence, given other controls, increase bilateral trade flows. Existing studies, however, are not unanimous on the empirical estimate of this coefficient. With a wide range of dataset incorporating 182 countries over the period 1984 to 2005, giving a total of 169,113 observations, Tumbarello (2007) finds statistically significant negative coefficient for the distance variable. However, positive and unstable distance coefficients are also found in some other studies. Sawyer *et al.* (2010) while searching for determinants of intra-industry trade in Asia through gravity models get fragile coefficient estimates for the distance variables depending of industry categories. Of the eight SITC categories, four (SITC 1, 4, 5 and 8) yields positive coefficient estimates and the rest carry negative signs with the distance variables. The authors conclude that transportation cost is more important for trading primary products than it is for manufacturing products.

Anderson and Wincoop (2004) contend that when technology in shipping or cost of communications fall faster than the rest of the economy, per unit cost of shipment falls and time series data may produce positive coefficient for the distance variable. It also reflects the effects of globalization on bilateral trade flows. Growing importance of services trade and the rapid progress in information and communication technology is making it easier for distant technologically developed countries to enter into the services sector of the developing nations. Thus distance is not as costly for trade now as it was a decade ago. What is more valued in international transaction is the delay time and cost of doing business across nations. Inefficient institutional infrastructure, excessive documentation requirement in import-export activities and the overall cost of doing business make trades among regional partners less attractive in South Asia.

It should be noted that the distance coefficient is insignificant in all of the three estimates in Table 3.5 which suggests that distance is not much important for the South Asian countries in their international trade. Though proximate to each other, poor transport infrastructure and procedural delays increase real transport time to such a level that to get a shipment of textiles from Pakistan or Europe, India for instance has to wait for the same amount of time (Sawhney and Kumar, 2008). With regard to the insignificant distant coefficient, two more explanations can be put forward. First, literature on off shoring activities suggests that transport cost is important when trade costs are incurred at each stage of production (Baldwin and Taglioni, 2011). This happens when parts and components trades are dominant in total trade, a feature not yet noticeable in case of South Asian trade. Second, though distances are measured here as between capital cities, traded commodity in practice travels more or less than this path. Hence, we are in a situation of the classical errors in explanatory variables problem, a circumstance where, as Wooldridge (2002) shows, variances of estimators inflate and estimates tend to be less significant.

Finally, the efficacy of the regional trade agreement in South Asia bearing its impact on bilateral trade flows should be evaluated on the basis of the three estimated coefficients of the regional dummies. Regional agreements are not always similar. In practice their values differ from case to case as they arise from a variety of reasons and their impacts are also expected to be different. The present day European Union emerged in response to a perceived security threat from the communist countries whereas NAFTA was put forward to expedite multilateral trade talks (Whalley, 1998, 2008). Smaller nations on the other hand seek regional agreements to widen their scope of market access. South Asia is an unusual case of regional integration in that the two major partners of this region have fought three all-out wars after their independence and have always been in a cold war situation. The region comprises the smallest country of the world, Bhutan, with a population of only 0.7 million and the mammoth India that engulf 83 per cent of the total land area of South Asia.

The trade creation and trade diversion consequences of the regional trade liberalization scheme in South Asia, implemented through their SAFTA initiative, can be analysed with the help of the coefficient estimates of the three regional dummies. Trade creation occurs when extra trades are generated among the members as they remove their tariff and non-tariff barriers at the regional level. In a regionally protected market, members find it cheaper to source their imports from the free trade area. Though producers in the rest of the world are more efficient, once external tariffs are taken into account they are in a competitive disadvantage position in the regional market. Trade diversion results when members' additional import can be explained as a substitution of import from the rest of the world. Possible scenarios for new trade patterns that may emerge after regional integration are explained in Table 3.6 where an up (alternatively a down) arrow in a cell indicates the rise (alternatively fall) in exports from the source to the destination region.

Table 3.6: Effects of RTAs on Trade Patterns

Destination \ Source	South Asia	Rest of the World
South Asia	↑ = Trade Creation ↓ = Dysfunctional Integration	↑ = Trade Creation ↓ = Import Trade Diversion
Rest of the World	↑ = Trade Creation ↓ = Export Trade Diversion	Not Applicable

There is no theoretical certainty regarding the direction of these two effects of trade creation and trade diversion. All depend on how the future state of the world is revealed after the policy changes. Regional specialization and the attendant scale economy can increase intra-regional export as well as the region's export to the rest of the world, should the falling cost enable regional producers to achieve the level of international competitiveness. Introduction of new products or changing structure of demand in favour of the rest of the world, in contrary, may reduce intra-regional trade flows. Moreover, different pattern of productivity changes within and outside the region can lead to any sign pattern of the three regional dummies. The up arrow in the first two cells, i.e. positive signs with the first two regional dummies, indicates trade creation. Down arrow in the second cell or negative sign with the second regional dummy is associated with trade diversion. The main purpose of regional economic integration is to enhance intra-regional trade flows and hence a down arrow in the first cell shows a case of dysfunctional integration whereby the particular FTA does not work in accordance with the expectation.

The nature of trade creation and trade diversion effects of the SAFTA can be understood in the light of the estimated coefficients of the three regional dummies. To avoid misinterpretation, the coefficients of the dummies need to be explained in the context of the semi-log regression model where exact percentage changes in the dependent variable due to the presence of an attribute in the dummy variable is measured as $[100\times(\exp(\hat{\beta})-1)]$, and following delta method its asymptotic standard error is computed with the formula $[100\times\exp(\hat{\beta})\times se(\hat{\beta})]$ (Wooldridge, 2002). This rule is followed while interpreting the dummy coefficients.

The coefficient of RTA1 gives the amount of additional trade flows among the members in the free trade area regime compared to the non-preferential era or trade with non-members. In general, because of reduced trade barriers, the coefficient is hypothesized to be positive. However, no empirical support is found for it in the context of the South Asian trade-flow data. The estimate of this dummy indicates that, after controlling for the gravity related variables (economic sizes, distances, and prices) and fluctuations in exchange rate, the current free trade agreement in South Asia (SAFTA), that is in place since 2006, has in fact reduced bilateral trade flow within the region. Considering the estimated coefficient and its statistical significance, the trade agreement in South Asia in its current form can be taken as ineffective in creating intra-regional trade flows.

Upward trend from simple plots of bilateral trade flows within the region, which may be observed in Figure 3.1 above, underlie the influence of other factors like GDP growth and currency depreciation, not regional integration per se. The estimated RTA1 coefficient of -0.2158 with a p-value of 11 per cent suggests that during the free trade regime intra-regional bilateral trade has been lowered on average per year by 19.4 per cent ($=100\times(e^{0.2158}-1)$) compared to the baseline non-SAFTA regime in the sample period. The figure is a bit lower in the PGLS case but statistically more valid.

Poor performance of the South Asian trade bloc has also been noted in some other less rigorous studies. Sawhney and Kumar (2008) blame the top-down approach of regional integration ignoring the ground reality of apathy toward trade and investment flows and political disputes over unresolved territorial issues as the root cause of turning South Asia into the least integrated region of the world. They point out that Pakistan denies India even the MFN benefits, though both are WTO members. Intra-regional trade in South Asia through the SAFTA falls far behind than what one might expect under a theoretical free trade area where it is assumed that there will be no barriers to trade among the members.

In addition to the scanty coverage of tariff lines under the agreement and inclusion of food and textile items – two major product of export interest for the members – in the sensitive list, widespread uses of para-tariff (e.g. infrastructure development surcharge) and non-tariff measures like government regulations, anti-dumping measures, import licenses and sanitary standards, severely impede trade flows. Anti-trade sentiment among the politicians in South Asia works through a partial interpretation of consumer and producer gains. When goods like gas and fish are exported it is argued that domestic consumers will suffer in terms of higher prices and foregone consumption. But when it comes to availing cheap foreign foods like poultry and sugar, destruction of domestic firms and rising unemployment are the pretext against tariff cuts.

Regional integration and free trade agreements are spreading around the world to take advantage of the intra-industry trade. The experience of the ASEAN members shows that these countries have substantially increased their intra-regional trade flows by pursuing a cooperative industrialization strategy, whereby various production stages are distributed across the region. Such polices, if followed in South Asia, can help them overcome the problem of having competitive advantage in similar products. Banik (2006) argues that adjustment costs are lower and political oppositions are not strong in case of intra-industry trades. Importing one variety of products against exporting another variety expand consumers' choices in both countries without jeopardizing the industry, which is less likely to happen in case of inter-industry trade. One problem of raising intra-regional trade through this mean is the low living standard of the region. Because of lower per capita income, demand for differentiated products is also lower in the South Asian countries.

However, as the countries of South Asia are growing fast and in their early phase of development, their import requirements are undeniably high which are being supplied by the rest of the world. The estimated positive coefficient of 0.2281 for the RTA2 dummy supports this argument (the figure is 0.15 under the PGLS method and statistically significant at 5 per cent level). This implies that the imports of the South Asian countries from outside the region have jumped up by about 20.4 per cent ($=100\times(e^{0.2281}-1)$), on average per year, after the formation of the SAFTA compared to the non-SAFTA periods. Thus we have an indication that either the South Asian producers are not producing the types of goods required by their member partners or the concession granted through the SAFTA could not produce the critical mass necessary for turning South Asia into an intra-regional trade enhancing bloc.

Another possible explanation for increasing imports from the outside regions is that the trade liberalization provision in SAFTA is less ambitious than the non-reciprocal unilateral or autonomous liberalization polices followed by the South Asian countries in the past few decades. Between 1983 and 2003 while unilateral liberalization accounted for about 66 per cent tariff cuts, bilateral and multilateral process contributed to only 10 to 25 per cent tariff reductions in the South Asian countries (World Bank, 2005). A more disappointing result appears when we consider the RTA3 dummy which has a negative coefficient of -0.3868, implying that the countries of the region could not keep up with the productivity improvement attained by the rest of the world, and as a result the trade agreement has not helped them to improve their export performance. Thus, looking at the trend export from South Asia to the rest of the world might seem to be growing, but it faced a structural downward shift of about 32.1 per cent (i.e. $100\times(e^{-0.3868}-1)$) in their post-FTA regime. However, these latter two dummies do not have strong empirical support from the South Asian data.

3.4.5 A Dynamic Panel Model of Bilateral Trade Flows

The results discussed so far based on the random effect methodology do not account for or address the endogenity problem, measurement error, and omitted variable bias. Export and GDP, for example, might be endogenous on the one hand, while some other relevant exogenous variables might be left out inadvertently. Likewise, corrupt practices among custom officials or false declarations of importers to avoid tariffs, or over and under invoicing can create measurement problem. These issues are better addressed with the more rigorous generalized method of moments (GMM) technique.

The approach involves first-differencing the estimating equation to remove cross-section specific or country-fixed and time-invariant effects, and then using the second and higher order lags as instruments for the differenced variables in the right hand side of the equation. Bond *et al.* (2001) show that such estimators consistently estimate parameters even in the presence of temporary measurement error and at the same time avoid omitted variable bias. Their detailed simulation experiment in the context of an empirical growth model also show that the system-GMM estimation, where a set of equations both in level and first differenced variables with the former instrumented by lagged first differenced series, performs better than a single differenced-only version of the GMM estimation procedure in finite samples.

GMM is an important development in econometrics in that it allows for estimation of model parameters without imposing distributional assumptions on the data generation process. It can even be applied to situations where no closed form solution is found for the first order conditions of the model (Davidson and MacKinnon, 2009). To apply the technique let us first write the trade-flow equation in a dynamic linear panel model context as,

$$(3.8a) \qquad y_{ijt} = \alpha + \gamma y_{ij,t-1} + \beta' X_{ijt} + \mu_i + \varepsilon_{itj}$$

where, $y_{ijt} = \log(X_{ijj,t})$, $y_{ij,t-1} = \log(X_{ij,t-1})$, and

$$X_{ijt} = [\log(GDP_{it} + GDP_{jt}) \ \log(s_{it} s_{jt}) \ \log(P_{it}) \ \log(P_{jt}) \ \log(E_{ijt}) \ \log(D_{ij}) \ RTA1 \ \ RTA2 \ \ RTA3]$$

The GMM estimator first gets rid of the country fixed effects, μ_i, by first-differencing equation (3.8a) which results in,

$$(3.8b) \qquad \Delta y_{it} = \gamma \Delta y_{i,t-1} + \beta' \Delta X_{it} + \Delta \varepsilon_{it}$$

The differenced error term is still correlated with the auto-regressive term through the common $\varepsilon_{i,t-1}$ term (that is, $y_{ij,t-1}$ in $\Delta y_{ij,t-1}$ depends on $\varepsilon_{ij,t-1}$ which is again part of $\Delta\varepsilon_{ij,t-1}$). De-meaning of the variables in the fixed-effect model or quasi-demeaning through the random-effect method does not help us in this situation. The single equation GMM method solves the endogenity issue by using $y_{i,t-k}$ for $k > 1$ as instruments for the

$\Delta y_{i,t-1}$ terms. Any auto-correlation in the error term is removed by transforming the data matrix with a H-matrix which has 2's along its main diagonal, -1's in the first off diagonal and 0's elsewhere. Thus the estimated parameters are,

$$(3.9) \quad \hat{\delta}_{GMM} = [\hat{\gamma} \ \hat{\beta}']$$

$$= \left[\left(\sum_{i=1}^{n} W_i' Z_i \right) \left(\sum_{i=1}^{n} Z_i' H Z_i \right)^{-1} \left(\sum_{i=1}^{n} Z_i' W_i \right) \right]^{-1} \times \left(\sum_{i=1}^{n} W_i' Z_i \right) \left(\sum_{i=1}^{n} W_i' H Z_i \right)^{-1} \left(\sum_{i=1}^{n} Z_i' \Delta y_i \right)$$

Where, the weight matrix,

$$W_i = \begin{bmatrix} \Delta y_{i,2} & \cdots & \cdots & \Delta y_{i,T-1} \\ \Delta x_{i,3} & \cdots & \cdots & \Delta x_{i,T} \end{bmatrix}'$$

the instrument matrix,

$$Z_i = \begin{bmatrix} y_{i1} & 0 & 0 & \cdots & 0 & \cdots & 0 & \vdots & \Delta x_{i3} \\ 0 & y_{i1} & y_{i2} & \cdots & 0 & \cdots & 0 & \vdots & \Delta x_{i4} \\ \vdots & \vdots & \vdots & \ddots & \vdots & \ddots & \vdots & \vdots & \vdots \\ 0 & 0 & 0 & \cdots & y_{i1} & \cdots & y_{iT-2} & \vdots & \Delta x_{iT} \end{bmatrix}$$

the autocorrelation matrix,

$$H = \begin{bmatrix} 2 & -1 & 0 & \cdots & 0 \\ -1 & 2 & -1 & \cdots & 0 \\ & & \vdots & & \\ 0 & 0 & -1 & 2 & -1 \\ 0 & 0 & \cdots & -1 & 2 \end{bmatrix}$$

and the differenced dependent variable,

$$\Delta y_i = \begin{bmatrix} \Delta y_{i3} & \cdots & \cdots & \Delta y_{iT} \end{bmatrix}'$$

The system-GMM approach exploits more information by using data in levels with lagged differences as their instruments in addition to the differenced data with lagged level as their instruments. Consequently, in the case of system-GMM estimation the above matrices are replaced by

$$W_i = \begin{bmatrix} \Delta y_{i2} & \cdots & \Delta y_{i,T-1} & y_{i2} & \cdots & y_{iT-1} \\ \Delta x_{i3} & \cdots & \Delta x_{i,T} & x_{i3} & \cdots & x_T \end{bmatrix}'$$

$$Z_i = \begin{bmatrix} y_{i1} & 0 & 0 & \cdots & 0 & 0 & \cdots & 0 & \Delta x_{i3} \\ 0 & y_{i1} & y_{i2} & \cdots & 0 & 0 & \cdots & 0 & \Delta x_{i4} \\ \vdots & & & & & & & & \\ 0 & 0 & 0 & \cdots & y_{i,T-2} & 0 & \cdots & 0 & \Delta x_{iT} \\ \vdots & & & & & & & & \\ 0 & 0 & 0 & \cdots & 0 & \Delta y_{i2} & \cdots & 0 & x_{i3} \\ \vdots & & & & & & & & \\ 0 & 0 & 0 & \cdots & 0 & 0 & \cdots & \Delta_{yi,T-1} & x_{iT} \end{bmatrix}'$$

$$\Delta y_i = \begin{bmatrix} \Delta y_{i3} & \cdots & \Delta y_{iT} & y_{i3} & \cdots & y_{iT} \end{bmatrix}'$$

The H matrix can be constructed in many ways for the system-GMM estimator. Econometric software ‘Gretl’ places the previous H matrix of the single equation GMM in the new expanded H’s north-west bloc, use an identity matrix at the south-east bloc and 0’s elsewhere (Cottrell and Lucchetti, 2012).

In accordance with the methodology just described, column five of Table 3.5 reports the system-GMM estimates of the trade flow equation in a dynamic panel setup where a lag of the dependent variable also appears in the equation along with other explanatory variables. Extensive use of instruments implies more moment conditions and hence larger information set which makes the system-GMM estimation procedure highly efficient. The validity of these instruments is usually tested with the Sargan over identification test, which in our implementation has a p-value of 0.2362 indicating the validity of the 433 instruments employed by this estimator (reported at the bottom of Table 3.5).

The overwhelming importance of the coefficient estimate of the lagged dependent variable points us toward the relevance of the Eichengren and Irwin’s (1998) hypothesis regarding the importance of history in bilateral trade flow data in South Asia. When the highly significant lag dependent variable is included in the model, the importance of other variables in terms of their coefficient estimates becomes dwarfed, though the sign patterns are preserved for the gravity related variables. The first regional dummy retains its sign, magnitude and statistical significance while the other two lose their significance. So, even when the history of bilateral trade flow is taken into consideration along with other theoretically relevant variables, the South Asian free trade bloc still remains dysfunctional.

Importance of history in bilateral trade flows can be compared with the phenomenon of path dependency observed in other areas. Existence of the QWERTY keyboard layout that was developed for manual typewriter in 1873 and later adopted in the computing industry is a prime example of path dependency. A more efficient DSK (Dovorak Simplified Keyboard) that was developed later after the invention of the electric typewriting machine could not enter the market and replace the older keyboard, as customers in the typewriting profession were reluctant to retrain them (Wi, 2009). Existing institutions that were engaged in imparting training also opposed the new keyboard layout. International trade similarly requires building networks across nations and incur substantial amount of sunk cost which make traders reluctant to reorient their existing trade patterns.

The relevance of the existing distribution of trade flows and the current levels of trade barriers is also found in a simulation experiment involving SAFTA, based on an extended version of the gravity model in Rodriguez-Delgado (2007). Smaller countries of South Asia, such as Nepal, Bhutan, the Maldives, and to some extent Bangladesh depend on the regional market for their import source and export destination. In conformity with the expectation of Srinivasan (1994), the simulation experiment involving a 50 per cent tariff reduction from the current state produces substantial increases in trade flows for Bhutan (2 per cent of GDP) and Maldives (1 per cent of GDP), whereas for Bangladesh, Pakistan, and Sri Lanka the increase is smaller (less than ¼ per cent of GDP in all cases). When SAFTA is hypothetically extended to include other regional blocs like NAFTA, EU, and ASEAN+3, it is found to be more trade creating but that comes at the expense of reduced custom revenue.

3.4.6 Interactions between the GDP Similarity and the Regional Integration

The results of the previous sub-section apply in an aggregate sense to all of the countries in South Asia. However, when individual country-specific panels are constructed, each consisting of 150 observations, the same random-effect model produces different coefficient estimates for the regional dummies. Only the summary results of the country specific studies are reported in Table 3.7 which shows that India and the rest of the South Asia (Nepal, Bhutan, and the Maldives) experience additional trade flow after the formation of the regional trade bloc SAFTA. Compared to the pre-SAFTA period, India has by far increased not only her regional export by 41 per cent per year, but also achieved an annual average increase of her export to the rest of the world by about 59 per cent, both of which could be ascribed to the bloc formation effect. The rest of South Asia as a group only manages to increase its intra-regional export by 4.8 per cent, but suffers an export loss to the rest of the world on the magnitude of 95 per cent per year. So, while SAFTA appears as trade creating bloc for India, it has been a case of export trade diversion for these three small South Asian countries.

Table 3.7: Country Specific Random Effect Estimation Results

Dependent Variable: log of bilateral exports

Dummies / Country	RTA1		RTA3	
	Coefficients	Implied percentage change	Coefficients	Implied percentage change
Bangladesh	-0.2187	-19.64%	-0.1741	-15.98%
India	0.3441**	41.07%	0.4627	58.83%
Pakistan	-1.9243**	-85.40%	-1.6028**	-79.87%
Sri Lanka	-1.1684*	-68.91%	-0.9545*	-61.50%
Rest of SA	0.0469	4.80%	-3.0658*	-95.34%

Notes:

- *Estimates of the other controls not reported here include $\log(GDP_i+GDP_j)$, $\log(s_is_j)$, $\log(P_i)$, $\log(P_j)$, $\log(E_{ij})$, and $\log(Dist_{ij})$.*
- *** and * indicate estimates significant at 5 and 10 per cent levels respectively.*
- *The RTA2 variable gets a value of one on all observation for the ROW panel and zero values on all observation for all the country-specific panels. In any case the RTA2 vector becomes collinear with the constant vector, and hence omitted.*

On the losing side, Bangladesh, Pakistan, and Sri Lanka see reduced bilateral exports within the region after the introduction of the preferential trading scheme, SAFTA. The trade flow loss is the highest for Pakistan, on the magnitude of about 85 per cent and 80 per cent respectively in its intra-regional and extra-regional export per year. Sri Lanka comes second in terms of experiencing export decline by 69 per cent and 62 per cent in the regional and extra-regional market. For Bangladesh, the amount of exports to both the external and the regional markets vary around zero form case to case and year to year to such an extent that no significant changes in exports into these two markets are detected (insignificant coefficient). When both the positive and the negative effects of the SAFTA for various countries are combined, the losers' negative intra-regional trade flows outweigh the gainers' positive trade flow and this is reflected as an overall negative intra-regional trade-flow effect for the region.

The two sets of beneficiary countries in terms of having increased bilateral trade flow within the region after the preferential liberalization have either higher or lower GDP compared to the average of the region. So the GDP similarity may be a crucial factor in determining who benefits from the regional integration in South Asia. The hypothesis can be tested by incorporating cross-product terms of the regional dummies and the similarity index in the regression and then testing for the statistical significance of the product term. Such interaction is known as attribute-treatment or trait-treatment link in the literature (Keith, 2008).

The random-effect estimation of the model after including an interaction term between the RTA1 dummy and the similarity index is reported in Table 3.8. In conformity with the hypothesis above, the interaction between RTA1 dummy and the similarity index has a negative coefficient. Though the interaction term is itself insignificant, the combined coefficient of the RTA1 term and the interaction term is found significant in accordance with the delta method (Greene, 2012). When these estimates are compared with the estimates in column two of the Table 3.5, it can be seen that all of the control variables remain the same in signs and similar in magnitude. However, the estimate of the first regional dummy is now different, indicating the influence of the GDP similarity index on the intra-regional trade creation effect. More specifically, the RTA1 coefficient has now inflated to -0.3825 from its earlier -0.2158.

Table 3.8: Regression Results with Interaction Effects

Outcome variable: log of bilateral exports

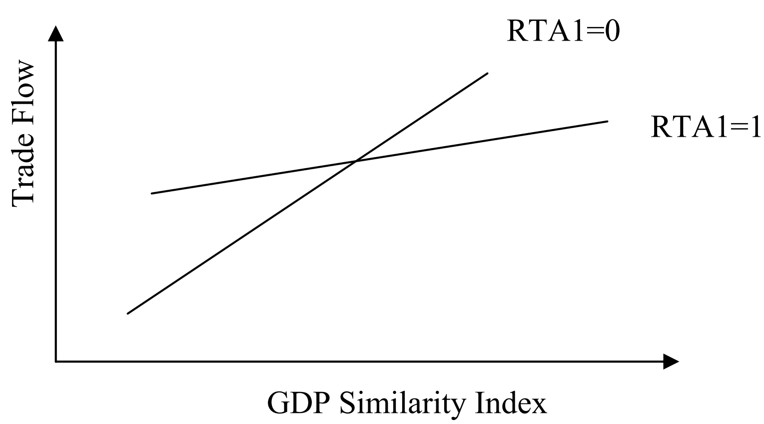
Predictors	Random Effect Estimates	Standard Errors	p-values
Constant	-29.52	3.7462	<0.001
$\log(Y_{it} + Y_{jt})$	1.5125	0.1672	<0.001
$\log(s_{it}s_{jt})$	0.3165	0.1195	0.008
$\log(P_{it})$	-0.3771	0.3147	0.231
$\log(P_{jt})$	0.3392	0.3000	0.258
$\log(E_{ijt})$	0.5750	0.2102	0.006
$\log(D_{ij})$	-0.7200	0.5183	0.165
RTA1	-0.3825	0.2137	0.007
RTA2	0.2214	0.2314	0.339
RTA3	-0.3899	0.3379	0.249
RTA1×log($s_{it}s_{jt}$)	-0.0758	0.0522	0.146

In the presence of RTA1-similarity interaction, the plain dummy coefficient (that is, the main effect) reflects a value when the similarity index assumes zero value. Since in this case countries are highly dissimilar, loss of intra-regional export is also high. When two countries are perfectly similar in terms of their GDPs, then the index takes a value of 0.25(=0.5×0.5) whose log value is -1.39. Adding this value times the interaction coefficients -0.0758 to the RTA1 dummy coefficient can be used to interpret the trade-flow changes for similar countries, arising from the regional integration. Thus, for the extremes case of perfectly similar countries, trade flow decreases by 38.61 (=100×($e^{-0.3825-0.0758*1.39}$-1)) per cent per year, and for the completely dissimilar countries bilateral trade is expected to fall by 31.78 (=100×($e^{-0.3825}$-1)) per cent per year.

The other two dummies, RTA2 and RTA3, however, get smaller and turn insignificant. The result can be interpreted by the fact that economically smaller nations in South Asia are at the same time LDC members, and hence receive more favourable treatment from other members. The sensitive lists they face from other members are less severe, and consequently have greater market access to the region. Larger members especially India is intimately connected with some smaller nations like Bhutan and Nepal through sub-regional blocs. Increased demands from these smaller nations that arise from their increased income, as a result, disproportionately fall on India.

The main effect of the GDP similarity still carries a significant positive coefficient, meaning that similar countries still trade more with each other. However, the negative sign of the interaction term indicates that countries that are further away from the average regional GDP figure now tend to create some compensating intra-regional trade flows. The situation can be visualized as shown in Figure 3.4 below, where it can be seen that similarity increases bilateral trade flows, but the effect of similarity on trade flow depends on whether the countries are regionally integrated or not. With regional integration (RTA1=1) trade flow increases with similarity but at a lower rate than it would be the case if they were not integrated (RTA1=0). So, controlling for similarity and other variables, smaller and larger countries increase their export into the regional market after integration, but at higher rates compared to an average regional member.

Figure 3.4: Interactions between Regional Integration and Similarity



The current literature in the context of South Asia do not consider the interaction between GDP similarity and regional integration dummy, though it may bring some additional insight regarding the differential impact of integration on the trading partners. Interaction effects are important and it can change the conclusion drawn from a given data set. Baltagi *et al.* (2003), for example, show that inclusion of a set of significant interaction terms in their study – one with importer-exporter, one with importer-time, and the other with exporter-time – led them to choose the Linder hypothesis against the Heckscher-Ohlin-Samuelson hypothesis, whereas the latter hypothesis is chosen if these significant interaction terms are omitted from the regression analysis.

3.5 Conclusions and Recommendations

This chapter investigates the impact of the ongoing free trade agreement in South Asia in changing the trade flow pattern of the member countries. As regional trade agreements have proliferated rapidly during the past few decades, economists and policy makers ask whether such a regime shift facilitates trade expansion or merely divert trade to make production structure more inefficient. Empirical results show that though geographic, cultural and ethnic proximity can have positive impact on trade flow, regional integration does not always guarantee additional trade flow irrespective of regions. At the level of integration South Asia has attained so far, this chapter shows that SAFTA in general has not been effective in producing extra trade flow within the region. However countries that lie at either extreme on the similarity index experience elevated regional export compared to those that are at the middle of the similarity scale.

When the dataset is subjected to the commonly followed random effect GLS approach or a more general panel GLS, negative impacts of regional integration on bilateral trade flows is found in the context of South Asia as a whole. However, there is country heterogeneity in the result, which is confirmed as the country specific panels are used instead of the whole dataset. A further extension of the model that includes the history of bilateral trades as an additional explanatory variable, and the panel GMM method is employed, it is again found that the South Asian free trade bloc is not effective in significantly changing the pattern of bilateral trade flow of the member countries. The structure of production and the nature of trade complementarities remain same throughout the region. The get rid of this quagmire South Asian countries have to device ways for regional production sharing agreements and specialize in different lines of production within broad sectors of production.

Only the effects on trade flows of the South Asian free trade bloc are considered in this chapter which does not validate or nullify the desirability of the SAFTA. Regional cooperation often involves multi-dimensional objectives. Enhanced political cooperation, credibility of policy reforms, or consideration of dynamic gains from trade can produce substantial benefits that may outweigh the distortionary effects of the bloc. Moreover, increased regional trade flow per se does not guarantee enhanced welfare or conversely lower trade can be associated with increased welfare if the opportunity for new commodity substitution generates substantial benefits for both consumers and producers. Changing pattern of efficiency of the trading partners both within and outside the region is important in this context. When preferential liberalization allows inefficient partners to increase exports to the member countries, the harmful effect of trade diversion arises at the same time. So the efficiency effect, which is closely related to productivity growth effect, of preferential liberalization on the trading partners, is examined in the next chapter.

CHAPTER 4

REGIONAL INTEGRATION AND PRODUCTIVITY GROWTH

4.1 Introduction

A country experiences productivity growth when her output rises faster than inputs. The standard of living of a country depends on its per capita income growth, and it is widely believed that long-term sustainable growth is not possible without continued productivity growth. Observed cross-country variations in income have been attributed to productivity differentials in the literature (Easterly and Levine, 2001). Productivity growth tends to be associated with high growth episodes, both across countries and over time (Dowling and Summers, 1998). This means that the performance of rapidly growing economies depends more on productivity growth than on mere factor accumulations. As labour productivity growth in South Asia during the last decade fell below the long-run trend (Ark and Timmer, 2003), it is an important issue for the policy makers of the region to explain the contributing factors of the productivity growth. Since trade creates important channels through which productivity is affected, and regional integration can change the existing trade patterns, a pertinent question is then, what empirical evidence we do have to support or refute the claim that the discriminatory trade policy can enhance productivity growth in South Asia.

Literature on openness reveals at least two channels through which openness can affect productivity, and these are trade and investment. Increased trade can foster a competitive environment whereby resources are attracted into more productive sectors of the economy. The dynamic effects of trade can be associated with the demise of inefficient firms and the expansion of incumbent efficient firms. This creates opportunity for reaping the benefit of large scale production. In a liberalized economy private investment is encouraged, and this, especially the foreign direct investment, increases productivity by transplanting new technology into the host economy. However, Grossman and Helpman (1991 and 1994b) show that sustained increases in productivity depend on the post-trade composition of the production structure. If trade leads to specialization in sectors where the opportunities for learning by doing are prevalent, then long-term productivity growth is promising, while productivity might fall if countries specialize in products that require low levels of skills. Moreover, non-economic factors like a congenial production atmosphere are also required for economic forces to work in the desired direction (Bandara and Karunaratne, 2010).

The productivity issue in South Asia, in the context of overall liberalization, has been investigated with subsets of manufacturing firms for selected countries (as in Mukim, 2011 for Sri Lanka and India; in Salim, 2003 for Bangladesh; and in Khanal and Shrestha, 2008 for Nepal), or for a selected set of agricultural commodities (as in Rahman and Salim, 2013; and in Selim, 2012 for rice production in Bangladesh). There are many other studies that link productivity changes to particular aspects of firms (importing, exporting or non-traded) or changes in demand and supply conditions (such as enlarged market and availability of new inputs). But it remains to be seen how these partial changes in the economy are reflected in overall economic performance. The specific research question explored in this chapter is, to what extent the regional trade agreement, SAFTA, has affected the productivity performance of the South Asian countries. Analysing the impact of regional integration on productivity is important in that it will help policy makers to choose among alternative trade policy options. However, this topic has hardly been scratched in the context of South Asia.

The rest of the chapter is organized as follows. Theoretical arguments and empirical evidence regarding the link between productivity and trade are explored in Section 4.2. A brief discussion of the existing literature on trade and productivity in general and in the context of preferential trade liberalization in particular is given in Section 4.3. Data along with their sources and the methodological framework for analysing them are presented in Section 4.4. Results of the estimated model and discussions of these results are contained in Section 4.5. The chapter concludes in Section 4.6.

4.2 Identifying the Channels of Trade-Productivity Linkage

Unless we can explain the logic behind trade-productivity linkage, simple statistical evidence of correlation between them will not solve the matter of causality. Productivity depends on a number of factors, of which openness and trade are considered important (Andersson and Lööf, 2009). Creation of new or improved intermediate goods through research and development (R&D) expenditure in one country and their subsequent utilization in another country through imports enables the latter to boost productivity based on the R&D expenditure of the former. Innovators' interests lie in having a larger market for the product that will cover the cost of innovation and bring profits. Thus, the benefit of the R&D expenditure is shared by all, though it may occur in one country.

While trade does not directly impact productivity, it does have some channels by which it can affect productivity. The following factors are believed to operate as the conduits of trade-productivity linkages:

(i) *Availability of better quality and wide range of inputs*: Access to foreign intermediate inputs can unleash domestic productivity in several ways, two of which are increased choices of inputs and better learning opportunities. Access to new sources of inputs enables firms to relax their technology constraints and grow on extensive margins. Ethier (1982) argues from a theoretical perspective that trade allows producers to choose from a variety of inputs, both domestic and foreign, thus making it possible to achieve cost efficiency in production. Methodologies for measuring such gains are discussed in Feenstra (1994) and Broda and Weinstein (2006). The gain is usually higher when domestic and foreign inputs are imperfect substitutes. Amiti and Konings (2007) find this type of productivity gain in the context of Indonesian firms when liberalization allows them access to cheaper and previously unavailable inputs.

Keller (1996) adds another element by pointing out that new products create an environment of learning, and importing firms may emulate that product or come up with a competing one. In this case, or in cases where interactions with foreign firms help reduce innovation costs of new products, permanent increases in productivity become realizable. If these two hypotheses of reduced cost and learning opportunities are valid, then the productivity levels of the importing countries should be boosted after liberalization. In accordance with this expectation, Coe and Helpman (1995) find a positive correlation between trade-weighted sum of the R&D expenditures of the trading partners and the total factor productivity (TFP) levels of the importers. The relation is strengthened when the number of new varieties imported is positively related with the amount of imports (Grossman and Helpman, 1991) or imported inputs are complementary to domestic inputs (Zaclicever and Pellandra, 2012).

The productivity gain from trade is also dependent on import sources and the absorptive capacities of the importers, the latter being influenced by the skill level of the labour force. Keller (1996), while examining the relation between trade pattern, technology flow and productivity growth, finds that there are significant variations in the estimated productivity growth that arise from different countries' R&D expenditures. The importance of import origin in shaping productivity is also found in Schott (2004) and Khandelwal (2009) in the context of the US import data, and in Zaclicever and Pellandra (2012) in the context of Uruguayan firms. These studies find imported inputs from developed countries to contribute more to the firm productivity compared to imports from less developed regions. Types of imported inputs also matter for productivity growth. Xu and Wang (2000), for example, find in their study that capital goods import contribute 10 per cent more productivity growth compared to the simple expenditure weighted imports.

(ii) *Technology spillover via exporting activities*: Trade opens up the opportunity for international exchange of technical information and makes research activities more efficient, as it eliminates the need for duplication of research in various countries. However, as technological innovations take place in a handful of developed countries[11], their proper diffusion is important for expanding the

[11] According to Keller (2009), the seven largest industrialized countries accounted for 84 per cent of the world's total research and development expenditure in 1995.

world technology frontier as well as for achieving an egalitarian world. Technological progress, which is at the heart of productivity growth, can be spilled over intra-industry, inter-industry, and within or across national boundaries. Technological spillovers at the global level can reduce income disparity among countries while a local spillover can create geographic income divergence at national levels. Technologies spread through imitations and learning, and traded commodities that embody new features become interfaces for technology spillovers. Keller (2009) shows that for many countries, around 90 per cent of total domestic productivity growth can be attributed to research and development activities of foreign countries, of which almost 20 per cent are trade related.

Exporting firms have chances to improve on their productivity as they come in contact with foreign consumers who impose higher quality requirements on the products. Improved ways of handling products and new sources of quality inputs are often suggested by foreign buyers. Frozen foods and medicine exports from Bangladesh, for example, face higher standards in the EU and the US market through the SPS (sanitary and phytosanitary) measures compared to the quality requirements of the domestic market. Exporting firms are provided with technical assistance which helps them to upgrade their technology and productivity.

Bernard and Jensen (1999) provide evidence from a cross-section of the U.S. manufacturing firms showing that exporting firms are on average more productive than non-exporting firms. Since output and employment grow at faster rates in firms that become exporters, liberalization raises total factor productivity through resource reallocation. These results are however based on the assumption that firms are randomly selected in the sample, which may not be true in practice. Firms that possess desirable performance attributes at the beginning become exporters more easily than average firms. This means that the causal direction from the exporting activity to the productivity growth is entangled.

Self-selection of more productive firms into the export market raises the selection bias problem in the prior analyses of the productivity performance of exporting firms against non-exporting firms and thus makes the reported casual inferences unreliable. Clerides *et al.* (1998) avoid the selection bias problem by using a dynamic discrete model in the context of firm-level data from Columbia, Mexico and Morocco. Their results show that previous exporting experience does not have any significant impact on current performance. Biesebroeck (2005) employs instrumental variable and semi-parametric methods to counter the endogenity issue, and finds that African exporting firms are 25 per cent more productive than their domestic counterparts. The superior productivity performance of the exporting firms is ascribed to the opportunity of achieving scale economy after entering the foreign market. Hallward-Driemeier *et al.* (2002) argue in the context of Southeast Asian firms that the substantial amount of investment activities on behalf of the exporting firms compared to the domestic firms makes them more productive.

(iii) *Competitive Pressure and Market Discipline*: Imports raise the level of competition faced by the domestic producers, prompting them to become more productive by reducing inefficiency. Removal of tariff barriers invites low-cost foreign firms and increases competition. To survive in a competitive environment firms cannot afford sluggish behaviour among the labour force or keep other resources idle. Firms that fail to increase efficiency are either forced to exit or lose market share.

Evidence suggests that firms become more disciplined in a competitive environment and management is under pressure to reduce x-inefficiency. Kalaitzandonakes and Taylor (1990) investigate the productivity effect of the severity of competition by considering two sets of winter vegetables in Florida, one facing only limited competition from domestic firms and the other encountering both domestic and foreign competition. Since both sets of products enjoy similar technological innovations during the sample period and require comparable investment expenditure to adopt the technology, higher productivity performance of the vegetable firms facing import is attributed to the presence of additional competition from imports.

Competitive pressure also forces firms to reduce mark-ups over marginal costs and thus benefits the society at large. Lower price-cost margin can arise from increasing returns, extended or thick market externalities, reluctance to labour hoarding behaviour (that is, the tendency of firms to keep labour force, especially skilled manpower, during recession or temporary fall in demand to make them readily available at boom time when demand survives), and reduced market power. The dynamics of mark-ups, however, differ across industry catagories.

Siotis (2003) shows in the context of the Spanish economy that non-traded sectors like utilites and services can afford to determine higher mark-ups compared to the interntionally traded manufacturing sector. Spain's gradual integration with the European Union during the second half of the eighities witnessed falling mark-ups in both these sectors. In a broader context, Allen *et al.* (1998) examine the effects of the European single market program on the competitive behaviour of the participating countries. While the intensity of the effects depends on the country size, these authors obtain an overall 0.02 percentage point reduction in manufacturing mark-ups and dissipating price disperesion across the European Union countries.

There are, however, theoretical arguments explaining that preferential liberalization might not work the same way as unilateral or multilateral liberalization do on firms' mark-up behaviour. Should integration produce trade diversion and offer regional producers protection from outsiders, the tendency for fixing prices at higher profit margins can persist. Moreover, the incentive to innovation and scale expansion might not work if domestic firms lose their market share after liberalization due to increased imports (Tybout, 2001 and Rodrik, 1992). Zeal for innovation may also fade away, as research and development activities become more of public goods in nature. Every country wants other countries to innovate and free ride on their innovations. All these factors work against the setting of reduced mark-ups by firms.

(iv) *The FDI Channel:* Trade and FDI are closely related. A large portion of export and import activities in the South Asian countries take place in the tariff shielded export processing zones or special economic zones where most of the FDIs are attracted. To the extent that foreign firms bring with them management and organizational skills and are better equipped with technological know-how, increased FDI is expected to raise overall productivity. The decisions of foreign firms regarding export versus FDI activities, however, depend on the relative importance of shipping and technology transfer costs, the latter rising with complexity of technologies. As countries within a region are naturally proximate to each other, arm's length trade is less expensive. Because of the low level of research and development expenditure, developing countries have low rate of product and process innovation. These countries compete with each other to attract FDI from developed countries.

FDI creates technological spillovers and productivity growth both horizontally and vertically. When domestic firms learn from a foreign firm in the same industry, the knowledge diffusion is horizontal. Haskel *et al.* (2007) and Blalock and Gertler (2008) provide evidence of the positive horizontal spillover effects of FDI for firms in the UK economy. They show that expansion of foreign firms' employment in 22 manufacturing industries has been instrumental in nurturing overall manufacturing productivity growth. Keller and Yeaple (2009) estimate horizontal spillovers with US data for the period 1987 to 1996 and find robust statistically significant effects of FDI on growth. The authors also suggest that high-tech sectors, like computer firms in Silicon Valley are likely to be more benefited from horizontal spillover compared to the low-tech toy or shoe producing sectors.

The vertical spillover effect of FDI activity takes place through backward and forward linkages. Multinational firms have much to gain from the better performance of their local input suppliers, and for this reason, Blalock and Gertler (2008) opine that it is in the interest of the former to transfer knowledge to the latter. Javorcik and Spatareanu (2008), in the context of Romania, show that compared to fully-owned foreign firms partially-owned foreign firms have a lower technology gap with domestic firms and, hence, have a better chance to diffuse technology and improve productivity in the host country. Kugler (2006) argues that firms are often reluctant to horizontally transfer technology in the apprehension that this might lead to increased competition. However, imparting knowledge to their customers or their input sources, i.e. the vertical spread of technology is not conflicting with the interest of foreign firms.

Local workers hired for the multilateral affiliates learn through on-the-job or formal training program. They can quit jobs to start new businesses of their own or join a domestic firm. Poole (2009) finds for Brazil that workers with previous experience in multinational firms earn higher wages suggesting their higher productivity. Learning and gaining from the presence of foreign firms in this way is known as the productivity gain from labour mobility or employee turnover. Also, when foreign firms act as suppliers of quality inputs into the domestic market, the economy becomes more productive.

4.3 Review of Related Literature

Productivity growth in liberalized economies has been studied in the literature from different perspectives. Broadly considered, most of these studies are concerned with the productivity effects of some form of non-discriminatory (unilateral or multilateral) liberalization, while some others deal with the productivity effects of preferential liberalization. Both sets of these studies depend on either a sample of agricultural or manufacturing firms or the economy-wide aggregate variables to analyse the phenomenon of productivity growth in a liberalized economy. To a large extent, these studies attribute to the trade-openness induced productivity change, one or several of the factors of the trade-productivity links discussed in the previous section. This section highlights the major conclusions reached by some of these studies and at the end of the section indicates the contribution of the present thesis to the current literature, especially in the context of regional trade liberalization and productivity growth in South Asia.

There is not much controversy in the literature when it comes to analysing the productivity effect of general trade liberalization. Most of these studies find some positive effects of openness on the overall factor productivity. Edward (1998), for example, uses 9 different indicators of openness on a set of 93 countries, and finds that irrespective of how the openness is defined, more open countries experience higher productivity growth. Controlling for endogenity by using instrumental variable approach does not change the results much. Similar positive effects of open economic environment on productivity are found in Topolova and Khandelwal (2010) for India, Khanal and Shrestha (2008) for Nepal, and in Karacaovali (2011) for a set of US firms. When dynamics are incorporated, Andersson *et al.* (2011), however, find productivity to fall at first and then to rise for the Swedish manufacturing firms in the short- and long-run respectively. The wavering productivity changes happen through a process of creative destruction, as increased competitive pressure forces the inefficient firms to exit and the efficient firms to expand productions.

The policy of regional integration affects productivity in a different way from that of the autonomous or multilateral trade liberalization. Since trade liberalization on a regional basis is discriminatory, it may protect some firms from the competition of extra-regional firms. Moreover, inputs of production can be sourced inefficiently from within the region, because of the uneven advantage granted to the regional firms. Several opportunities, however, can arise within the bloc as member states offer market access to each other. In a larger regional market, there are prospects for division of labour and economies of scale. To take advantage of the local-content rule, firms may prefer intra-regional cross-border investments. Badinger (2005) analyses both investment-led temporary and technology-led permanent effects on output and productivity of regional integration for the 15 European countries. The author argues that, regional integration creates a favourable environment for entrepreneurial activity by reducing risk premium for investment and lowering the cost of collecting capital from a wider market.

The potential for productivity improvement through investment liberalization has got less priority in the current regional integration scheme in South Asia. In the SAFTA agreement, the signatories only express their willingness to remove barriers to intra-regional investment in a sub-section of an additional article (Article 8.b), which does not have any legal requirements or force, like the measures adopted for the traded goods in the Article-7 of the agreement. Intra-regional investment in South Asia is primarily driven by bilateral agreements among the members or through some joint-venture projects among firms of the member states. For example, there is a joint-venture between the Sri Lankan motor vehicle company, Associated Motor Wars, and the Indian tyre manufacturing company, Ceat, to exploit quality rubber from Sri Lanka and make tyres for vehicles in the domestic as well as international markets (Athukorala, 2013). Similarly, India has substantial amount of foreign direct investment in Nepal and Bhutan through bilateral agreements. So the coefficient of the regional dummy in this analysis is not likely to reflect the effect on the output growth of SAFTA-induced investment changes. However, the coefficient of the capital stock in the production function will indicate the importance of taking concrete investment measures in future negotiations.

Formation of trade blocs among members that are asymmetric in terms of their sizes or level of development often raises concern about the consequences of the agreement for the weaker parties. Mexico is a relatively low income country in the NAFTA compared to the other members of the bloc. The productivity impact of NAFTA on the manufacturing sector of this developing country is analysed in López-Córdova (2003). The author follows the Olley and Pakes (1996) methodology to counter the selection bias and the endogenity problems in the study. Instead of directly taking the OLS residuals as measures of productivity, it is modelled as a function of the observed investment and capital stocks. Probability of a firm's exiting from the industry is then estimated from a probit model. The information regarding survival possibilities based on investment expenditures and capital stocks are then used to estimate productivity form a Cobb-Douglas production function. Within this framework of analysis, inclusion of Mexico in NAFTA is found to be productivity enhancing for the import-competing firms and the US-owned foreign firms.

In general, firms that are in no way connected with the external market show poor performance after liberalization. Preferential tariff margins, import intensities, export activities and foreign investments, all positively explain the observed productivity performances of the sampled firms. Hoyos and Iakovone (2011) apply on the same dataset a difference-in-difference methodology, which controls for time-invariant firm-specific characteristics, to discover the channels of productivity growth in the Mexican firms. Their results show that more integrated firms (both exporting and importing) experience higher productivity gain compared to both the less integrated firms (either exporting or importing) and the non-integrated firms (neither exporting nor importing). However, as a sharp devaluation occurred in Mexico in the same year NAFTA was implemented, the productivity effects reported in the study are intermingled with the effects resulting from the exchange rate changes.

The difference between NAFTA and SAFTA is that, while the former replaces the bilateral trade agreement between Canada and the USA, the latter retains active sub-regional groupings. Moreover, NAFTA is more integrated than SAFTA in terms of product coverage, investment measures, and the removal of non-tariff barriers. The policy measures covered under NAFTA are more elaborate and the agreement embrace policy changes in many areas including intellectual property rights (IPRs), services trade, and cross border capital movements. The shallowness of the South Asian agreement can be surmised by looking at its laconic 12 pages document and comparing it with the 573 pages detailed document of the NAFTA. In such circumstances, the market expansion and the productivity effects of the current free trade agreement could be expected to be quite different for the South Asian countries, compared to those experienced by the North American countries.

Free trade agreements can be signed among states that are part of different regions (for example, the FTA between Australia and China, or the agreement between India and Singapore), in which case factors other than transport cost (such as the complementarity of production structure, production network, and market expansion opportunity) get priority. In addition to being a free trade area, SAFTA is a regional bloc at the same time, and hence transport cost is an important consideration for this bloc. While most of the studies discussed so far, focus on productivity gain arising from tariff reforms, Blyde *et al.* (2009) emphasize the role of reduced transport cost in improving productivity of the Brazilian and the Chilean firms. Trade costs appear as a more important factor than tariff barriers in affecting productivity in their analysis. These authors find trade liberalizations to improve productivity not only through the inter-sector resource allocation, but also through inter-firm resource mobility.

Trade costs and other barriers to trade hinder inter-firm resource allocation, which permits inefficient firms to stay in an industry and limits the expansion of the incumbent efficient firms. The results are in agreement with the prediction of Melitz (2003) regarding firm entry and exit that may result from regional integration. Reductions in trade costs in an integrated market lower the productivity threshold of the exporting firms. New firms that are drawn into the export markets are usually the productive ones. Liu (1993) in the context of Chile, and Ramaswamy (1999) for Indian firms also find supports for higher efficiency of the surviving and the newly entered firms and lower efficiency for the exiting firms.

When the impact of the intra-regional trade liberalization is analysed in a monopolistically competitive heterogeneous-firm setup, Melitz and Ottaviano (2008) find additional insights on welfare and long-run firm locations. Increased competition from import forces some domestic firms to cease operation in the short run. However, the short-run welfare rises, as new available varieties expand the choice set and increased import dominates the reduced domestic production. In the long run, industrial de-location takes place when firms find other countries as more attractive place for production. This pattern of shift in the geography of production is also highlighted in Venables (1985, 1987), Krugman and Venables (1996), and Baldwin *et al.* (2003). Their basic argument is that, higher trade barriers enable different countries to maintain a mosaic industrial structure. Below a certain critical level of trade barriers, industry-specific basins of attraction are created across countries, from where the goods of the concentrated industries are supplied to the whole region.

Theoretical possibilities of such industrial locations or dislocations raise fear among the LDC members of the SAFTA that knowledge-intensive and increasing-return industries will be attracted to the urban centres of the relatively developed countries of the region. The state of initial comparative advantages among the countries will be further intensified, and it will be difficult for some of the countries to escape from their undesirable production structure. There is also the problem of short-run adjustment cost. The threat of maintaining an unwanted industrial structure for some countries and the social tensions of unemployment are among several factors (notably, the political misunderstanding between the two large members, India and Pakistan) that explain why the South Asian countries are so reluctant to deepen the level of their integration.

Though the productivity effect of SAFTA is not available in the literature, the impact on productivity of bilateral trade liberalization between India and Sri Lanka, and the geographic distribution of the gains among the exporting firms are studied in Mukim (2011). A total of 313 major Indian exporting firms' productivity performance is analysed over the period 1989 to 2008. Self-selection bias (for example, low-productive firms' higher tendency to exit) is controlled for in the study by using the survival probabilities from a probit model. The simultaneity bias (for example, inputs and outputs may be chosen simultaneously, thus making input choices endogenous to the productivity) is taken care of by using intermediate inputs as proxy for time varying productivity shocks. A lagged export dummy (indicating whether the firm exported last year) is also included in the production function to assess whether exporting activities generate additional productivity.

The results in Mukim (2011) are consistent with the theoretical expectations. In addition to the learning by exporting evidence (significant positive coefficient on the lagged export dummy), export intensities are found higher among firms that are geographically proximate to Sri Lanka. Moreover, the location advantage in terms of providing better transport infrastructure, power supplies, and good regulatory environment also help firms to export more. A missing link from export to productivity not considered in the above study is the impact of geographic concentration on firm productivity. Since rival exporting firms are concentrated near the border, there is a possibility of high motivation among these firms to make strategic investment decisions that improve their productivity. This type of productivity improvement can arise independent of export activities and resembles the argument of Porter (1990) who, observing such positive effects of industry concentration on productivity, suggests that regional development policies should be designed in such a way that firms can locally control their investment and R&D expenditure decisions.

Most of the studies on productivity growth in the context of South Asia are country specific and concerned with a selected set of manufacturing or agricultural firms. Overall productivity analysis, especially in the context of regional integration in South Asia, is missing from the literature. Prudent trade policy analyses require understanding of both the micro and the macro economic impact on productivity of policy changes. Data required to measure aggregate productivity are inadequate or sparse in almost all countries in South Asia. This has been a discouraging factor for measuring aggregate productivity-regionalism nexus in the context of developing countries. Utilizing the limited available data, multiple imputed datasets have been created for aggregated productivity analysis in this chapter. However, the results are also compared with those obtained from using the actual shorter dataset to check their consistency. In addition, the South Asian dataset has been extended to include ten more neighbours from the Southeast Asia region, so that the productivity performance of these two sets of countries can be compared.

4.4 Data and Methodology

4.4.1 Description of the Data

The analysis of this chapter is also built on panel data similar to that used in the previous chapter. However, we are concerned here with a different set of variables that is relevant to productivity measurement. Given the panel nature of the data, we can evaluate the average influence of variables experiencing inter-country variation along the time dimension. Simple cross-section data display only inter-unit variation in data and fail to control for the influence of unit-fixed effects. For example, Lee (2002) points out that in analysing the effect of schooling on wage, individual-specific unobserved abilities are ignored in the cross-section data. Similarly, inter-temporal variations of a single unit, obtained from a pure time-series data may not be applicable to other units. Conclusions reached by considering both the individual and the inter-temporal dimensions of the data will be more general and widely applicable than would be possible if we considered only cross-section or time-series data.

The key variables used here for productivity analysis include labour, capital, education and output, each aggregated at the country level. Depending on data availability, the sample of the relevant variables for the seven South Asian countries ranges from 1981 to 2010. Gross domestic products at constant prices (2000 US dollars) are treated as the aggregate output and these values are obtained from the online World Development Indicators data bank (http://data.worldbank.org/products/wdi). Other variables collected from the same source include gross capital stock formations, total number of employed people aged over fifteen, and the percentage of population that have completed secondary level of education.

Size of the labour force is not used as a measure of aggregate labour input on the ground that it includes both employed and unemployed persons which vary in accordance with the health of an economy. Moreover, the labour force participation rate is not stable due to the encouraged and discouraged worker effects. So, for that reason, the number of people aged over fifteen and employed is taken as the amount of labour input. Data for this variable are collected from the online databank of the World Bank (www.databank.-worldbank.org).

Total amount of capital stock is the other required variable in the aggregate production function. However, countries report gross fixed capital formation (GFCF) each year, not the total stocks that are needed for estimating the production frontier. The perpetual inventory method, as suggested in Fuente and Doménech (2000), is followed to construct the capital stock series from the GFCF of the concerned countries. The major tasks in obtaining such series are first to estimate the initial capital stock, and then with a differential equation, the remaining series are derived. More specifically, the following two equations are used to obtain the capital stock series:

$$K_{1981} = \frac{GFCF_{1981}}{g_{(GFCF,1981-2010)} + \delta}$$

$$K_{t+1} = K_t - \delta K_t + GFCF_t \text{ , for } t = 1981, \ldots, 2010$$

where g is the growth rate of the GFCF, averaged over the sample period, and δ is the depreciation rate of capital stocks, which is assumed here at 0.05.

Presence of missing values makes the dataset an unbalanced panel and the total number of usable observations is adjusted accordingly in the estimation procedure, when the observed-only dataset is considered. Recent advances in imputation of missing values in panel data allow us to recover valuable information about the unobserved values and make the estimates more reliable. The multiple imputation procedure suggested by Little and Rubin (2002) is applied here with the help of the "Amelia II" software, developed by Gary Kings (2012), to examine the pattern of missing data and recover model-based stochastic imputed values. The stochastic nature of the imputed data makes them amenable to be used with the observed values for any statistical analysis. Results are, however, reported for both the imputed and the shorter observed-only dataset for comparison.

4.4.2 Dealing with Missing Data

The data available for the study comes in such a way that, observations on various variables are missing not at the same point in time or for all countries at the same time point. List-wise deletion of observations because of at least one missing value for only one variable means that available information on other variables or from same variables on other countries that could have been used to predict the missing values are discarded. The information content and the estimation performance can be substantially improved by analysing the pattern of missing data and applying modern imputation procedures. Both cross-section and temporal relationship among the variables are used here to impute missing values. For example, if Bhutan is known to have a trade flow amount of 0.5 million dollars with Bangladesh in 1995, this information, along with other pieces of information retrievable from other relevant variables, is utilized in calculating the unknown trade flow between these two countries in 1993. It is shown in the literature (for example, in Honaker and King, 2010) that multiple imputations based inferences reduce bias and improve efficiency of estimates, compared to the estimates obtained from data with list-wise deletions of missing observations.

In multiple imputations, a conditional predictive distribution for the missing values $Z_M=(Y_M\ X_M)$ based on the observed data $Z_0=(Y_0\ X_0)$ is defined, and then missing cells in the data matrix is filled in by drawing values from the posterior distribution,

$$f(\theta \mid Z_0) = \int f(\theta \mid Z_0, Z_M) f(Z_M \mid Z_0)\, dZ_M$$

where θ is the parameter vector of the distribution. Z_O and Z_M are the observed and missing values respectively. Some packages implement the draw with the Markov Chain Monte Carlo (MCMC) tool. However, Amelia-II follows the expectation-maximization bootstrapping (EMB) approach whereby multiple bootstrapped samples, which look like complete data, undergo expectation maximization procedure to generate parameters of the posterior distribution. Imputed values are then generated from the distribution with the bootstrapped parameters. Each missing cell is filled in with multiple imputed values, creating several datasets all of which have the same observed but different imputed values. These new datasets can be combined or used independently for statistical analysis, as is done for the observed-only data set (Honaker *et al.*, 2011).

4.4.3 Methodology and Empirical Model Selection

Efficiency of the production process is inherent in the concept of productivity. Naively it can be measured as a ratio of the total output to the total amount of an input, as is done in the case of measuring labour productivity. In macroeconomic context, the Solow (1956) model is widely used to derive aggregate productivity measures. Though the measure of productivity change based on the Solow concept misses out the contribution of some other unknown factors, some economists still consider it as the best available measure of productivity change. Hulten (2000), for example, concludes that the residual based productivity measure provides a simple internally consistent framework for explaining economic growth and a guide to many other economic measurements.

Total factor productivity growth is not just a technical progress. Organization of production and worker motivation can also influence productivity. Similarly, producing for a larger market can enable firms to reap the benefit of a scale economy. Productivity growth is broadly defined here to include all these sources. However, technical inefficiency that arises from negligence or inefficient uses of resources can co-exist with total factor productivity growth. Availability and adoption of an advanced technology but inability to fully capitalize on it, say because of skill shortage, can result in such a situation. Both possibilities are considered in the following analysis.

Literature suggests two alternative ways of estimating the production frontier, from which technical inefficiencies can be inferred. One is the non-parametric linear programming based data envelopment analysis (DEA) and the other is parametric econometric estimation based stochastic frontier analysis (SFA) approach[12]. The former estimates a piece-wise linear deterministic frontier, based on the linear programming technique and does not allow for noise factors or errors in measurement. The only source of deviation from the frontier is assumed to be arising from technical inefficiency and there is no room for statistical significance testing. To overcome this statistical decision making problem, Simar and Wilson (2000) propose a bootstrap based technique that provides confidence interval for the DEA inefficiency estimates. Both these procedures are employed here to check for the robustness of the results across these two estimation methods.

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[12] There is a third bootstrap based compromise approach pioneered by Kuosmanen and Kortelainen (2012), where properties of both the DEA and the SFA are combined. In this approach the piece-wise linear deterministic production frontier is replaced by an increasing and concave function that may be differentiable or not, and treating the composite error term as stochastic. This method results in a stochastic non-smooth data envelopment analysis.

The basic idea behind the stochastic frontier approach is that, a set of realized input-output combinations are observed for a number of countries over some time periods, and then among them the best performing aggregate activity levels are chosen to estimate a stochastic production frontier, which can be termed in this context as the South Asian technology frontier. Input combinations producing outputs that lie far below the frontier are technically inefficient, and are assumed to result from not utilizing the best available production methods that are being used by the countries near the frontier. The technical inefficiency may in fact also result from measurement errors or prevailing production environment like strikes or natural calamities. A similar exercise is done in Growiec *et al.* (2011) to construct a world technology frontier by using data from 19 highly developed OECD countries. However, whereas missing values of some the variables are extrapolated forward to obtain the required yearly observations in their sequential DEA estimation of the frontier, the multiple imputations method is used here to get the missing yearly observations.

Availability of panel data enables us to simultaneously investigate the technical change and technical efficiency across countries over time. In a panel data setup, the efficiency frontier along with the inefficiency model can be represented as:

(4.1*a*) $$Y_{it} = \exp\left(X_{it}\beta + V_{it} - U_{it}\right), \text{ and}$$

(4.1*b*) $$U_{it} = Z_{it}\delta + \varepsilon_{it} \qquad i = \{BD, IN, MA, NE, PK, SL\},\ t = \{1, \cdots, 30\}$$

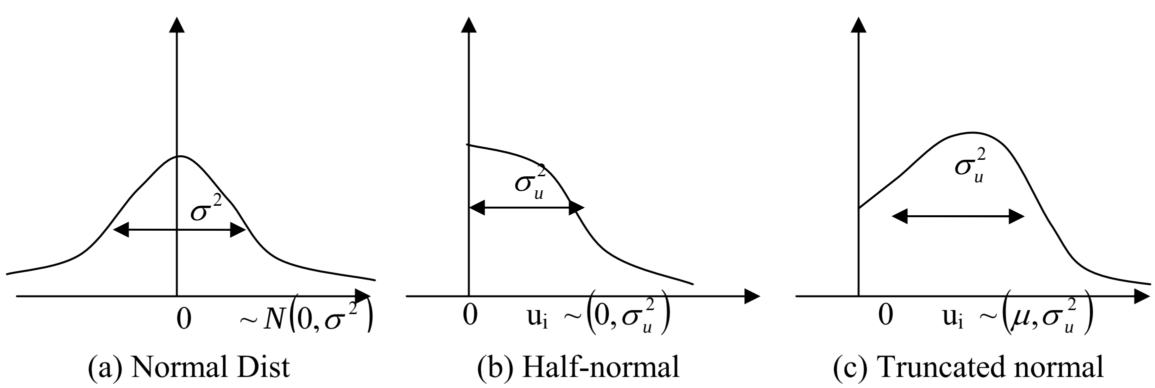
The dependent variable Y_{it} is the aggregate output, measured by constant dollar GDP, of county i (i = 1, ...,7) in period t (t = 1981, …, 2010). Though observations along all the time points and cross sections are not available, Coelli *et al.* (2005) argue that this type of model is still identified and estimable with the remaining unbalanced panel. The vector variable X_{it} has within it the gross capital stock (K_{it}) and the total number of person employed (N_{it}) of country i in period t. It also includes the year variable as a measure of shift of the production frontier over period, and the regional integration dummy that is hypothesized to affect the overall productivity. The Z_{it} vector in equation

(4.1b) contains covariates that can affect inefficiency levels of the countries. Skills of the employees or economic infrastructure are candidate variables for this vector.

Of the two error terms, V_{it} and U_{it}, in the technology frontier equation (4.1a), the first one possesses the standard independent and identically distributed variable assumption, i.e. $V_{it} \sim N(0, \sigma_V^2)$, while the second one is considered to be the non-negative realizations of errors, intended to capture (technical) inefficiency effects in the aggregate production process. The non-negative values of U_{it} are obtained by truncating a normal distribution at zero that has a mean of $Z_{it}\delta$ and a variance σ_U^2, i.e., $U_i \sim N(Z_i\delta, \sigma_U^2)$.

However, the distribution collapses to the half-normal distribution if $\delta = 0$, that is, when inefficiencies are not explained by other factors. The representative error distributions are illustrated in Figure 4.1. It should be noted that σ^2 is the variance of a normal distribution and when it is truncated at zero the remaining distribution, as Coelli (1995) shows, has the variance, $\sigma_u^2 = [(\pi - 2)/\pi]\sigma^2$. In case of a half-normal distribution, the mode is at zero implying that most of the countries are efficient (since, $e^{-u} = e^{-0} = 1$) relative to their efficiency frontier, whereas for the truncated normal case most of the firms are inefficient to some extent.

Figure 4.1: Normal, Half-normal and Truncated Normal Error Distributions



Whether the model should accompany the inefficiency part (4.1b) is an empirical matter, and depends on the nature of the data. Introduction of this additional part uses up some degrees of freedom and often creates parameter identification problem (Peyrache and Coelli, 2009). From a different perspective, Pascoe *et al.* (2004) suggest to incorporate as many determinants as possible into the technology frontier, instead of adding a separate inefficiency equation. Their argument is that, for obtaining the unbiased estimates of capacity utilization, both the inefficiency and the utilization components should be measured directly from the production frontier.

In our implementation of the model (4.1) with the available South Asian data, the variance parameter, γ (reported and defined in Table 4.1), is found to be above 0.98, implying that there are significant variations in the country effects relative to the total variation in the data. Any attempt to incorporate the year or the education variable in the inefficiency part of the model turns the variance matrix near singular and makes the parameter estimates unstable. Moreover, the log likelihood value drastically falls from 193 for the main model (4.1a) to only 26 for the complete model (4.1a and 4.1b). From these considerations, only the main stochastic part of the model is retained in the following analysis. Unlike some other studies (as in López-Córdova, *et al*. 2003), where the estimate of productivity is obtained in the first stage from a production function, and then in the second stage the productivity estimate is regressed on some other explanatory variables, a single equation estimation strategy is preferred here. The two-stage methodology is problematic in that the assumption of the independence of the error term in the first-stage is no longer tenable when a second-stage regression is performed.

4.5 Results and Discussion

4.5.1 Choosing the Functional Form

In contrast to non-parametric approaches, analysis of a stochastic frontier is based on a chosen functional form. Three functional forms commonly applied in empirical works are the transcendental logarithmic or translog, the intrinsically non-linear constant elasticity of substitution (CES), and the Cobb-Douglas (CD) forms. Among these specifications, the translog form is the most flexible and can encompass many other forms including the above two. However, fitting this from requires estimation of additional parameters. An additional set of square and cross-product terms of the factors needs to be estimated along with the CD parameters. This requires a rich dataset so that a substantial amount of variation and independence remain along the extra-dimension created for the translog form.

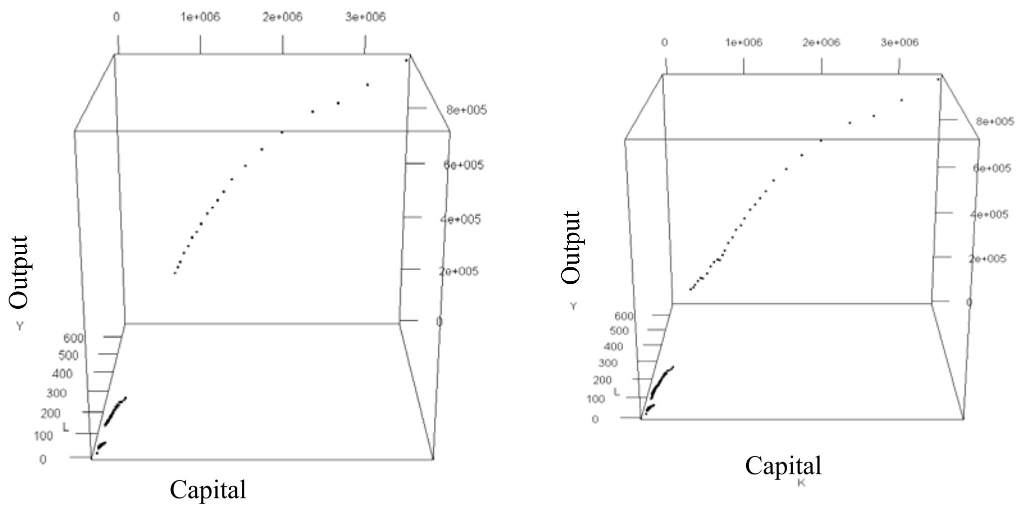
When the current dataset is fitted to the flexible translog functional from, the estimated model behaves poorly in terms of its economic interpretation. Though the log likelihood value for the model is higher than the other two models, the coefficient of the capital term becomes negative and most of the predictors turn insignificant (results not reported, but available from the author). The second-order terms in the translog model thus appears to create a multicollinearity problem. However, the CD and the CES functions can be derived from the translog form with appropriate parameter restrictions on the latter[13]. The CD form imposes zero restrictions on the coefficients of the second-order terms, while the CES specification applies the $b_{KK} = b_{LL} = 0.5 \times b_{KL}$ constraint.

Uses of a priori information through such restrictions eliminate the multicollinearity problem and give more sensible parameter estimates. The log likelihood value is reduced somewhat, as it should happen with any restricted model. However, the reduction is only slight, from 200 for the translog model (the translog results are not reported) to 196 for the CES model and 193 for the CD model. When the data are plotted in three dimensional scatter diagrams in labour, capital, and output space (Figure 4.2), a smooth curvature through the points can be imagined. The gap in the scatter arises as the maximum amount of labour, capital, and output for some smaller member countries are substantially lower than the minimum amount of these variables for the larger countries. The gap is slightly reduced in the imputed dataset (Figure 4.2b). Since our purpose is to provide some economic explanation of the frontier and not predict output based on the

[13] The CD form imposes zero restrictions on the coefficients of all the second-order terms in the translog function, while the CES specification applies the $b_{KK} = b_{LL} = 0.5 \times b_{KL}$ on the coefficients of the [Log(Capital)]^2, [Log(Labour)]^2, and [Log(Capital)]× [Log(Labour)], respectively.

highest log-likelihood value, the CD and the CES form are chosen as the parametric representation of the frontier.

Figure 4.2: Three Dimensional Scatter Plot of Labour, Capital, and Output



(a) Observed data only (b) Observed and imputed data

4.5.2 The Estimated South Asian Technology Frontier

The maximum likelihood estimation of the technology frontier for South Asia is provided in Table 4.1. There are four estimated technology frontiers in the table. These are the CD and the CES technologies estimated from the observed and the imputed data. The standard errors, reported beneath each parameter estimate, are the diagonal elements of the final directional derivative matrix of the log likelihood function.

Examining Table 4.1 for a quick comparison of the parameter estimates across datasets and technologies, several features can be detected. First, the log likelihood values of the two technologies are quite close when they are based on the same data, observed or imputed. For the CD and the CES technology respectively, these values are 193 and 196 for the observed, and 302 and 308 for the imputed data. This suggests that the CES technology better fits the South Asian data. Second, the qualitative information or sign pattern of all the parameter estimates are unaffected, whether we consider the CD or the

CES technology, or the observed or the imputed data. Differences emerge, however, when we are interested in the magnitude of the parameter estimates and the strength of the statistical significance of the parameters.

We need some caution when comparing the coefficients of the labour and the capital in the two technologies. In the case of the Cobb-Douglas technology, the coefficients of the two factors directly express the share parameters or output elasticities with respect to the respective factor use. Whereas the share parameter for the CES frontier is derived from the restrictions imposed on the translog frontier. The share parameters and the elasticity of substitution parameter for the CES frontier are derived in the appendix to chapter 4. The estimated share parameters for labour and capital for the CES production frontier are 0.49 and 0.51 respectively (for the imputed data). These figures are more balanced than those obtained under the CD specification.

The calculated elasticity of substitution parameter for the CES is 0.95 which is slightly lower than the CD counterpart value of one. In both the functional forms, productivity of one factor rises with the increasing availability of the other factor. However, this productivity increase is constrained by the presence of a negative term associated the cross-product term (α_{LK} = -0.0025 for the observed data and -0.008 for the imputed data) in the CES case. The estimated substitution elasticity is slightly lower accordingly in this case.

The justification for using the stochastic frontier against the simple OLS can be made by comparing the log-likelihood values from these two alternative models. The bottom two rows of Table 4.1 show that the log likelihood value for the stochastic model under the CD technology and complete observations is calculated at 192.81, while the OLS fit produces a log likelihood value of 18.47, much lower than the former (similar patterns are observed when the results are from the CES technology and the imputed dataset). The comparison can be made statistically.

Table 4.1: Parameter Estimates of the South Asian Technology Frontier

(Dependent Variable: Log of Output)

Parameters	CD Technology		CES Technology	
	Observed Data	Imputed Data	Observed Data	Imputed Data
Constant	2.273** (0.063)	1.157** (0.408)	4.303** (1.064)	3.103** (1.413)
Log(Capital)	0.731** (0.051)	0.826** (0.036)	0.511** (0.087)	0.519** (0.118)
Log(Labour)	0.231** (0.038)	0.163** (0.028)	0.169** (0.047)	0.450** (0.092)
$[\text{Log(Capital)}]^2$	---	---	0.005** (<0.001)	0.016** (0.006)
$[\text{Log(Labour)}]^2$	---	---	0.005** (<0.001)	0.016** (0.006)
[Log(Labour)] ×[Log(Capital)]	---	---	-0.0025** (<0.001)	-0.008** (0.003)
Year	-0.005* (0.003)	-0.009** (0.002)	-0.006** (0.002)	-0.005 (0.003)
RTA	-0.033** (0.016)	-0.048** (0.013)	-0.034** (0.015)	-0.051** (0.013)
Variance Parameters				
$\hat{\sigma}^2$	0.174* (0.095)	0.139** (0.075)	0.183** (0.099)	0.184 (0.134)
$\gamma = \frac{\sigma_u^2}{\sigma_u^2 + \sigma_v^2}$	0.987** (0.007)	0.981** (0.011)	0.989** (0.006)	0.986** (0.010)
Log likelihood *(OLS log likelihood)*	192.81 (18.47)	302.18 (19.56)	196.17 (35.154)	307.52 (25.52)

Notes:

- *The numbers in the parentheses are standard errors of estimates.*
- *"**" and "*" indicate significance level at 0.01 and 0.05 respectively.*

Monte Carlo evidence suggests that (Coelli, 1995) when the model parameters are estimated by the maximum likelihood method, likelihood ratio test has better size properties compared to the Wald test while performing one sided parameter tests. Therefore, we compare the two log likelihood values obtained from the restricted (OLS) and the unrestricted (stochastic) models through a likelihood ratio test statistic. The value of the test statistic[14] is 348.68, which is substantially higher than the critical value of 3.84 at 1 degree of freedom[15] obtained from a mixed chi-square distribution and hence we reject the null hypothesis of no technical inefficiency in the model against the claim that inefficiency in the aggregate production data is present for the South Asian countries.

The coefficients of both the capital stock and the labour force variables are of expected signs and statistically significant at the conventional five per cent level. Relatively higher value of the capital parameter highlights its relative scarcity[16] and the consequent importance of this factor for output growth in South Asia. The estimates suggest that an increase in capital marginally by one per cent leads to more than 70 per cent rise in output in case of the CD specification, both for the observed and the imputed data. This result is typical for labour abundant economies. Combined with the labour coefficient of 0.231, the estimated production function suggests a return to scale value of 0.96 with a standard error of 0.004, the latter being calculated from the linear combination of the variance of the capital and the labour parameter estimates. So the assumption of constant returns to scale Cobb-Douglas aggregate production technology is statistically valid. Allowing for the CSE technology, reduces the importance of the capital share, but still remains slightly above 50 per cent.

[14] The test statistic is calculated according to the formula, LR = -2 [log likelihood (unrestricted model) – log likelihood (restricted model)] = -2(18.47 – 192.81) = 348.68.

[15] The degrees of freedom equal the number of restrictions required to turn the stochastic model into the OLS model. The only restriction here is $\sigma_v^2 = 0$.

[16] In the sense that one per cent change in capital stock in the margin leads to more change in output compared to that induced by one per cent change in the number of people employed.

Considering the importance of capital and given the structure of demand, increased investment can come from supply-side measures. The quality of national institutions and government policies affect the economic environment within which firms make investment decision and interactions among various economic units take place. Hall and Jones (1999) show that the observed cross-country differences in capital accumulation, educational attainment, and productivity experience to a large extant can be explained by the status of their social infra-structure and government policies. Importance of capital stock, however, does not downplay the role of labour force in output growth. In case of the Cobb-Douglas or the CES technology, there exists a symbiotic or complementary relationship between the two factors of production. That is, labour becomes more productive as additional units of capital are available, and the vice versa. Mathematically speaking, the second cross-partial derivatives of the production function with respect to both inputs are positive.

The coefficient of the year variable captures the Hicks-neutral technological change, whereby the production frontier shifts in such a way that the optimal choice of labour and capital remains the same. This type of innovation is often assumed while working with an aggregate production function, where factor substitution activities occurring at micro levels are cancelled out in the aggregate. The very low coefficient of the year variable (-0.005 to -0.009, depending on model and data) implies that the production frontier for the South Asian countries as a whole slightly moved inward each year or at best remained stagnant in the study period. Mild decline in productivity also becomes apparent from the non-parametric Malmquist total factor productivity growth analysis performed later in this section.

The results of the stochastic frontier analysis caution us against the inappropriateness of using a single-factor based productivity growth measure. Simple labour productivity growth, for example, does not automatically imply total factor productivity growth. Per capita outputs in the South Asian countries are obviously growing during the sample period. But once the contribution to output growth of the rapid capital stock growth is accounted for, there remains little or no room for total factor productivity growth. The spectacular output growth in the region (from 5 per cent for Bangladesh to more than 7 percent for Maldives, average yearly real output growth over the past three decades[17]) can thus be attributed to the input growth and capacity utilization.

Of particular interest for this part of the thesis is the coefficient of the RTA dummy, which is found here to be negative and statistically significant. The coefficient ranges from -0.033 to -0.051 across functional forms and data chosen for estimation. This implies that the SAFTA regime has not been conducive to productivity growth in South Asia. Compared to the pre-SAFTA regime, the production frontier has moved further inward in the agreement period by about 3 per cent to 5 per cent, depending on models or data used. The poor performance of the SAFTA from the perspective of productivity growth can be attributed to the inability of the trade agreement to expedite investment flow within the region. The investment-output ratio of the South Asian countries during the past few decades has been in fact about half to two-thirds of that achieved by the neighbouring Southeast Asian countries (Collins, 2007).

There is another reason for the productivity to be negatively affected from regional integration. Knowledge diffusion through trade is found to be lower when both trading partners are from developing countries, compared to the situation where the partners are from a mixture of developed and developing countries (Schiff, 2003). Thus to the extent that preferential trade replaces the North-South trade with the South-South trade, productivity may fall. Moreover, productivity depends not only on economic factors, but also on other factors like democracy, stability of government, level of corruption, congenial political environment and supporting domestic institutions. Bandarra and Karunaratne (2010) show, in the context of Sri Lankan manufacturing firms, that political unrest and the absence of social order can overwhelm the force of economic policy reforms. They show, in particular, that despite the liberalization polices of the subsequent governments since 1977, Sri Lanka has experienced a unstable productivity performance depending on investment climate and production uncertainty.

[17] These growth rates were obtained by regressing log output on a time trend for each country over the sample period.

Education and training program improve the quality of labour. They are part of human capital and are thought to increase output by improving the productivity of labour. Data on this variable for the South Asian countries are severely missing. Around 86 per cent of the potential observations for this variable are not reported in the available sources in the sample period. Adding education to the model increases the number of parameter to be estimated, but, because of missing data, row-wise deletion makes only 21 observations usable for estimation. Loss of information reduces the log likelihood value of the model to only 12 from 193 for the model without the education variable. The coefficient of education turns out as positive but insignificant. Other variables preserve their sign pattern, but most of them lose statistical significance. Consideration of the imputed data does not improve the situation either. The education variable still remains positive but insignificant. So, the education variable is not included in the models reported in Table 4.1 for analysing the productivity frontier.[18]

4.5.3 Implication for Technical Efficiency

Increases in total factor productivity can result from the efficient uses of existing resources or by the tightening of their slack behaviours (technical efficiency), or by introducing cutting edge technology in the production process (technical change). Identifying the sources of productivity growth is important, as it helps government to make selective policy intervention in the problematic areas of output growth. Total factor productivity growth can accompany substantial amount of technical inefficiency if a major portion of the workforce is not trained enough to take advantage of the new technology. Skill shortage also creates the problem of capacity utilization, as the workers are unable to fully exploit the capabilities of the complex machines. Government supported training programs for displaced workers to cope with structural changes, building efficient institutions and developing required infrastructure throughout the country can alleviate both the supply bottlenecks of skilled workers and the capacity underutilization problem.

[18] I thank an anonymous examiner of this thesis for suggesting that some other variables, like trade-GDP ratios as a measure of liberalization, a dummy for the global financial crisis could be included into the model. This can be done as a further extension of this research.

One useful aspect of the estimated production frontier based on panel data is its ability to compare efficiency levels among various countries and over time. The estimated production function and the observed input-output vectors can be used to calculate the technical efficiencies of the countries in the sample. It should be kept in mind, however, that the reported technical efficiency measures are relative to the South Asian technology frontier, not to the best practice technology of other countries outside the sample with similar inputs. The Debreu-Farrell measure of technical efficiency expressed as the ratio of observed output to potential output based on available inputs, i.e.,

(4.2) $$\theta_{it} = \frac{y_{it}}{\hat{y}_{it}} = \frac{\exp(x_{it}\beta - u_{it})}{\exp(x_{it}\beta)} = \exp(-u_{it})$$

is reported in Table 4.2. These estimates are supplemented by and compared with the Simar and Wilson (2000) proposed bootstrapped DEA frontier based bias-corrected inefficiency scores.[19] The 95 per cent confidence intervals for these scores, reported in Table 2, are constructed from 2000 replications of these estimates. In all of the cases, except for Bhutan, the bootstrapped scores lie within the intervals. Both the SFA and the DEA based measures suggest that there are considerable variations in the efficiency estimates of the members. Varying country effects are also consistent with the high gamma value obtained in Table 4.1 for the stochastic frontier estimates.

Several points emerge when the estimates are compared across the estimation methodologies and the chosen datasets. First, from the technical efficiency consideration, both the SFA and the DEA approaches consistently rank Bhutan, India, and Nepal as seventh, fifth and sixth respectively. Other countries maintain their ranking across the observed and the imputed datasets, though estimation methodologies change their inefficiency ordering. For Sri Lanka, the change in position is minor, from the third

[19] When the true frontier is unknown, the usual inefficiency estimates from the DEA frontier are upward biased. Simar and Wilson (2007), in particular, show that the estimated inefficiencies can be written as $\widehat{\theta}_{ij} = \theta_{ij} + O_p(n^{-2/(p+q+1)})$, where p and q are the dimension of input and output, and n is the sample size. O_p is order of convergence in probability.

under the SFA to the second under the DEA. The Maldives moderately shift position from the second to the fourth, while Bangladesh jumps to the first position from the fourth place.

Table 4.2: Technical Efficiency of the South Asian Countries

(Averaged over the sample period)

Countries	Observed Data			Imputed Data		
	SFA Efficiencies	DEA Efficiencies		SFA Efficiencies	DEA Efficiencies	
	Estimates (Rank)	Bias Corrected Estimates	95%Bootstrap Confidence Interval	Estimates (Rank)	Bias Corrected Estimates	95% Bootstrap Confidence Interval
Bangladesh	0.7594 (Rank=4)	0.8424 (Rank=1)	(0.7275, 0.9481)	0.8340 (Rank=4)	0.8457 (Rank=1)	(0.7366, 0.9490)
Bhutan	0.4776 (Rank=7)	0.5961 (Rank=7)	(0.3452, 0.4466)	0.4878 (Rank=7)	0.4867 (Rank=7)	(0.4254, 0.5458)
India	0.6543 (Rank=5)	0.7021 (Rank=5)	(0.6376, 0.9921)	0.6928 (Rank=5)	0.7600 (Rank=5)	((0.6831, 0.9921)
Maldives	0.9720 (Rank=2)	0.7105 (Rank=4)	(0.6395, 0.9934)	0.9806 (Rank=2)	0.7673 (Rank=4)	(0.6845, 0.9929)
Nepal	0.5191 (Rank=6)	0.6838 (Rank=6)	(0.6193, 0.7378)	0.6118 (Rank=6)	0.7018 (Rank=6)	(0.6332, 0.7553)
Pakistan	0.9822 (Rank=1)	0.7781 (Rank=3)	(0.6810, 0.9935)	0.9823 (Rank=1)	0.7824 (Rank=3)	(0.7074, 0.9928)
Sri Lanka	0.8314 (Rank=3)	0.7658 (Rank=2)	(0.6752, 0.9930)	0.8514 (Rank=3)	0.7855 (Rank=2)	(0.7012, 0.9932)
Mean	0.7423	0.7255	--	0.7772	0.7328	--

Note: SFA - Stochastic Frontier Analysis; DEA - Data Envelopment Analysis. DEA efficiency measures are output oriented and averaged over the sample period.

These changes are expected as these two approaches are based on different assumptions. The SFA imposes a parametric frontier on the dataset, and the DEA takes the outer boundary of the data points as the frontier, without considering the possibility of any stochastic variations in the data. Another point to note is that, the uses of additional information from the imputed data preserves inefficiency ordering among countries under both the SFA and the DEA methods. Moreover, if we note the bootstrapped 95 per cent confidence interval in the table, we see that the intervals shrink when imputed data are used. In case of the SFA, however, the imputed data give us more precise estimates, as reflected in Table 4.1 before.

Investigating why some countries perform better than others is useful in providing policy advice. In this respect, we can examine Figure 4.3 where the data points are placed in the inputs-per-unit-output space. Instead of the usual production frontier, we are now interested in the unit isoquant, which can be thought of as the lower bound of the observed data. Countries with input combinations lying near the upper left-hand corner and the lower right- hand corner are representatives of capital-intensive and labour-intensive production units respectively.

It is clear from the figure that Bhutan is using the former while Nepal is using the latter type of technologies. Their inefficiency scores are around 50 per cent compared to the regional production frontier. In other words, they are producing half the output of their regional peers with similar amount of inputs. Both of these countries are at the bottom of the efficiency score ranking table. Moderate and top performers appear to be using more balanced technologies. So, the balanced use of inputs in the production process looks more promising for the South Asian countries.

Figure 4.3 Capital-Output, Labour-Output Ratios and the Perceived Unit Iso-quant

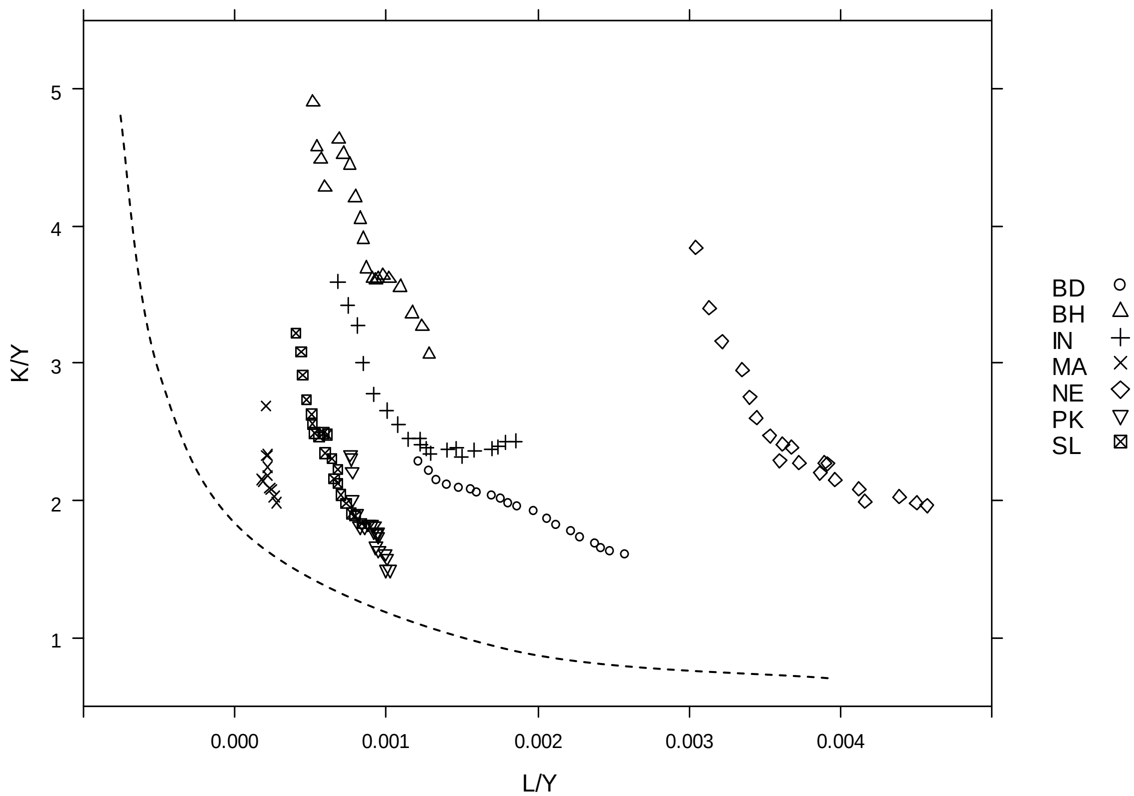


Figure 4.3 also reveals some input combinations that are lying along the southwest to the northeast direction. These countries are using similar and balanced input ratios, but their performances are different. Productivity differences among these countries can be explained with the quantity versus quality argument. Larger amount of capital stocks to work with is not a guarantee for higher productivity. What matters for output growth is the innovative content or complexity of the technology and the organization of production. Countries that are equipped with the latest technologies and have better human resources will lie near the frontier. Absence of these quality attributes will place countries further away from the frontier. The Maldives and Sri Lanka have more or less balanced input ratios and their positions in the human development index are also

relatively better than other countries in South Asia. The technical efficiency rankings of these two countries are accordingly good. Though Nepal has achieved balanced input ratios in some years within the sample, lack of human resource development and advanced capital inputs means inefficiency relative to the regional production frontier.

Poor technical performance is thus related to the influence of non-physical factors in utilizing available technologies. Muller (1974) points out that some non-tangible factors like the depth of knowledge among the workforce and the smooth flow of information throughout the economy can be determining factors in harnessing available technologies. If the mean year of schooling is taken as an indicator of these factors, then the estimated productivity performance for the South Asian countries can be rationalized. The Human Development Report (2011) identifies Bhutan and Nepal as the lowest and the second lowest countries in South Asia in terms of their mean level of schooling. These two countries have 2.3 years and 3.2 years of mean schooling respectively among their population. The figures for the other South Asian countries are comparatively better: 8.2 years for Sri Lanka, 5.8 years for Maldives, 4.9 for Pakistan, 4.8 for Bangladesh, and 4.4 for India (Human Development Report, 2011).

Though some countries like the Maldives, Pakistan and Sri Lanka are doing better by appearing near the frontier, their true performance can be evaluated if we take into consideration in the dataset some other countries outside the region that are more or less at the similar level of development. When the dataset were extended to include the ten more Southeast Asian countries of Brunei, Cambodia, Lao, Indonesia, Malaysia, Myanmar, Philippines, Thailand, Singapore and Vietnam, the average estimated technical inefficiencies for the South Asian countries is found at 0.77 which is lower than the ASEAN average of 0.81 (results reported in Table A4.1 in the Appendix to Chapter 4).

The data are then divided into two subsets, one corresponding to the SAFTA period and the other to the non-SAFTA period, to evaluate the comparative performance of these two sets of countries in these two periods. The result shows that the technical inefficiencies of the South Asian countries against the Southeast Asian countries seem to have deteriorated in the SAFTA period. While the pre-SAFTA average technical efficiency in South Asia was 0.69 against 0.67 in Southeast Asia, the post-SAFTA technical efficiency in South Asia declined to 0.52 against 0.60 in Southeast Asia. The comparable efficiency estimates for these two regions are qualitatively similar for the DEA based analysis.

4.5.4 Changes in Total Factor Productivity

Changes in total factor productivity give us an idea of how the total or aggregate output changes relative to the changes in all factors of production. The scopes for productivity improvement through technical and allocative efficiencies are limited. Unlimited and permanent increases in output are possible only through continued technical progress or innovation. While the previous section analysed the technical efficiency situation of the South Asian countries, a comparison of the total factor productivity changes for these countries over the sample period is provided in this section. Productivity changes involve consideration of both the changes in the amount of output produced and the corresponding adjustments in the input levels. Treatment of productivity in this way differs from the simple labour productivity measure. A general formula for productivity comparison, where multiple inputs and outputs are involved, is given by,

(4.3) $$\log(TFP_{st}) = \log(Output\ \ Index_{st}) - \log(Input\ \ Index_{st})$$

Output and input quantity indexes in the above expression can be calculated indirectly by utilizing the link between the volume index and the price index or directly by using the index number formula. Since aggregate data series in the form of constant dollar values are available, the direct approach is employed here. The output and the input indexes are generally calculated from the Tornqvist formula, where the index number is expressed as a weighted geometric average of the price (or, quantity) relatives. More specifically,

(4.4) $$I_{st}^{T} = \sum_{i=1}^{n} \left(\frac{w_{is} + w_{it}}{2} \right) (\log q_{it} - \log q_{is})$$

where I_{st}^{T} is the Tornqvist quantity (input or output) index[20], and $w_{is} = q_{ms} / \sum_{m=1}^{M} q_{ms}$ and $w_{it} = q_{mt} / \sum_{m=1}^{M} q_{mt}$ are the share of output (or, input as the case may be) of a country in period s and t respectively (M is the total number of input used or output produced). The sum varies over the number of outputs (here it is one, as we are using the aggregate GDP as the only measure of output) or inputs (here two, broadly defined labour and capital) considered in the analysis. Though the index itself does not pass the transitivity or circularity test, it can be modified to reflect the fulfilment of the transitivity property.

In the case of multi-country productivity comparison we require the transitivity property, whereby it is guaranteed that if a country A, for example, is 2 times more productive than another country B which in turn is 3 times more productive than a third country C then country A will show up as 6 times more productive than country C. Even the ideal Fisher index does not satisfy the transitivity property. Caves *et al.* (1982) provide the following alternative index based on the Tornqvist index to obtain a transitive index (multilateral generalization):

(4.5) $$I_{st}^{C} = \prod_{r=1}^{M} \left[I_{sr}^{T} \times I_{rt}^{T} \right]^{\frac{1}{M}}$$

where the comparison between the two elements s and t (countries or time periods) is done indirectly via the r (where, r = 1, …, M) elements of available alternatives. In log form the above expression simplifies to (Coelli, *et al.*, 2005),

(4.6) $$\ln I_{st}^{C} = \frac{1}{2} \sum_{m=1}^{M} (w_{ms} + \overline{w}_m)(\ln q_{ms} - \ln \overline{q}_m) - \frac{1}{2} \sum_{m=1}^{M} (r_{mt} - \overline{r}_m)(\ln q_{mt} - \ln \overline{q}_m)$$

So intuitively the index shows, how two countries differ in terms of their output indexes when both are expressed relative to the overall mean of the sample countries in the dataset. The transitive index in the left hand side of the above equation is obtained by

[20] The Tornqvist index which is derived solely on the basis of observed data can also be derived from the flexible translog parametric specification. Since the index can be calculated without parametric knowledge or functional form, it is has been termed as the superlative index in literature (Diewert, 1976).

considering all possible pairs of comparisons among the input or output indexes in the sample and taking the geometric mean over them. When expressed in log form, the index reflects the candidate country's relative position compared to the average of all the permutations of country pairs' productivity comparisons.

A multilateral comparison of the productivity indexes and their trend for the South Asian countries is shown in Figure 4.4. These productivity indexes are based on the estimated distance measures of various component indexes. In particular, they depend on the following four distance measures:

> d11 = A vector of length 7 containing distance function estimates under CRS in period 1 relative to the technology of period 1.
>
> d12 = A vector of length 7 containing distance function estimates under CRS in period 1 relative to the technology of period 2.
>
> d21 = A vector of length 7 containing distance function estimates under CRS in period 2 relative to the technology of period 1.
>
> d22 = A vector of length 7 containing distance function estimates under CRS in period 2 relative to the technology of period 2.

The Malmquist index between any two periods, *s* and *t*, is then estimated as:

$$(4.7) \qquad I_{st}^{i} = \left(\frac{d21}{d11} \times \frac{d22}{d12} \right)^{1/2}, \qquad i = 1, \cdots, 7,$$

Or, equivalently it can be decomposed into,

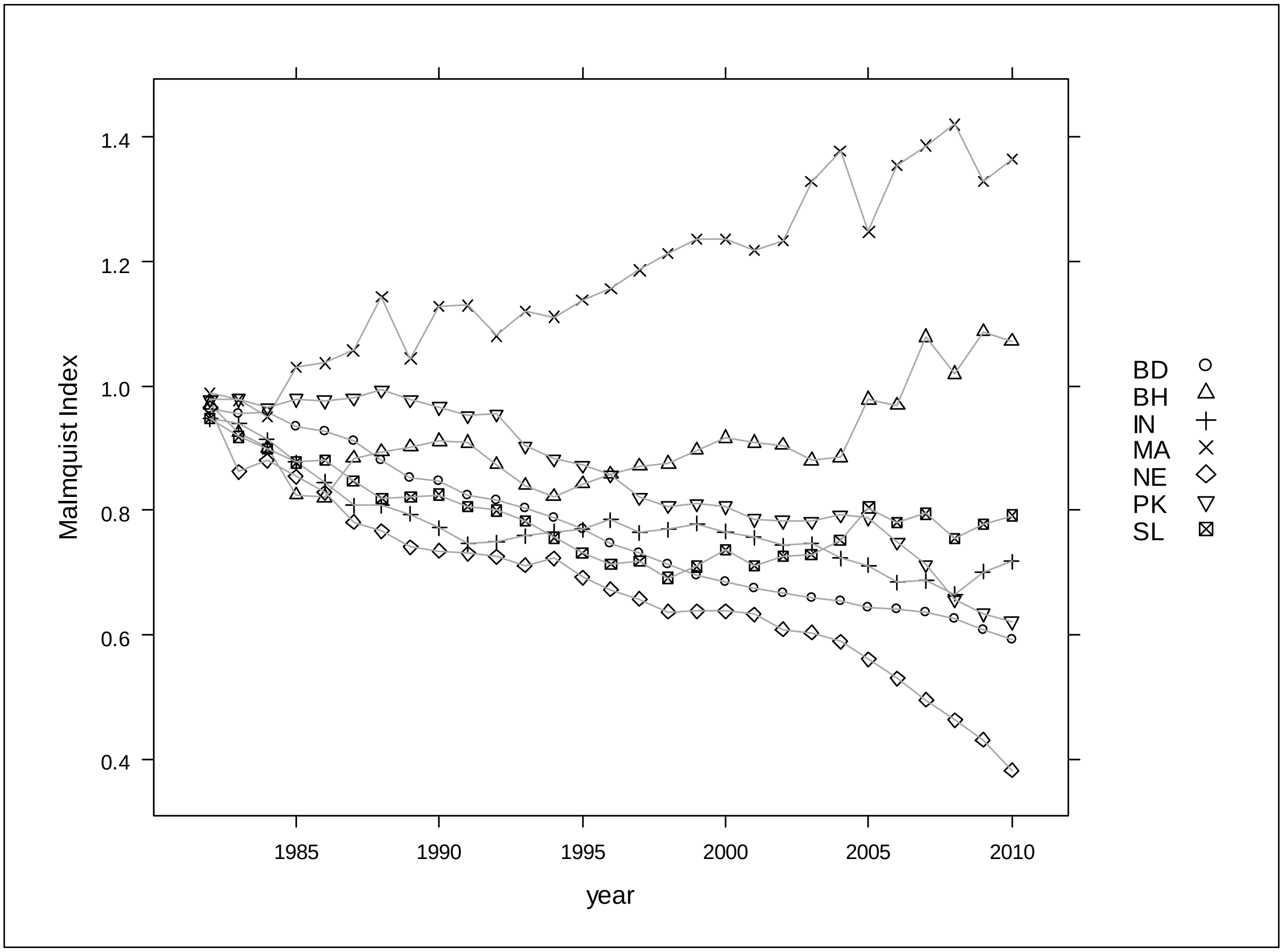
$$(4.8) \qquad I_{st}^{i} = \left(\frac{d22}{d11} \right) \times \left(\frac{d21}{d22} \times \frac{d11}{d12} \right)^{1/2}, \qquad i = 1, \cdots, 7$$

Where the term in the first bracket is the inefficiency component of the total factor productivity index and terms in the last bracket is the technical change component.

Wilson (2010) considers further decomposition of this index into the pure technical change, the scale efficiency change and the change in the scale of technology. Since the index is based on distance measures from the DEA frontier, price information is not required. It should be noted, however, that the returns to scale assumption is crucial in determining the magnitude of the index. In case of aggregate data, Coelli and Rao (2005) suggest that the assumption of the constant returns to scale (CRS) is more sensible, as the frontier is not specific to any particular firm. Grifell-Tatze and Lovell (1995) argue that the use of variable returns to scale (VRS) assumption confuses the gains or losses from the scale effect when it is used in the Malmquist index. From these considerations, the TFP measures are calculated here with a CRS technology assumption.

Figure 4.4 shows that, the experience of productivity growth for the South Asian countries were quite dissimilar during the past three decades. The Maldives enjoyed a spectacular total factor productivity growth compared to the other member countries. The productivity gain for this island economy has been around 40 per cent since the beginning of the eighties. The global economic recession in the latter part of the 2000s severely affected the tourism revenue. According to a CIA world fact-book report, the real GDP of the Maldives was contracted by 7.5 per cent in 2009. This adverse effect is reflected in the dipping of the TFP for the Maldives in 2009 in the figure. Decomposition of the TFP growth, shown in Table 4.3 reveals that the overall TFP growth for this country is driven by the technical changes or shift of the frontier. The inefficiency part remains constant.

Figure 4.4: Total Factor Productivity Changes in the South Asian Countries (1981 – 2010)



At the other extreme lies Nepal with her dismal productivity performance over the sample period. Both technical change and technical efficiency are responsible for this overall productivity decline. The positions of the other countries are in the middle of these two extremes. Their productivity show slightly downward trend or stagnation in the sample period. In the recent period, however, Bhutan, Sri Lanka, and India are showing signs of recovery from their long-term decline. For Bhutan, the recent productivity boost is coming from both the efficiency and the technical change components. When the productivity performances of these countries in the SAFTA period (2006-2010) against the pre-SAFTA period are compared, no unanimous result can be observed. Nepal, Pakistan, India, and Bangladesh have suffered from total productivity loss, the Maldives has gained, and the others have remained more or less unchanged in terms of their TFP performance in the regional trade agreement period.

Table 4.3: The Malmquist TFP Index and its Components

		PERIOD AVERAGES					
		1981-1985	1986-1990	1991-1995	1996-2000	2001-2005	2006-2010
BD	MALM	0.953	0.885	0.801	0.715	0.660	0.621
	EFCH	1.000	0.969	0.943	0.932	0.894	0.973
	TECH	0.953	0.909	0.841	0.759	0.738	0.624
BH	MALM	0.905	0.883	0.858	0.884	0.911	1.045
	EFCH	0.978	0.969	1.002	1.040	0.983	1.100
	TECH	0.926	0.912	0.848	0.847	0.946	0.950
IN	MALM	0.919	0.806	0.758	0.773	0.736	0.691
	EFCH	0.967	0.859	0.869	0.984	0.986	0.978
	TECH	0.951	0.936	0.864	0.776	0.745	0.712
MA	MALM	0.987	1.082	1.116	1.206	1.281	1.371
	EFCH	1.000	1.000	1.000	1.000	1.000	1.000
	TECH	0.987	1.093	1.113	1.218	1.297	1.375
NE	MALM	0.891	0.771	0.717	0.649	0.599	0.461
	EFCH	0.939	0.853	0.854	0.855	0.821	0.723
	TECH	0.948	0.899	0.831	0.751	0.730	0.620
PK	MALM	0.976	0.979	0.913	0.821	0.787	0.675
	EFCH	1.032	1.032	1.032	1.032	1.032	1.032
	TECH	0.945	0.949	0.875	0.786	0.762	0.636
SL	MALM	0.911	0.839	0.776	0.714	0.744	0.780
	EFCH	0.986	0.915	0.915	0.890	0.866	0.897
	TECH	0.924	0.919	0.837	0.803	0.871	0.874

- *Key: BD – Bangladesh, BH – Bhutan, IN – India, MA – Maldives, NE – Nepal, PK – Pakistan, SL – Sri Lanka.*
- *MALM – Malmquist TFP Index, EFCH – Efficiency Changes, TECH – Technical Changes.*

Widespread differences in productivity performance among the South Asian countries point out the importance of regional cooperation beyond trade liberalization measures only. Since the countries within the region show different levels of performance, free movement of labour and capital within the region can increase the overall factor productivity by ensuring regionally efficient allocation of resources. Whereas unrestricted trade indirectly increases productivity by intensifying competition, resource flows have direct impact on productivity. However, the weaker economies of the region have a nervous apprehension that their sovereignty might be under threat if large firms from the relatively developed countries of the region dominate their economic activities.

In cases where drastic measures of trade liberalization are politically infeasible, creating opportunities for training programs and technical help can alleviate the productivity problem of the lagging countries. Extended cooperation will create an atmosphere of increased regional bonding at the same time. Similarly, as an alternative to full capital account liberalization, Steinherr (2006) suggests the introduction of a regional currency unit. The common currency unit will foster regional trade by alleviating import and export financing constraints.

Some Caveats on the Aggregate Productivity Measure

The aggregate factor productivity analysed in this chapter should not be taken as synonymous with microeconomic factor productivity. Total factor productivity is sometimes measured at the firm, industry or sector level, and as part of the system they affect the economy wide or aggregate productivity. Rises in the productivity of all the firms or an increase in market share of the higher productive firms can show up as an improvement in the aggregate productivity.

However, productivity paradox might arise if the micro founded aggregated productivity index in not constructed properly. Fox (2011), for example, shows that popular methods of aggregation often give rise to situations where aggregate productivity falls in spite of increase in productivity of all the individual firms. When low-productive sectors have a lion share of output in the economy compared to the high-productive sectors, the economy can show falling productivity, though all sectors are improving. The paradox arises because of the changing shares, which are used as weights in calculating the aggregate productivity index.

In a bottom up approach, Baily *et al.* (1992) use a representative overlapping generation model to link macro-level productivity with micro-level measures, but do not find any correspondence between them. The problem arises as macro theories are based on the assumption that firms are perfectly competitive, whereas they are not in reality. Moreover, in macroeconomic productivity analysis it is assumed that only aggregate inputs affect the aggregate output. The possibility that input redistribution among sectors can lead to output growth is ignored. Hence, the results derived from national aggregates can be taken as an approximate or broad indicator of productivity change. Temple (2006) has more discussion on this issue.

Felipe and McCombie (2005) argue that, though aggregate production functions are the most widely used concept in macroeconomics, their foundations are not so strong. The estimated production functions are likely to reflect the underlying accounting identity, instead of the actual technology. This criticism also applies to firm level production function, when firm outputs are measured in constant dollar terms, perhaps because these firms produce services or multiple outputs. These authors, however, do not address the difficult question of how to find better alternatives that avoid these problems.

4.6 Conclusion

This chapter shows how trade policy reforms in general, and intra-regional trade creation initiatives through SAFTA in particular, have affected various aspects of productivity growth in South Asia. Both the stochastic frontier and the deterministic frontier approaches are applied to panel data, comprising the seven member countries of the region and thirty years of information, to arrive at the results. The empirical analysis of the chapter shows that economic model based measure of productivity can be quite different from the simple per capita output growth.

Though independent policy reforms of the South Asian countries during the eighties and the nineties helped them to achieve moderate economic growths, these are basically input driven. The analysis of the study based on available data suggests that the productivity performance during the past three decades in South Asia has been far from satisfactory. The stochastic frontier estimates show that the South Asian production frontier has, if anything shifted slightly inward over the sample period. The coefficient of the year dummy in the production function, representing the Hicks-neutral technical change, is found in the range of -0.005 to -0.009 depending on the chosen technology or the data set. Introduction of the trade pact SAFTA in the latter part of the 2000s only deteriorated productivity by further shifting inward the production frontier.

The results remain unchanged when the analysis is performed using the data envelopment analysis (DEA) methodology, where a priori functional form for the production frontier is not imposed on the data. The total factor productivity and its components are investigated based on this non-parametric frontier. Except for the Maldives and to some extent for Bhutan in the recent period, the total factor productivity of the South Asian countries have shown downward trend. Sri Lanka and India, of late, are showing signs of recovery. The decomposition shows that, for most of these countries the principle source of productivity change is the efficiency change. For the two extreme countries, the Maldives and Nepal, both the efficiency and the technical change components contributed to their overall productivity changes.

Some economists argue that unilateral non-discriminatory trade liberalization usually results in productivity or efficiency gain. However this is not true in case of preferential trade liberalization. Extra preferential margins enjoyed by the regional partners create new export opportunities in the expanded regional market for them, which may turn into productivity gain through the trade-productivity linkage. But, regional integration at the same time destroys the competitive environment to some extent in the regionally protected market. The negative result of the trade pact on the technology frontier of South Asia hints about its failure to intensify competition through increased trade flows or sourcing of quality inputs from the regional market. However, the different level of efficiency among the members, that is their different abilities to produce outputs from similar amount of inputs, implies the importance of allowing for cross-border resource mobility. This raises the case for deep integration beyond the current practice in SAFTA that only allows tariff concessions on a limited number of traded items.

Given data quality, productivity measurement at aggregate level for developing countries is a difficult task. This is further complicated by the fact that productivity growth can stimulate accumulation, which results in input based growth. Input growth is observed and easy to measure, but to some extent productivity growth lies behind it, though the latter is unobserved (I thank an anonymous examiner for pointing this out). Thus the results obtained in this chapter are broad indicators, rather than exact descriptions, of productivity growth situation in the South Asian countries.

Economic integration through the removal of trade barriers are intended to increase competition in the regional market and improve productive efficiency. Economic restructuring and adjustment costs take place along the way. The residual based measure of productivity change is considered as a supply-side constraint on achieving welfare. Consumer valuations of output are also required to arrive at a more comprehensive measure of economic welfare. The next chapter uses a general equilibrium framework to evaluate the welfare implication of regional integration in South Asia. Distributions of welfare changes among the trading partners and the pattern of output changes at the disaggregated sectors from various policy scenarios will emerge from that analysis.

CHAPTER 5

AN ANALYSIS OF THE WELFARE EFFECT OF SAFTA

5.1 Introduction

The ultimate goal of any trade policy like regional integration is to enhance the welfare of the participating nations. The formation of a free trade area results in a new tariff structure and a new constellation of prices. Economic agents respond to these by choosing a different bundle of goods and services, which gives rise to welfare changes. Trade integration considered in the earlier chapters is only one transmission channel through which welfare gains or losses might occur. However, as the pattern of trade and the efficiency of the sources of supply change with the formation of discriminatory trade blocs, the full welfare consequences of such moves may be broader.

Khoso *et al.* (2011) show with a computable general equilibrium (CGE) approach that a 15 per cent unilateral tariff cut on behalf of Pakistan will increase her welfare, when measured in terms of equivalent variation (EV), by 567 million US dollars. Siriwardhana (2004) does the experiment in a sub-regional context, by eliminating tariffs between Sri Lanka and India. The author finds the welfare of India and Sri Lanka to rise by 10,877.01 million and 365.29 million US dollars respectively after the reform. The rest of South Asia, which includes Pakistan as well, suffers a welfare loss on the magnitude of -4,331.30 million US dollars. The results from these two studies differ as they employ different versions of the global database GTAP, and their aggregations are not similar.

Existing studies on the welfare effect of regional integration in South Asia focus primarily on the effect of intra-regional tariff concessions, ignoring the accompanying unilateral tariff liberalization by these countries. It is more practical to allow tariff liberalization to take place on both the unilateral and the preferential fronts while investigating the welfare effects of trade policies. The simulation experiments designed in this chapter take into account these types of simultaneous policy changes. This simultaneous nature of policy issues is considered in designing the simulations of this chapter. Moreover, the parameters of the model are considered here as random realizations from a uniform distribution, which will enable us to evaluate the results in the presence of parameter uncertainty. Some other issues that are addressed in a general equilibrium framework in this chapter are the sector-level adjustment in output, employments and wages. The results from the static version of the model is then compared with a recursive dynamic version of the model, where it is shown that the results are substantially changed once dynamics are incorporated in the model.

The rest of the chapter is organized as follows. Literature on the welfare effect of regional trade agreements, employing both partial and general equilibrium approaches, is investigated in Section 5.2. A brief overview of the global database, GTAP, on which the simulation experiments of this chapter are built, is given in Section 5.3. Details of the model structure and the underlying assumptions are contained in Section 5.4. Results of the various simulation experiments and their interpretations are discussed in Section 5.5. An overall assessment of the findings and possible directions for future research are provided in the concluding section.

5.2 Review of Related Literature

Depending on the specific research question and the nature of policy experiments, researchers have applied both the partial equilibrium (PE) and the general equilibrium (GE) methodologies to deal with the welfare aspect of trade policy changes. Both approaches have their own merits and limitations. Though GE models take into account inter-sector linkages, from the computational perspective and for understanding the result, these models are usually set up at more or less aggregate level. If not millions, there are thousands of commodities at the micro level to consider even in a small economy, and it is practical to limit the number of categories to a reasonable level like 15 to 20 categories or sectors for general equilibrium analysis. The PE model cannot handle inter-sector linkages or maintain budget constrains at the aggregate level, but disaggregation can be carried out at any level as the investigator wishes. Compared to the GE, the results are also relatively easy to comprehend and interpret.

5.2.1 Studies Relying on the PE Approach

In examining the welfare effect of unilateral and other forms of regional integration policies in South Asia, Hossain (1997) finds, using a partial equilibrium simulation framework, that the unilateral liberalization is the most welfare improving for all countries, compared to the other forms of liberalization considered. Though a custom union (CU) produces more welfare changes than that of a free trade area, political difficulties over sacrificing the freedom of making external policies keeps the South Asian leaders interested only in the free trade area (FTA).

Using area variation measures of the consumer surplus and producer surplus, the above study shows that under both the CU and the FTA there are inter-country variations in welfare change and there are both gainers and losers. Under the FTA, Bangladesh and Sri Lanka suffer welfare loss of -0.78 per cent and -0.88 per cent of their GDPs respectively, while India and Pakistan gain by 0.26 per cent and 1.06 per cent of their GDPs respectively. Welfare losses are severe, when regional trade policies are not accompanied by external reductions in tariffs.

The elasticity parameters for the import demand and the export supply functions for various product categories of the members are estimated in Hossain's (1997) study, whenever data are available. In many cases the author applies parameter values from India to other countries. This may be a problem for the credibility of the welfare estimates, as the elasticity estimates for the same product group varies between India and other members, when these estimates are based on available information. For example, in the case of chemical industry, the estimated elasticity for India is – 0.72 and for Sri Lanka is – 0.25. These figures are – 0.81 and – 0.21 respectively for the other manufacturing products (Table 1 in Hossain, 1997). If a similar pattern exists for the other missing elasticity estimates, the strategy of using Indian data for other countries is likely to make the results less reliable. Moreover, as the aggregation level is high (2-digit SITC), there should be substantial amount of intra-industry trades and the general equilibrium framework appears more appropriate in such a context.

Results from industry-level partial equilibrium analyses depend on a number of factors, such as the assumed demand and cost structure of the industries, the domestic prices of the members to the agreement and world prices, multilateral and preferential tariffs, domestic taxes, input sources and their tariff structure, market structure, and any prevailing export incentive scheme (for example, the duty drawback system) of the members. A number of partial equilibrium simulations using different sets of assumptions are analysed in World Bank (2006) to examine the welfare effects of a proposed bilateral FTA between Bangladesh and India for five selected products of export and import interest for these two countries. Of these five products, only readymade garments are of export interest to Bangladesh and the remaining four products, namely light bulbs, cement, sugar, and bicycle rickshaw tyres are import competing for Bangladesh.

Each industry is subjected to a number of simulations with various types of assumptions, and the resulting welfare effects and their distribution across economic actors are found substantially different in World Bank (2006). For example, in the case of light bulb industry, competitive market structure produces strong consumer surplus (3.94 million US dollars) and a slightly negative producer surplus (-1.24 million US dollars) in the Bangladesh economy, Light bulb suppliers in India gain but other suppliers that were previously selling inputs to the Bangladesh bulb producers lose. The net welfare gain for the producers in India amounts to 1.06 million US dollars in the long run. The results are intensified as the demand elasticity parameters are raised. The overall welfare gain is reduced when the product market is assumed imperfect and the Indian suppliers collude with the dominant Bangladeshi producers to set the post-FTA price at a higher level.

However, it should be noted that, when partial equilibrium simulations produce large changes, we can no longer assume that expenditures on other sectors of the economy will remain unaffected. The *ceteris paribus* assumption of the partial equilibrium methodology begins to break down at that point. A more detailed analysis, allowing for inter-sector expenditure spillovers and forcing the overall budget constraint, features inherent in the general equilibrium methodology, can be more useful in such circumstances. In the case of the SAFTA, member countries offer thousands of tariff lines in the list of concessions. Some of the items have strong backward and forward linkages. For example, when the garments sector is liberalized, the banking business (specially the earnings from the LC business) is severely affected. So, a general equilibrium analysis of the regional trade policy changes may be more relevant to the policy makers and other economic agents of the economy.

5.2.2 Studies Based on the GE Framework

Motivations for the general equilibrium analysis of trade policy changes arise from the fact that various regions and production sectors are interlinked in the global economy. The effect of protection in one sector can potentially spread over the whole economy. Consequently, economists have been interested in employing the general equilibrium methodology to investigate the rippling effects of trade liberalization measures on employment, output and prices of various sectors of the economy. However, as multi-sector and multi-region models are computationally complex, these studies are primarily based on simulation experiments. In spite of complexity, recent advances in computing power has inspired international organizations and many national governments to increasingly rely on the general equilibrium methodology in formulating their macroeconomic and trade policies.

Literature regarding the welfare effects of trade liberalization in South Asia is to a large extent country focused and employs computable general equilibrium (CGE) types of methodology with static framework. Siriwardana (2000) analyses the effects of bilateral trade liberalization in South Asia with special emphasis on Sri Lanka. Within the Global Trade Analysis Project (GTAP) framework, the author experiments with bilaterally liberalizing the Sri Lankan economy against three groups of countries – South Asia (SA), ASEAN-4, and the other ASEAN countries. In most of the experiments, the welfare change for Sri Lanka measured in terms of equivalent variation significantly improves, the strongest effects being felt with the SA. The CGE model adopted by the author is based on the constant returns to scale technology and no provision is made for capital accumulation. If investments respond to the regional integration, the long-run income growth and its spillover effects on other countries are likely to be missed out in the static analysis.

Raihan and Razzaque (2007), in a Bangladesh focused study, consider two simulations, one allowing for 100 per cent tariffs cut by all members on the traded commodities and the other adding a simultaneous 50 per cent multilateral tariffs slash by Bangladesh. Their analysis from the first simulation shows that Bangladesh suffers a welfare loss of about -184.1 million US dollars, while all other regions in South Asia gain, India being the prominent beneficiary of the full liberalization. A large amount of trade diversion from India to Bangladesh, especially in the agricultural and other manufacturing products, replaces efficient alternative supply sources for Bangladesh and gives rise to the welfare loss. The study also finds textile and apparel exports rise and services export to fall from India to Bangladesh. However, in simulation two, when Bangladesh liberalizes with the outside regions as well, the welfare loss is eliminated and the net welfare change turns positive.

This chapter builds on the Raihan and the Razzaque (2007) study, but uses an updated version of the GTAP database and treats Nepal as a separate region rather than part of the other South Asian countries. Moreover, instead of considering an unrealistic full market access, a 15 per cent extra concession to the SAFTA members compared to the other regions is considered. The simulations allow each member country to also have unilateral liberalization by 10 per cent, both individually and simultaneously with other members, along with the regional preferences. The purpose of this latter simultaneous tariff reduction exercise is intended to investigate the effect of the ongoing autonomous liberalization program of the South Asian countries in the presence of the regional agreement.

Strutt and Rae (2008) apply a dynamic GTAP model to analyse the impact of bilateral and regional trading agreements in the Asia-Pacific region. When compared with a baseline scenario, their simulations show that the gains from these hypothetical agreements rise with the number of countries to the agreements and with the amount of commodity coverage in the agreement. The outcomes also depend on how their trading partners are forming blocs with other countries. There are always incentives for countries to be member of some blocs, as losses are severe for the left-out countries.

Though trade liberalization is found beneficial for the overall economy in many studies, it does not signify that all parts of the economy are equally benefited. Krishna *et al.* (2010) examine, in the Indian context, the relationship between unequal regional development and distribution of gains from trade liberalization. Their findings show that inadequate infrastructure or poor communication system constricts the ability of the lagging region to reap the benefits of the trade liberalization program. The authors report that a one percentage point reduction in tariff increases the amount of poverty by 0.8 percent in the disadvantaged area compared to the overall mean rate of poverty reduction. Similar types of asymmetric effects favouring the rich region are found for price reduction, wage gain, and HDI improvement. So to make free trade beneficial for all, adequate catch up opportunities need to be created in the remote, inaccessible, and deprived regions of the economy.

Available studies in the CGE context in South Asia that have employed the GTAP database are based on, at the latest, version 7 of the database (released in the year 2008). The database has been significantly updated in the GTAP8.1 version, published in 2013, by incorporating new regions and correcting some anomalies of the previous releases of the databases. Since Nepal is a separate region in the new database, the welfare effect of policy changes on this country can be evaluated separately, which was not possible in the earlier studies. Moreover, the data issue is not trivial in the CGE context. The calibrated parameters and results are affected by the benchmark data, even though they are based on the same model. From this consideration and the perspective of sensible simulation design, the current study is expected to provide more applicable results. Evaluation of the static results in comparison with the dynamic outcomes will further inform debate regarding the welfare effect of SAFTA.

5.3 Data and Methodology

5.3.1 Description of the Database

In an increasingly integrated world, regional trade policy analyses require databases that are extensive in country and sector coverage. The Global Trade Analysis Project (GTAP) was established in 1992 at Perdue University to facilitate multi-country, economy-wide policy analysis. With cooperation from various international organizations, its first global database was launched in 1993, and has been often updated since then, every three years on average. The latest available update GTAP 8.1 (released in May, 2013) is used here for the purpose of simulating welfare changes. The database contains consumption, production, trade flows, support and protection data, and other information on 57 sectors for 134 regions mapped from 244 GTAP countries.

The global database is constructed by taking inputs from detailed input-output tables of the individual countries. Though these tables differ in terms of their structure and reporting year, consistent structure with the required sectoral classifications are attained by ensuring some macro balances (such as, costs plus profits equal sales revenue), and then updating to a common base year in the GTAP database. For countries and regions that do not supply input-output tables, these tables are created based on the resemblance of their per capita income and the overall production structure with those countries in the GTAP dataset that supply input-output tables.

All region-specific input-output tables are then combined with the respective national accounts, bilateral trade data, and protection data collected from various international sources to construct country-specific social accounting matrices (SAMs). These SAMs are standardized and expressed in common currency, so that they can be integrated into a global database. From this grand database we can learn about the intermediate input requirements of a firm, from both domestic and international sources, and the distribution of their products to other firms, consumers, and to exports. Government is included to facilitate income redistribution, and tariff rates determine tariff revenue on imports. Consistency checks are also performed (such as, the sum of all regional savings equal global investment) to make sure that the data represent an equilibrium for the reference year. The details of the global database construction procedure are provided in Gehlhar *et al.* (1997). Current mapping of the sectors and regions can be found in the relevant documentation maintained online by the GTAP officials at www.gtap.org.

To keep track of the simulation results and for analytical convenience, the GTAP database has been aggregated into 15 regions and 10 sectors in this study. In case of the dynamic analysis, however, the aggregations are limited to 10 regions and 10 sectors to reduce computational burden. Mappings of the original GTAP sectors and regions into the constructed aggregated sectors and regions are shown in Table 5.1A and 5.2A, respectively in the appendix.

5.3.2 Methodology

Like any standard CGE analysis, the trade policy simulations developed in this chapter are based on the following four steps: choosing the model structure, collecting and organizing the relevant benchmark data in a social accounting matrix (SAM) format, choosing or calibrating parameter values of the equations system, and finally changing the policy variables of interest to see how the endogenous variables of the system respond in comparison with the base data. Two model structures that are applied in this thesis for the purpose of welfare estimates of the policy changes are based on the standard GTAP model as described in Hertel and Tsiag (1997) and its recursive dynamic version as proposed in Ianchovichnia and McDougall (2012).

The basic data required for the model are national accounts, household income and expenditure, input-output tables, trade and protection data for the reference year. These data are adjusted to prepare a consistent benchmark equilibrium dataset so that it can be treated as a solution to the model at the reference year. The solution corresponds to a set of exogenous (policy) variables, and the parameters are obtained from literature search, assumed, or by calibrating the model to the benchmark SAM data. Policy variables can be changed to carry out counterfactual experiments, which yield new sets of values for the endogenous variables in the system. Policy appraisals can then be made based on the pairwise comparison between the benchmark and the counterfactual values, or by comparing the functional values based on these two distinct sets of the pre- and the post-simulation tables. For example, we may compare the EVs or GDPs derived from the benchmark and the counterfactual tables.

5.3.3 Theoretical Structure

An applied general equilibrium model comprises numerous equations and calibrated parameters. As a consequence, the results appear to be coming from a black box. So, it is important to make the model as transparent as possible. This sub-section provides an overview of the model structure from where the results are derived.

The regional computable general equilibrium (CGE) model considered in the following analysis divides the whole world into 15 regions: Bangladesh, India, Nepal, Pakistan, Sri Lanka, the rest of South Asia, Southeast Asia, East Asia, Oceania, North America, the European Union 25, Latin America, Middle East and North Africa, Sub-Saharan Africa, and the rest of the world. This particular aggregation scheme is intended for investigating the welfare effect of the simulation on the individual South Asian countries and their major trading partners.

Using the GTAP flexible aggregation methodology, 10 sectors have been created from 57 GTAP sectors. These 10 sectors are the final commodities and members of the traded commodity set. The original 5 factors are mapped into the same 5 factors. Of them, capital is produced and is assumed to be only domestically mobile, so that domestic rates of return on capital can vary to clear the market. The remaining 4 factors are non-produced or primary sectors: land, unskilled labour, skilled labour, and natural resources, which are also non-traded. Two of these factors, land and natural resources, are the sluggish factors, while the other two are domestically mobile between sectors.

There are three types of agents in every region: producers or firms, private households, and the government, all agents operate under the regional household umbrella. The role of the government is to collect taxes and revenue and then redistribute them to the households in a lump-sum fashion. Government is assumed to remain within its budget constraint. The two other agents engage in optimizing behaviour.

Producers: The production function has a nested constant elasticity of substitution (CES) form. There are two nests at the bottom of the production structure. In one nest, value added services are produced from 5 factors: land, skilled labour, unskilled labour, capital, and natural resources. The other nest combines the domestic and the foreign inputs to produce composite intermediate inputs. These two nests use the CES technology. Value added services and the intermediate inputs are then combined, this time using the fixed coefficient Leontief technology, into final products at the top level of the production. The structure of production is shown in Figure A5.1 in the Appendix to Chapter5.

Final products of a sector produced in different countries are considered as differentiated by country of origin. Consumers, for example value an Australian car differently from an American car. This is the famous Armington (1969) assumption, which allows for two-way trade within the same sector. Producers can produce for the home or the foreign markets. In response to price changes, producers are guided by the elasticity of transformation in deciding how much to supply in each market segment.

Private Households: Private households maximize utility subject to their budget constraint. These utility functions are of nested form[21]. At the bottom level, products sourced from various regions are CES aggregated into composite products and then at the top level Cobb-Douglas utility defined over these composite products and domestic products is maximized (Figure A5.2 in the Appendix to Chapter 5). The consumer behaviour leads to a representative demand function for each sector in each region.

Use of the linear homogenous functions (such as the CES, the Cobb-Douglas, and the Leontief) in describing the behaviour of the agents has some important advantages in welfare analysis. One such advantage is that the ordinal utility can be expressed in dollar terms using the money metric utility function. For example, the indirect utility function derived from a CES function,

[21] The CES form makes elasticity of substitution between any two products constant. The nested structure is created to achieve different degrees of substitution among various sets of products residing in distinct nests.

(5.1) $$v(p_1, p_2, m) = m\left(\alpha_1^{\sigma} p_1^{1-\sigma} + \alpha_2^{\sigma} p_2^{1-\sigma}\right)^{\frac{1}{\sigma-1}},$$

or the expenditure function at the unit indirect utility,

(5.2) $$e(p_1, p_2, 1) = 1/\left(\alpha_1^{\sigma} p_1^{1-\sigma} + \alpha_2^{\sigma} p_2^{1-\sigma}\right)^{\frac{1}{\sigma-1}}$$

can be used to define the cost of utility as,

(5.3) $$v(p_1, p_2, m) = \frac{m}{e(p_1, p_2, 1)}.$$

where, $v(.)$, $e(.)$, and m are indirect utility function, expenditure function and money income respectively. p's are the prices of products, $\alpha's$ are the expenditure shares and σ is the elasticity of substitution parameter. The money metric utility function can be used to measure the welfare effect of policy changes. If $\mu(p^*; p^0, m^0)$ is defined as the monetary compensation required at price vector p^* to achieve the indirect utility evaluated at (p^0, m^0), then the equivalent variation (EV) and the compensating variation (CV) measure can be defined as:

(5.4) $$\begin{aligned} EV &= \mu(p^0; p^1, m^1) - \mu(p^0; p^0, m^0) \\ &= \mu(p^0; p^1, m^1) - m^0 \end{aligned}$$

(5.5) $$\begin{aligned} CV &= \mu(p^1; p^1, m^1) - \mu(p^1; p^0, m^0) \\ &= m^1 - \mu(p^1; p^0, m^0) \end{aligned}$$

Examination of the above two equations shows that, though both measures are in terms of money, while the EV measure of welfare change uses the base year prices $(i.e., p^* = p^0)$ as the reference prices, the CV measure uses the current prices as the reference prices. In the case of several policy changes, the EV measures are useful in that these measures are comparable against a common reference price vector.

Closure Rules and the Equilibrium Mechanism

Since in a computable general equilibrium model, total number of variables usually exceeds the number of independent equations, we need to close the model by assigning values for some of the variables which turn into exogenous variables. The way the closure rule is selected guides the adjustment process to new equilibrium. For example, setting the amount of labour force exogenously determined at their available endowments, and letting wages to vary endogenously will reflect the long-run adjustment mechanism of the neo-classical labour market. Setting wages fixed and allowing employment to vary endogenously will elicit a Keynesian type short-run adjustment in the labour market. In the short-run closure, capital stock and real wage rate are exogenous, and employment and returns on capital are endogenous. The reverse is the case for the long-run closure.

A general equilibrium is characterized by a situation where all markets (i.e. labour, capital, and goods market) clear and the income balance equations are satisfied, so that consumers are on their budget lines. The base data in the SAM is taken as an equilibrium solution of the model. As one or more of the exogenous variables are shocked, the model traces through a new set of prices for the inputs and outputs of the system to reach a new equilibrium. Parameters specified for the behavioural and technical equations of the model guide economic agents to a new mixes of output for the economy, revenue for the government, and welfare for the regional households.

The model is implemented by taking inputs from the benchmark SAM, where the initial interaction among all the agents across the sectors and regions are laid out. Basically, the SAM is a tabular representation of the circular flow of the economic activities of an economy, where each row and column of the table represents respectively the income and the expenditures of a sector. Table A5.3 in the appendix shows the structure of a simple open economy SAM. Equality of the row sum and the column sum of the corresponding sector ensures macroeconomic balances (that is, income equals expenditure). The SAM is a snapshot of the economy at a particular point in time, and to make it useful for policy purposes, it needs to be linked with a set of equations describing the technical and behavioural responses of various accounts in the SAM.

5.4 Calibration and the Model Parameters

The model described in the previous section can be solved only if parameter values of all the relevant functions are available. In practice, some parameters are obtained from literature search, some are assumed (guestimates), and the rests are calibrated in a model consistent way. Calibration means that some parameters (especially the share parameters and the scale values) are computed in order to calibrate the model to the base year SAM data. The calibration assures that, when the equation system is solved with these parameters, the equilibrium quantities obtained are the same as those given in the benchmark data. Once the parameters are calibrated from the base data, they remain same throughout the simulation experiments. The parameter file used for the model calibration and simulation is reported in Table 5.1.

Some key elasticity parameters in the model are the elasticity of substitution that the producers have among the primary factors in the value added nest (ESUBVA(r)), the Armington elasticity between the domestic and the imported intermediate inputs (ESUBD(r)), and the elasticity of substitution among foreign input use (ESUBM(r)). Usually the share and scale parameters are calibrated from the benchmark data. For example, the labour share is calibrated by dividing the sector output by the wage bill, the Constant Difference Elasticity (CDE) parameters are calibrated from the expenditure elasticities, and so on. The calibration procedure is succinctly described in Shoven and Whaley (1992).

These elasticity parameters are important for determining the outcome of the simulations. As shocks are introduced, consumers and firms are guided by these parameter values to determine the extent of their substitution pattern among the endowment factors or among the commodities of various regions. The sensitivity of the simulation results has been checked by randomly altering some of these values, as discussed in the result analysis section (Section 5.5.3).

Once the model is calibrated for the remaining unknown parameters, it is ready for simulation experiment. However, before doing so, it is important to check the calibrated model for consistency. One such consistency check is the homogeneity test of the overall model, whereby if all prices are multiplied by a whole number, all real values remain unaffected and nominal values rise by the same multiple. The homogeneity test is applied here by doubling the numéraire and observing that all variables respond as expected.

Table 5.1: Summary of the Parameter File

Parameter Name	Dimension	Description	Value Used[a]
SUBPAR(i,r)	10 × 15	The substitution parameter in the minimum expenditure function	0.18 to 0.99
INCPAR(i,r)	10 × 15	Expansion parameter in the minimum expenditure function	0.01 to 1.52
ESUBD (i)	10 × 1	The elasticity of substitution between domestic and imported goods (Armington CES aggregation structure for all agents in all regions)	1.9 to 5.12
ESUBM (i)	10 × 1	The elasticity of substitution among imports from different destinations (Armington CES aggregation structure for regional allocation of imports, for all agents and all regions)	3.8 to 11.67
ESUBVA (j)	10 × 1	CES elasticity of substitution between primary factors of production, in the production of value-added in j	0.2 to 1.63
ETRAE (i)	5 × 1	CET elasticity of substitution between sectors for sluggish primary factor endowments.	-1 to 0
RORFLEX (r)	15 × 1	Expected rate of return flexibility parameter with respect to investment in region r.	10
RORDELTA	Binary	Investment fund allocation mechanism across region; when RORDELTA=0, investment fund are allocated across region to maintain existing composition of capital stock, and when RORDELTA=1, investment funds are allocated across regions to equate the changes in the expected rate of return.	1

Note: [a] Details are in the chapter appendix (Table A5.4).

5.5 Welfare Analyses of Trade Policy Reforms in the General Equilibrium Framework

Welfare effects of trade policy changes can be viewed from the perspectives of the individual countries forming the bloc, the bloc itself, the rest of the world, or the world as a whole. Under a very restrictive set of assumptions Viner (1950) was the first to argue that trade diversions can lead to welfare loss for a customs union. Lipsey (1970) illustrates how the general equilibrium analysis of trade policy changes can give rise to numerous cases depending on the assumptions made about the demand and cost structure of the countries involved in trade. Possibilities of inter-country and intra-commodity substitution complicate the outcome. Allowing for inter-commodity substitution and with the simplest possible general equilibrium model, where a custom union with two members and rest of the world interact, Lipsey (1970) arrives at eight different cases of welfare changes that can result from trade diversions.

Lipsey's analysis is based on a 3×3×3 model. Trade theories presented in few enough dimensions to be manageable have little guidance for policies in the complex real world. Dixit and Norman (1980) point out that the general equilibrium effect of policy changes cannot be known until deciding upon the functional forms of the model and imputing parameter values on them. CGE models take us in that direction by giving economic theories a quantitative flavour.

Francios and Reinhart (1998) point out that CGE models move toward 'numbers with theory' by starting from a distorted base equilibrium and analysing the effect of policies from the perspective of the second best theorem. In a general equilibrium setting, protections in one sector are seen as implicit tariffs on other sectors. Overall welfare can increase if reform measures lead to reductions in net inefficiencies. However, it is also possible for tariff reduction in one distorted sector to move resources into another more distorted sector and thus potentially create welfare loss.

5.5.1 Simulation Design and the Results from the Static GTAP Model

To analyse the effects of trade policy changes on welfare, several simulation experiments have been designed. Instead of experimenting with the unrealistic complete tariff elimination on all traded commodities within South Asia, only limited preferential liberalizations are allowed for in the counterfactual experiments. The relevance of the partial liberalization can be understood once we consider the magnitude of actual concessions offered by the South Asian countries to their preferential partners compared to the rest of the world, which are listed in Table 5.2. The list includes preferential margins to countries outside of South Asia as well. For example, India's concessions to Singapore or other countries to which she has trade ties are included in India's depth of preferential margins.

Table 5.2: Extent of Preference over MFN Tariffs

(Number of Tariff Lines)

Countries	Depth of Concessions (Percentage Points) 0 to 5	6 to 10	11 to 15	15 +	Total Number of Tariff Lines
Bangladesh	1,895	5	2	2	1,904
Bhutan	NA	NA	NA	NA	NA
India	17,729	9,370	176	2,326	29,601
Maldives	NA	NA	NA	NA	NA
Nepal	4,205	248	12	43	4,509
Pakistan	7,243	1,388	1,352	1,496	11,479
Sri Lanka	22,007	3,797	3,462	1,496	30,762

Source: Compiled from Tariff Download Facility at WITS (www.tariffdata.wto.org)

Since separate data for concessions offered only to the SAFTA members are not available, the number of tariff lines enjoying different degrees of concession as shown Table 5.2 can be taken as upper bounds of concession for the South Asian countries. The table shows that the extent of concession to the preferential partners is in many cases limited to the 0 to 5 per cent range. For Bangladesh, 1,895 tariff lines received 0-5 per cent concession out of the 1,904 total tariff lines. Only 2 tariff lines are in the 15+ per cent tariff range. Similar is the situation for Nepal. Though the other South Asian countries have some items in the 6 per cent and above preferential margins, the pattern is still highly right-skewed. These preferential margins scenarios are unlikely to dramatically change in the near future. So, the tariff reduction schemes in the counter-factual experiments considered here are quite liberal compared to current practice.

Three types of simulations are considered in analysing the welfare effects. In the first simulation, the SAFTA members are assumed to grant each other 15 per cent tariff concession in all traded sectors, while maintaining status quo with the other regions. The second set of simulations maintains the 15 per cent regional tariff concession, but now allows unilateral tariffs of each member to fall by 10 per cent individually as part of the respective country's independent liberalization program. This captures the effect of autonomous liberalization policy observed over the past few decades in South Asia. The third simulation is similar to the second one, but instead of unilateral liberalization by a single country, we assume all members to simultaneously reduce their unilateral tariffs in addition to the 15 per cent regional concession. The last simulation is more realistic than the first two, but surprisingly the impact of such simulation scenario has not been considered in the current literature. The results of these three simulations are discussed from both the aggregate and sectoral perspective in the next two sub-sections.

5.5.2 Aggregate Results

In the CGE context, the purpose of the simulation study is to gain some idea of how the allocation of goods among consumers and the use of resources among producers change as the benchmark economy is shocked by altering the values of one or more of the exogenous policy parameters. Efficiency and welfare consequences of the simulated outcomes are ex-ante, in that they assume what the economy would look like in the base year had the policy changes (new values for the exogenous variables) were in place. Welfare endogenously responds to policy changes, as it is calculated based on endogenously determined variables. Policies are evaluated in terms of their welfare implications for the society, and we can form expectations regarding the beneficial or harmful effect of policy changes in the context of general equilibrium simulations.

One of the major concerns with simulation experiments is the uncertainty of the parameter estimates and their potential impact on the results. Deverajan *et al.* (1997) explain in the context of a simple general equilibrium model that in the face of adverse terms of trade shock, the policy advice for the affected country can change from real devaluation to real appreciation, depending on the value of the elasticity of substitution parameter. Under any external shock, the elasticity of substitution (for households) and the elasticity of transformation (for firms) determine the strength of links between prices and outputs of various sectors. Since variations in the Armington elasticity parameter substantially change the simulation results, some parameters are randomly shocked in the model, and the mean and standard deviation of the results are reported. Magnitudes of the standard deviations can be considered as inversely related to the degree of confidence we can place on the results.

Literature on the welfare effect of tariff liberalization (for example, Huff and Hertel, 2000) shows that the welfare change from reform measures depends on the initial size of the distortion, the degree of reform, and the responsiveness of the factors to the new incentives introduced by the policy change. Since the last two items are essentially the same for all the SAFTA members (tariff shocks are the same for all members and ESUBD varies only over commodities, not over regions), distribution of the welfare gains among the members are heavily influenced by the initial level of protection. Examination of the initial tariff data shows that India imposes the highest tariffs to the other members, compared to the bilateral tariffs imposed by the other members within South Asia. The initial bilateral tariff structures of the member countries are reported in Table A5.5 in the appendix.

Table 5.3: Welfare Effects of Alternative Trade Liberalization Scenarios

(Millions of US Dollars)

Country/ Region	SAFTA tariff cut by 15%	SAFTA tariff cut of 15%plus autonomous cut of 10% by						SAFTA by -15% & ALL by -10%
		BD	IN	NE	PK	SL	RS	
Oceania	-2.89 (0.02)	-2.81 (0.02)	-2.26 (0.04)	-2.93 (0.02)	-6.02 (0.14)	-3.42 (0.03)	-2.97 (0.02)	-5.93 (0.14)
East Asia	-36.15 (0.89)	-54.85 (0.11)	-214.08 (2.36)	-37.07 (0.90)	-82.87 (1.24)	-51.4 (0.70)	-37.24 (0.94)	-296.68 (0.41)
Southeast Asia	-13.68 (0.02)	-15.65 (0.02)	-51.76 (0.14)	-13.78 (0.02)	-17.42 (0.05)	-15.49 (0.00)	-13.88 (0.02)	-59.56 (0.16)
Bangladesh	3.69 (0.54)	72.66 (0.49)	-7.25 (0.67)	3.67 (0.54)	1.00 (0.56)	3.31 (0.54)	3.64 (0.54)	58.59 (0.04)
India	189.51 (3.20)	190.67 (3.15)	1313.89 (11.26)	189.38 (3.20)	186.8 (3.09)	193.32 (3.2)	189.14 (3.21)	1314.78 (2.23)
Nepal	29.86 (0.10)	29.82 (0.10)	27.26 (0.04)	33.96 (0.15)	29.83 (0.10)	29.85 (0.10)	29.86 (0.10)	31.28 (0.12)
Pakistan	27.95 (0.43)	27.49 (0.44)	17.35 (0.23)	27.93 (0.43)	299.87 (5.56)	27.83 (0.43)	28.18 (0.44)	288.89 (0.23)
Sri Lanka	0.81 (0.11)	0.40 (0.11)	-9.64 (0.41)	0.82 (0.11)	-1.29 (0.16)	67.31 (1.35)	0.83 (0.11)	54.36 (0.12)
Rest of SA	15.02 (0.23)	15.06 (0.24)	15.56 (0.25)	15.02 (0.23)	11.71 (0.03)	14.32 (0.23)	20.13 (0.34)	16.72 (0.04)
North America	-22.1 (1.25)	-46.52 (2.54)	-155.33 (5.67)	-22.81 (1.27)	-77.47 (4.09)	-38.04 (2.24)	-22.85 (1.28)	-252.53 (0.02)
Latin America	-5.94 (0.14)	-7.01 (0.16)	-38.14 (0.75)	-6.08 (0.14)	-15.98 (0.42)	-8.29 (0.16)	-6.16 (0.14)	-51.97 (0.15)
EU_25	-33.75 (0.77)	-47.18 (1.31)	-281.85 (3.85)	-32.15 (0.94)	-92.44 (2.71)	-47.44 (1.38)	-35.15 (0.82)	-367.46 (0.12)
MENA	-2.11 (0.01)	-2.13 (0.02)	-6.66 (0.25)	-2.13 (0.01)	-6.27 (0.09)	-3.57 (0.03)	-2.11 (0.01)	-12.35 (0.27)
SSA	-5.7 (0.03)	-5.78 (0.08)	-20.38 (0.08)	-5.75 (0.04)	-11.55 (0.39)	-6.34 (0.06)	-5.56 (0.05)	-26.85 (0.41)
ROW	-24.21 (0.21)	-25.89 (0.19)	-85.84 (0.00)	-24.52 (0.22)	-53.13 (0.91)	-29.76 (0.61)	-24.24 (0.23)	-122.32 (1.41)

Note: numbers inside the parentheses are the standard errors of the random welfare results. Region Codes: BD – Bangladesh, IN – India, NE – Nepal, PK – Pakistan, SL – Sri Lanka, RS – Rest of South Asia, MENA – Middle East and North Africa, SSA – Sub-Saharan Africa. ROW – Rest of the World

Table 5.3 shows country and region specific welfare change of tariff reforms in accordance with the simulation experiments described above in the preceding section[22]. The welfare measure is based on equivalent variation and expressed in millions of US dollars in the base year 2007 prices. These welfare-change results are accompanied by the standard errors of the results that arise from the random selection of the parameter values. To be specific, the parameters representing the elasticity of substitution between domestic and imported commodities (ESUBD(i)) are taken as random realization from a uniform distribution with mean equal to the values assumed in the parameter file (Table 5.4A in the appendix) and variation around these values by ±10 per cent. The magnitudes of these standard errors confirm that the sensitivity of the results is not too strong. In most of the cases they are within the 5 per cent bound of the mean values, and hence one can be confident that changing the parameter values will not destabilize the results.

There are both gainers and losers from the expected policy changes. India tops the list of gainers from the SAFTA liberalization (about 190 million US dollars). This is consistent with the expectation, as India has the highest amount of distortion in the base data. The welfare changes are negligible for Sri Lanka and Bangladesh (0.81 million and 3.69 million US dollars respectively). The other South Asian countries enjoy moderate welfare gains. The welfare gain for Nepal, Pakistan and the Rest of South Asia are 29.86 million, 27.95 million, and 15.02 million US dollars respectively. When expressed in percentages of the GDPs of the respective countries, except for India and Nepal, these figures are less than 0.01 per cent. For India and Nepal, the welfare effects are 0.02 per cent and 0.30 per cent of their GDPs respectively.

Indian unilateral liberalization has remarkably negative effects on the welfare of Bangladesh and Sri Lanka. These two countries move into the region of welfare loss and suffer -7.25 and -9.64 million US dollars respectively from the unilateral move of India. However, these losses are effectively tackled when they also undertake liberalization

[22] It should be noted that liberalization of non-tariff barriers and the complicacy of rules of origin are not considered in these simulations.

unilaterally. The last column of Table 5.3 shows that their welfare in the latter case improves to 58.59 million and 54.36 million US dollars respectively.

Expected welfare effects on various regions arising from the SAFTA preferential tariffs depend on what is happening in the unilateral liberalization efforts of the South Asian countries. The first thing to note from these experiments is that the losers are those that are not responding to the tariff cuts of others by reducing their own tariffs. Quantitatively, the top two losers are the East Asia and the EU25 regions. Their welfare losses are on the magnitude of -36.15 million and -33.75 million US dollars respectively, when the South Asian countries exchange 15 per cent tariff concession regionally. The amount of losses are magnified to -214.08 million and -281.85 million US dollars respectively, when India undertake an additional -10 per cent unilateral tariff reduction along with the SAFTA concession. These two sets of countries have strong trade relationship with India and the pattern of trade flow substantially changes after the Indian trade reform.

The harmful effects for some of the regions remind us about caution signalled by Chipman (1998) about the welfare effect of a trade diverting customs union. His detailed numerical exercise with the welfare effect of a custom union formation in a 3-goods, 3-country world shows that for the union to be beneficial for all, the pre-union tariff of the members need to be enormously high, about 1800 per cent, when the elasticity of substitution is assumed at 0.25.

In general equilibrium multi-sector models, there are many distortions and they interact with the simulation experiment to determine the amount of welfare changes. The welfare changes reported in Table 5.3 can arise from several sources: the terms of trade effect, the resource allocation efficiency effect, the endowment effect, and the technology effect. Since technology and endowment are exogenous in this static experiment, the possible sources of welfare gain reside in the allocation efficiency and the terms of trade effects. The terms of trade effect is slightly negative for Bangladesh and Sri Lanka, -0.06 and -0.02 respectively, and positive for the other South Asian countries (Table A5.6 in the appendix).

McDougall (1993) shows that terms of trade effect arises from changes in regional export and import prices. The terms of trade result in this study obviously suggests that import prices rise faster than the export prices for Bangladesh and Sri Lanka under the simulation. The total endowments of all the factors of production (land, skilled labour, unskilled labour, capital, and natural resource) are held fixed under the closure, allowing their prices to vary. The reallocation of resources among various sectors within countries and the changes in sector level outputs are examined in following sub-section.

5.5.3 Sector Specific Results

The economic effects on the disaggregated sector level output and resource utilization of the 15 per cent regional tariff concession are reported in Table 5.4. The analysis of the disaggregated results allows us to identify two sets of sectors, one experiencing major disruptions in output and factor use, and the other only slightly perturbed by the policy change. The heavily affected sectors are textile in Bangladesh and Nepal, meat and livestock in Nepal, food processing in Nepal and Sri Lanka, light manufacturing in Bangladesh, Nepal, and Sri Lanka, transport and communication in Nepal. The other sectors across regions are not disturbed as much. The changes in the rest of the region outside South Asia are negligible, and hence retaliatory measures are unlikely to be taken by them.

Disaggregated sector-specific results make one thing clear, that the smaller economies are more vulnerable to policy shocks. This happens because the changes in demand appear enormous for the smaller nations relative to their aggregate outputs. For larger economies these changes are not so severe. In our case, Nepal experiences 2.39 per cent rise in output in the heavy manufacturing sector and -0.49 per cent fall in the textile sector. These changes are accompanied by almost equivalent (in fact, slightly higher) response, in the same direction, in the use of skilled labour, unskilled labour, and capital (these are within-region mobile factors), and negligible response of the other two factors, land and natural capital (these are sluggish factors in GTAP parlance). These patterns of factor responses to output changes are also apparent for other product groups and countries.

Table 5.4: Percentage Changes in Output and Resource Allocation

		Grain Crop	Meat Lstk	Extra ction	ProcF ood	Text Wapp	Light Mnfc	Hvy Mnfc	Util_ Cons	Trans Com	OthSe rvices
BD	O	-0.04	-0.02	-0.02	-0.03	0.19	-0.22	-0.17	0.05	-0.02	-0.03
	L	-neg	0.03	0.01	0.09	0.19	0.01	0.04	0.13	0.11	0.10
	NU	-0.06	-0.05	-0.03	-0.03	0.19	-0.22	-0.16	0.06	-0.01	-0.02
	NS	-0.06	-0.05	-0.03	-0.02	0.20	-0.21	-0.15	0.06	-0.01	-0.02
	K	-0.06	-0.06	-0.03	-0.04	0.18	-0.23	-0.17	0.04	-0.03	-0.03
	R	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IN	O	0.01	neg	-0.02	0.02	-0.02	neg	0.03	0.02	neg	-0.02
	L	neg	-0.01	-0.03	-0.02	-0.04	-0.03	-0.01	-0.02	-0.03	-0.04
	NU	0.02	0.01	-0.03	0.02	-0.03	-neg	0.03	0.01	-neg	-0.02
	NS	0.02	0.02	-0.03	0.03	-0.01	0.01	0.04	0.03	0.02	-0.01
	K	0.02	0.01	-0.03	0.02	-0.02	-neg	0.03	0.02	neg	-0.02
	R	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE	O	0.02	0.17	-0.35	1.18	-0.49	-1.75	2.39	0.48	-0.16	-0.09
	L	-0.02	0.06	-0.38	0.44	-0.34	-0.90	0.93	0.07	-0.20	-0.17
	NU	0.04	0.22	-0.41	1.19	-0.48	-1.74	2.40	0.49	-0.16	-0.11
	NS	0.06	0.25	-0.40	1.26	-0.40	-1.66	2.48	0.58	-0.05	-0.02
	K	0.03	0.21	-0.42	1.17	-0.50	-1.76	2.38	0.47	-0.18	-0.12
	R	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PK	O	neg	0.01	-0.05	0.02	-0.01	-0.05	-0.03	0.04	-0.01	-0.01
	L	neg	neg	-0.06	-0.01	-0.02	-0.04	-0.03	0.00	-0.02	-0.02
	NU	0.01	0.01	-0.07	0.01	-0.02	-0.06	-0.03	0.03	-0.01	-0.02
	NS	0.01	0.02	-0.07	0.02	-0.01	-0.05	-0.03	0.04	0.00	-0.01
	K	0.01	0.02	-0.07	0.02	-0.01	-0.05	-0.03	0.04	0.00	-0.01
	R	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SL	O	-0.08	0.04	neg	-0.12	-0.10	0.50	-0.10	0.17	0.03	-0.04
	L	-0.01	0.14	0.07	0.16	0.19	0.45	0.19	0.31	0.26	0.21
	NU	-0.13	-0.01	0.00	-0.13	-0.10	0.50	-0.10	0.17	0.02	-0.04
	NS	-0.13	0.00	0.00	-0.12	-0.09	0.51	-0.09	0.18	0.04	-0.03
	K	-0.13	0.00	0.00	-0.12	-0.09	0.51	-0.09	0.18	0.03	-0.03
	R	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: Sector codes and their detailed construction are in Table 5A.2 in the appendix.

O – Output, L – Land, NS – Skilled Labour, NU – Unskilled Labour, K – Capital, R – Natural Resources

(-)neg – negligible, less than (-)0.01

For India, a comparatively larger economy in South Asia, the highest change in output is 0.03 per cent in the heavy manufacturing and -0.02 per cent in textiles. So, the burden of structural adjustments from the reform will be disproportionately higher for the smaller countries. However, these percentage changes hide the real volume of output changes and factor uses in these countries. For example, though the output response and factor adjustments are minuscule in percentage terms, in absolute term output of the heavy machinery sector rises from 463,876 million US dollars to 464,015 million US dollars or by 139 million US dollars in India, which is larger than the 19 million US dollars (from 793 million US dollars to 812 US dollars) increase in output of the same sector in Nepal.

Careful examination of Table 5.4 shows that, in some cases utilization of land responds in the opposite direction of the output change. For example, despite the output expansion in the processed food sector in India, Pakistan, and Sri Lanka, land use is falling. The processed food industry is not land intensive, and the relative rise in land price compared to the other factors elicit factor substitution response to such an extent that firms use less land in the post-simulation equilibrium. This apparently perverse response in factor use, which is a characteristic feature of the general equilibrium results, is also observed in the manufacturing industries (both heavy and light) for Bangladesh and India, and for other services in Sri Lanka.

There are a few caveats worth mentioning in interpreting the welfare effects and the sector specific results derived above. First of all, productive resources (endowment commodities, in GTAP language, and produced capital goods) are assumed fixed within countries or regions. These resources move only within countries and their prices adjust according to the demand conditions. The problem of short-run unemployment as resources move across sectors is not considered. In practice after a shock is introduced, economies may take 10 to 15 years to reach a new equilibrium (Ianchovichina and McDougal, 2000). Since no adjustment costs are allowed while restructuring at the sector level outputs are taking place, the welfare results reported above may be overstated. Similarly, considerations of monopolistic competition market structure and increasing returns could also alter the results.

Introduction of dynamics is another source that may modify the welfare results. In a forward-looking multi-sector general equilibrium model, Bhattarai (2001), for example, finds that financial liberalization in Nepal that started in the year 1992 has increased output in each sector, and both the rural and urban households have been benefited from the liberalization. Though the cost of capital rises due to increased demand for capital, efficient resource allocation and rising productivity increase household income. Rising savings enable the economy to reach an equilibrium where all sectors use more capital inputs and increase their respective output, in spite of the fact that capital is more expensive after liberalization. This type of simultaneous increase in capital in all sectors is not possible in the static GTAP framework. However, as any attempt to incorporate all these features (for example, market structure, dynamics, and scale economy) will make the model complicated and potentially intractable, the following sub-section extends the previous static model to the recursive dynamic version of the GTAP model suggested by Ianchovichina and McDougall (2012).

5.5.4 Results from the Dynamic GTAP Model

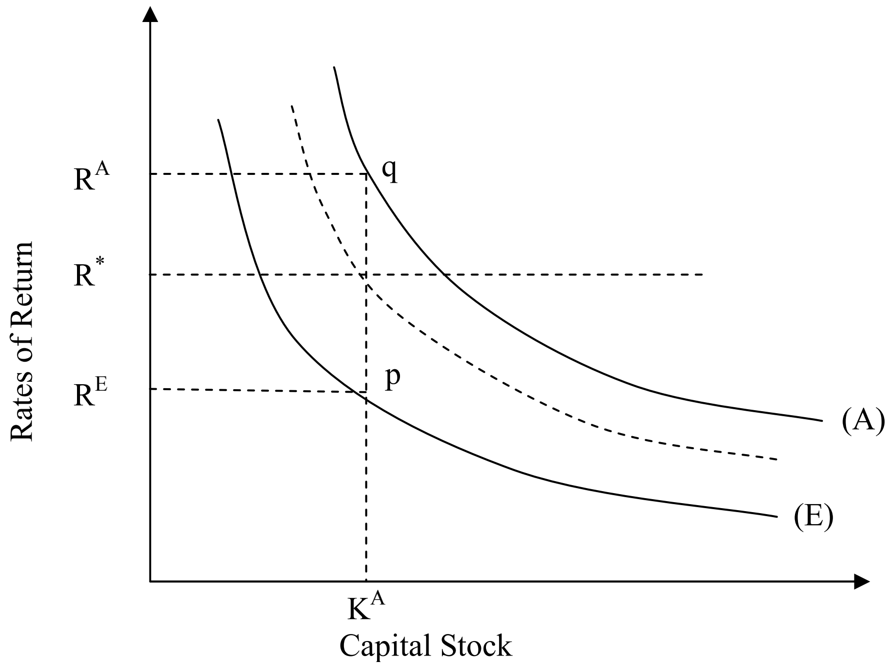
The results derived in the previous section are based on the assumption of benchmark equilibrium data, which are shocked to perform counterfactual experiments and there is no role of time or of adjustment paths in determining the outcome. The investment equation is closed by treating the price of saving as the numeraire good. The purpose of this section is to allow investment to respond to changes in the expected rate of return and see how the economy evolves as capital flows across the border. Because of the particular closure employed in the static GTAP model where capital is only domestically mobile, wide differences in capital rental returns across region can exist in the post-simulation equilibrium. This phenomenon is not consistent with the observation that profit-maximizing international investors can rebalance their portfolios to bring asset returns in line with one another. Empirical results (for example, Golub and McDougall, 2012) also support convergent behaviour in the rates of return to capital across countries over time.

The dynamic investment theory is based on the lagged adjustment of capital stocks and the adoptive expectation of rates of return. At a particular period, the model may be characterized by a disequilibrium situation. For example, the actual data for a country may show higher rates of investment in spite of lower rates of return, as was the case for the Southeast Asian countries immediately before their financial crisis. This type of inconsistent situation is taken as errors in expectation, which are assumed to be eliminated over time.

Figure 5.1 illustrates the determination of investment and capital stocks in this model. The two curves (E) and (A) in the figure represent the expected and the actual rates of return schedules respectively. The former shows the relationship between capital stocks and expected rates of return while the latter shows the relationship between capital stocks and actual rates of return. The downward slopes of these curves indicate that both actual and expected returns fall with the increasing availability of capital. The difference between them is a reflection of the errors in expectation. These curves shown in the figure are a snapshot of the economy at a particular time period when the capital stock is K^A, the actual rate of return is R^A, and the expected rate of return is R^E due to the expectation error in that period.

These two curves are drawn close together over time depending on the strength of an adjustment parameter. As capital stock grows (falls) at the normal rate – the rate at which the actual rate of return remains unchanged – the (E) schedule moves to the right (left) at that rate. The movement of (A) is determined by the apparent normal growth rate of capital stock, which is the sum of actual growth rate of capital and an adjustment factor that depends on the flexibility of the rates of return. When errors are fully eliminated these two curves coincide (shown by the dashed curve in the figure), and from then on the actual and the expected rates of return stay at the long-run rate, R*. The details of the adjustment process and the equation system that governs it can be found in Ianchovichina and McDougall (2012).

Figure 5.1 Investment Schedules: Actual (A) and Expected (E)



Source: Adopted from Ianchovichina and McDougall (2012)

In the recursive dynamic GTAP model, the benchmark dataset changes over years in accordance with the expected changes introduced in some of the exogenous variables in the base data. Since the SAFTA is designed to be implemented in phases, the dynamic model is employed here to investigate the multi-step policy simulation[23]. The welfare outcome and the evaluation of factor income in accordance with the dynamic GTAP model are examined in the following two sub-sections.

5.5.4.1 The Welfare Outcome

In contrast to the static version of the model, the simulation experiment now consists of three consecutive batches of runs: the base run, the base re-run, and the policy deviation run. The base case scenario reflects the future state of the economies over the simulation

[23] The effect of the phasing in of SAFTA can also be evaluated through multi-step static simulations to learn about the separate static effects that are independents of the dynamic interactions.

period, and is built on taking inputs from macro-economic forecasts and expected policy environment. For the purpose of this chapter, the simulations are taken to start from 2007 and proceed for the next five periods, each consisting of five years. The baseline projections are based on Chappuis and Walmsley (2011), where the authors provide long-run macroeconomic projections for the GTAP regions. Some other sources consulted for constructing the baseline scenario are Foure *et al.* (2010), IMF World Economic Outlook (2011), and the IIASA Education Projection (2010) as documented in Samir *et al.* (2010).

The case for using a base re-run arises due to the differences in closures used in the base case and in the policy deviation. Real GDP, for example, is exogenously shocked in the base case in accordance with the future economic outlook, while the real GDP is treated as endogenous in the policy closure to examine the effect of policy deviation on this variable. Changes in closure sometimes change the numerical results, even though there is no policy deviation (Dixon and Rimmer, 2002). Hence, the base case is re-run with the policy closures to prevent the contamination of the policy outcome from the alteration of the closure.

Finally, the policy deviations are implemented in two phases. 15 per cent and 25 per cent additional (compared to the base run) tariff reduction in the traded commodities among the SAFTA members are enforced in the first period (2007 to 2012) and in the second period (2013 to 2017) respectively. Though there is no policy shock after these periods, the effects of the previous policies continue to be felt throughout the future. The results of these experiments on the EV outcome of the SAFTA members are shown in Table 5.5.

Table 5.5: Two-Stage Tariff Reduction Scheme of the SAFTA and the EV Changes in the Dynamic Model *(Millions of US Dollars)*

	Cumulative EV Changes					Contributing Factors (2007-32)		
	2007-12	2013-17	2018-22	2023-27	2029-32	Allocative Efficiency	TOT Effects	Technical Change Effect
NAFTA	-110 (<-0.001)	-1524 (-0.009)	-8295 (-0.050)	-15290 (-0.093)	-18951 (-0.115)	-7350 (-0.045)	-975 (-0.006)	-3807 (-0.023)
EU25	65 (<0.001)	1642 (0.010)	-5640 (-0.034)	-15352 (-0.091)	-21318 (-0.127)	-13106 (-0.078)	-1187 (-0.007)	-4240 (-0.025)
ROW	-1037 (-0.005)	-7739 (-0.039)	-23142 (-0.117)	-40161 (-0.204)	-50170 (-0.254)	-21976 (-0.111)	-5281 (-0.026)	-8819 (-0.045)
ASEAN	-185 (-0.014)	-1114 (-0.086)	-2200 (-0.170)	-3369 (-0.260)	-4080 (-0.315)	-1786 (-0.138)	-319 (-0.025)	107 (0.008)
Bangladesh	-314 (-0.459)	-6457 (-9.438)	-7819 (-11.429)	-9247 (-13.516)	-10250 (-14.982)	-11474 (-16.771)	56 (0.082)	1462 (2.137)
India	3183 (0.258)	3334 (0.270)	10013 (0.812)	15913 (1.291)	18424 (1.494)	-25905 (-2.101)	8297 (0.673)	14456 (1.173)
Nepal	218 (2.120)	636 (6.185)	1894 (18.419)	3823 (37.178)	5128 (49.869)	-413 (-4.016)	-439 (-4.269)	655 (6.370)
Pakistan	-110 (-0.077)	-12470 (-8.710)	-13996 (-9.776)	-14323 (-10.004)	-14330 (-10.009)	-20513 (-14.328)	351 (0.245)	3000 (2.095)
Sri Lanka	-154 (-0.476)	-2445 (-7.558)	-1876 (-5.799)	-1294 (-4.000)	-1140 (-3.524)	-10884 (-33.643)	615 (1.901)	2383 (7.366)
RSA	-195 (-1.623)	-2799 (-23.292)	-3804 (-31.655)	-4989 (-41.516)	-5771 (-48.024)	-8819 (-73.388)	-1171 (-9.745)	1841 (15.320)

Note: These figures are expressed as percentages of the base-year (2007) GDPs of the respective regions inside the brackets.

The effects of the tariff reduction scheme are reported as the cumulative differences between the outcomes of the two scenarios: the base run or the control path and the perturbation of that path by the policy deviations. When these results are compared with the EV results obtained before under the static simulations scenarios in Table 5.3, the effects of introducing dynamics and allowing cross-border capital flows are dramatic. In the static case, all of the South Asian countries enjoyed higher welfare under the 15 per cent regional and unilateral tariff liberalization scenarios. Now in the dynamic case, except for India and Nepal, these countries are losers in the long run compared to the base-run forecast. For Bangladesh, Pakistan, Sri Lanka, and the rest of South Asia, the welfare losses increase over time. The accumulated welfare loss at the end of the period for these countries stand at 10250 million, 14330 million, 1140 million, and 5771 million US dollars respectively.

Though the welfare of India and Nepal increase over time, the overall welfare change of the region turns out negative and the welfare loss is severe for the world as a whole. Welfare losses of an FTA can be explained with Krueger's (1995) interpretation that, to avoid the rules of origin barrier, investors crowd in the country with the most liberal tariff structure within the bloc, which is often not in conformity with the law of comparative advantage. This leads to an inefficient production structure and reduced welfare.

The way the EV changes are calculated can be decomposed into many contributing parts for each of the periods (Huff and Hertel, 2000), some of which are reported at the right hand portion of Table 5.5. The country specific overall EV effects conceal the mixed response of the ingredients that make up the overall effects. First of all, the resource allocation effect is negative in all regions irrespective of whether they are member of SAFTA or not. This confirms that allowing for discriminatory trade liberalization in South Asia will lead to a wrong type of resource allocation in the region. However, the technical change effect is positive for all SAFTA members.

Finally, as consumers and producers adjust consumption and sales in response to policy changes, relative prices of exports and imports also change. Contributions to national welfare from this source, or the terms of trade (TOT) effect component of the welfare changes, among the South Asian countries are mixed. India, Pakistan, and Sri Lanka gain from terms of trade changes, while Nepal, Rest of South Asia, and non-members suffer from adverse terms of trade movement. Welfare gain for Bangladesh from this source is minimal, only 56 million US dollars accumulated over the thirty years of the simulation period.

This pattern of terms of trade changes is a reflection of the observation in Panagariya and Duttagupta (2001) that preferential tariffs can lead to deteriorated TOT for the smaller open economies in a bloc. International prices are not affected much in such cases, and the tariff preferences of the smaller members effectively turn into TOT gains for exporters in the larger members. In the absence of trade creation, replacement of efficient world export by the members (trade diversion) creates efficiency loss and net welfare losses for both the bloc and the world as a whole.

5.5.4.2 Impact on the Functional Distribution of Income

Apart from the welfare measure considered above, an important question that societies face and modern trade theories purport to explain is how factor earnings are affected by trade liberalization. Changes in factor earnings have important political economy implication for carrying out the reform program. Distribution of factor ownership is not even in a society and hence functional distribution of income is linked with the personal distribution of income. Possibilities of upsetting the income balance may attract political opposition to the reform program. Since there are five factors of production in the model, the solution values for the price variables corresponding to these factors should give us some idea of how factor earnings are likely to evolve over the simulation period. Table 5.6 shows the cumulative differences in factor prices along the policy path against the baseline scenario in the two-stage tariff reduction dynamic simulation.

Table 5.6: Cumulative Differences in Factor Price Changes between the Baseline Scenario and the Policy Path

	Bangladesh	India	Nepal	Pakistan	Sri Lanka	Rest of South Asia
Land	21.02	6.81	157.99	20.84	80.94	168.74
Unskilled Labour	13.98	5.29	132.28	17.00	75.03	120.05
Skilled labour	12.26	4.34	191.03	17.02	76.75	126.31
Capital	-2.16	1.38	47.44	-0.17	6.93	-3.97
Natural Resources	21.73	7.61	260.38	28.47	109.27	334.25

Note: Figures in the table are differences, at the end of the simulation period, between the percentage changes according to the policy path and the baseline projection.

The factor price changes are more or less in line with the prediction of the Stolper-Samuelson factor price equalization theorem. South Asian countries are labour-abundant and, in accordance with the theory, wages are expected to rise faster than the capital rentals. Except for Nepal, skilled and unskilled wages rise almost at the same rate within each countries of the region, because of the policy shock. The accumulated wage gains are higher for the smaller economies, ranging from 120 to 191 per cent, and smaller for India, only around 5 per cent. For Bangladesh and Pakistan, the wage gain is around 12 to 17 per cent, while wage will moderately rise in Sri Lanka by 76 per cent. In spite of wage increases, net welfare in some countries fall. This happens because the GDP price indexes of these countries rise at the end of the simulation period which has negative impacts on consumer surplus. Changes in tariff revenue, terms of trade and some other factors also interact to determine the net welfare position.

The skill difference does not matter much in terms of their price increase. This however does not mean that the demand for these two types of labour will rise at the same rate. In fact, when we look at the baseline scenario in Table A5.7 in the appendix, it becomes clear that the supply of skilled labour is expected to rise faster than the unskilled labour in South Asia. So their demand will also rise faster than the unskilled labour to ensure that the wages for these two categories of labour rise *pari passu*. The rapid growth of skilled wage in Nepal and in the rest of the South Asian countries can be explained by the fact that in the baseline scenario the skilled labour forces of these countries are projected to grow mildly compared to the other South Asian countries. Land and natural resources, which are sluggish in movement and are of fixed supply within a country in the baseline scenarios, are most severely affected in Nepal and other smaller members of South Asia, as the export baskets of these countries are heavily dependent on land and natural resources (such as, forestry in Nepal, fisheries and tourism in the Maldives, and vegetables in Bhutan).

5.6 Conclusion

Trade policy reforms inevitably give rise to winners and losers, both within and across the regions. Alternative scenarios of trade liberalization policies and their potential impact on welfare have been examined in this chapter from the perspective of the static GTAP framework and its recursive dynamic extension. The results from the static version of the model show that, given the policy stance of the other countries, it is in each individual South Asian country's own interest to unilaterally liberalize their economies along with the regional liberalization. The economy implementing unilateral reform substantially improves its welfare and effectively shields itself from the detrimental effect of unilateral trade liberalization policies of the other members. The result implies that the South Asian countries should not limit their liberalization attempt to the regional front only. In the absence of progress in multilateral trade reform, payoffs from autonomous liberalization for these countries are also enormous.

An explicit investment equation and adjustment mechanism of rates of returns across the regions are then introduced into the model to examine the dynamic effect of the trade liberalization program. A baseline scenario is also constructed by taking input from available macroeconomic forecasts for the GDPs, skilled labour, and unskilled labour. The policy deviation from the benchmark economy consists of two-stage tariff reductions by the SAFTA members: 15 per cent in the first period (2007-2012) and 25 per cent in the second period (2013-2017). When the cumulative differences in welfare accumulated along the policy path and the controlled baseline scenario are examined, it turns out that except for India and Nepal, all other South Asian countries lose welfare. The decompositions of the welfare change show that there are some gains from technological change but substantial loss from resource misallocation. Overall, both the region and the rest of the world face welfare loss from the agreement.

The distributional consequences of the agreement from the functional income perspective are then examined and, in accordance with the Stolper-Samuelson theorem, it is found that abundant factors in each region stand to gain from the liberalization program. The result from the dynamic simulation shows that the price of labour rises faster than the price of capital in the long run in all member states. Increases in the GDP price indexes, however, cause net welfare loss in some of these countries. To have a consolidated view of the impact of the tariff liberalization program of the SAFTA, the welfare results of this chapter and the results of the previous chapters are put together in the next chapter. Potential for further research in this area of study is also indicated in that chapter.

CHAPTER 6
CONCLUSION

6.1 Introduction

The South Asian free trade agreement (SAFTA) was launched in 2006 in response to the proliferating preferential trading agreements in other parts of the world in general, and the incentive form the success story of the neighbour regional trade bloc, the association of the Southeast Asian nations' free trade area (AFTA), in particular. The broad aim of this thesis is to investigate the economic impacts of the current regional free trade agreement in South Asia from three important perspectives, namely, the trade flow, productivity, and welfare. Depending on the nature of the problem, these issues are addressed with an extended gravity model, production frontier approaches, and general equilibrium methods.

A general implication of the study is that, an effective regional integration requires not only the provision for preferential tariff margins, but also a significant commitment from the contracting parties to eliminate other forms of trade barriers. Based on the explanations provided in the preceding chapters, we may argue that the existing shallow integration in terms of tariff concessions on a limited number of items is not effective in bringing noticeable changes in the South Asian economies. Traders are unwilling to apply for the regional preference, as the bureaucratic cost of doing so exceeds the thin margin of preference. Trades are taking place as before, exploiting the most favoured nation (MFN) tariffs that are available under the multilateral WTO agreement.

In the presence of a real resource cost to maintain the agreement (for example, administrative cost to oversee the implementation of the rules of origin issue), the overall impacts of the agreement are detrimental to the economies of South Asia, so far as the trade flow, productivity and welfare effects of the preferential tariff concessions are concerned. The purpose of this chapter is to present the key findings of the previous chapters, indicate policy implications, and recommend the direction for future research in this area of study.

The rest of the chapter is organized as follows. Section 6.2 presents the key findings of the study, which is followed in Section 6.3 by the policy implications. Limitations of the study and some areas that deserve attention in future works are indicated in Section 6.4.

6.2 Key Findings

The major research problem pursued in Chapter 3 has been to disentangle the effect on trade flows of the regional trading agreement from the influence of other factors like GDP growth and non-tariff barriers to trade. Several conclusions emerge from the analysis of the chapter. First of all, though the GDPs of the trading partners are significant in affecting bilateral trade, geographical proximity measured in terms of bilateral distance is not. Second, the thin margin of preference offered in SAFTA has failed to bring momentum in intra-regional trade in South Asia. The trading community of the region has been reluctant to collect extra documents and go through additional administrative procedure to avail the thin regional preference. Third, though on average intra-regional trade flows do not rise in South Asia because of the agreement, there are country-specific variations in the result. Regression results based on the interaction between GDP similarity index and the RTA dummy indicate that when trading partners are dissimilar in terms of the similarity index (such as India and Nepal), the loss in bilateral exports are lower than when the trading partners have more similar income (such as Bangladesh and Pakistan). Sub-regional agreements of India with the small countries of the region (e.g. with Nepal) make the broader SAFTA agreement more useful to them.

The productivity effect of the preferential trade liberalization in South Asia is analysed in Chapter 4. Results obtained from the stochastic frontier and the data envelopment analyses show that the total factor productivity in South Asia is on the wane after the free trade agreement. The decomposition of the total factor productivity establishes technical efficiency as the prime source of the observed productivity decline in South Asia. When compared with the productivity performance of the neighbour Southeast

Asia region, it is found that the South Asian countries are performing worse in the post-SAFTA period. Inability to expedite investment activities and harness the labour force to appropriate the currently available modern technologies has been the stumbling blocs on the way of achieving higher productivity growth in South Asia.

There is, however, country heterogeneity in terms of technical efficiency in resource utilizations. This creates a ray of hope for productivity improvement through regional integration, if the depth of integration can be carried out to the level from where cross border resource mobility becomes a reality. Another result from the analysis of this chapter is that the productivity performance is better for countries that have a balanced input mix. Sri Lanka, India, and the Maldives have acquired more or less balanced input combinations and their performances are relatively better compared to the other South Asian countries in the sample period. However, though Nepal has managed to accumulate capital faster than labour force and entered into the balanced zone of input mix, her productivity performance remains lower. This is explained by the quality versus quantity attributes of a similar combination of inputs, and suggests the importance of developing quality inputs for the purpose of productivity growth. For countries like Nepal, for example, human resource development is a key factor for reducing technical inefficiency.

Preferential trade liberalization and its impact on the economic welfare of the South Asian counties are studied in Chapter 5 from a general equilibrium framework. The results from the static part of the analysis show that a 15 per cent margin of regional tariff concession benefits the members at the expense of the non-members. India emerges as the topmost beneficiary of the regional tariff reform, probably because of her higher initial bilateral tariff in the benchmark data. The welfare outcomes are significantly higher for members that implement unilateral reforms along with the regional agreement. Thus the incentive for undertaking unilateral reforms among the members is strong.

In the dynamic exercise, the trade policy deviation representing a two-step preferential tariff reform – a 15 per cent tariff concession in the first period and another 25 per cent in the next period – show that most of the countries and regions face welfare loss against the benchmark scenario. Only India and Nepal remain in the positive territory of welfare change. The South Asia region and the world as a whole lose in net terms. There is, however, a compensating soothing effect of the program on the functional distribution of income. Both skilled and unskilled wages rise at the same rate and remain substantially higher than the capital earnings throughout the simulation period. For the smaller countries in South Asia, such as Nepal, Bhutan, and Maldives, the prices of land and natural resources sharply rise after the liberalization, as their export bases are heavily dependent on the fixed supply of these two sluggish factors.

6.3 Policy Implications

The key findings of the study discussed above have some important implications for the South Asian countries regarding their trade policy strategies. Considering the importance of international trade in economic growth and development, trade liberalization is now an integral part of policy reform agendas of many developing countries. Trade liberalization through regional integration is one of several trade policy options. The depth of economic integration depends on more than the number of tariff lines covered in the concession lists and the amount of preferential margins offered. Free movement of resources, investment measures, harmonization of standards, and coordination of economic policies among the participating nations also play a crucial role in fostering intra-regional trade flows. Indeed, the productivity analysis of the free trade agreement in South Asia pursued in this thesis finds varying performance of the inputs among the South Asian countries, implying the potential for a mutually beneficial cross border resource flow agreement. There are no signs of willingness, however, on the part of the South Asian countries to extend cooperation in these fields.

Under such circumstances SAFTA remains ineffective, and a relevant question arises as to what alternative policy options are available for the South Asian countries to sustain their trade supported growth. One obvious response to the weak regional trade liberalization approach is to reduce tariff and non-tariff barriers unilaterally without considering the trade policy measures of other countries. From a welfare perspective, the empirical analysis of this thesis also supports unilateral trade reforms of the members. It is argued that, though such an independent policy will not invoke reciprocal tariff concessions from the trading partners, it will improve the society's welfare by enabling consumers and producers access to more varieties of commodities at lower prices. If it happens that productive resources are not utilized properly at their potential level in the protected regime, liberalization will bring productivity by increasing competitiveness. Unilateral liberalization policy is, however, hard to implement, especially in countries where government policies are influenced by interest groups or political lobbies. There are also risks of balance of payment deterioration and the associated dependency on foreign funding.

Another alternative is liberalization on reciprocal basis, which covers both multilateral and bilateral approaches. Advantages of the reciprocal against the unilateral liberalization include limited increase in foreign competition and opportunities for market access in other countries. Because of these two offsetting effects, producers are less reluctant to oppose liberalization that is taken on a reciprocal basis. Though both regional and multilateral approaches embrace reciprocity, the former has an element of discrimination within it, in that only a handful of members receive concessions. On the contrary, the principle of non-discrimination is inherent in multilateral negotiations. The very first article of the GATT (now WTO) states that any concession offered by any members should be equally enjoyed by the every other member.

However, diversity of interests among a large number of countries makes the process tremendously slow moving. The latest multilateral trade talk that started in Doha in 2001 could not be concluded as of December 2013. The progress of the multilateral talks is hampered as new complicated issues like agricultural and services sector liberalization arise. Of late, in the WTO Ministerial Conference in Bali, a coalition of 19 agricultural commodity exporting countries, the Cairn Group, pressed for reducing farm subsidies and market distortions. The new director general of the WTO, Roverto Azevedo of Brazil, managed to keep the Doha Round alive by striking a bargain among the 159 member countries to make them agree to take measures to speed up the processing of goods through customs, and to publish their custom requirements. It is expected that more progress could be achieved in the future built on this "Doha Lite" deal.

While regional liberalizations are quicker and relatively easy to negotiate, the stability and irreversibility of commitment are not as good as those achieved through multilateral talks. This can be seen from the fact that many regional agreements have fallen dormant after their creation. The multilateral approach is credible in that it is harder for the contracting parties to renege on an agreement reached through the WTO. Moreover, many arguments showing static and dynamic gains from regional integration also apply to other forms of trade liberalizations. Increased competition and knowledge dispersion through export and import activities are inherent in increased trade flows, by whichever means these are achieved.

So, wherever possible, the path of multilateral liberalization should be the first-best policy option. But many economists at the same time believe that preferential trading agreements (PTAs) are now so deeply rooted in the world trading system that they will stay side by side with the multilateral system. Frustrated by the lack of decision among many players, countries are now teaming up on a smaller scale, so that the badly needed trade expansion can take place. The two big regions across the Atlantic, the EU and the USA, that represent 60 per cent of the world GDP, held their FTA talk in the early 2014 to expand trade, investment, and remove regulatory barriers. Sometimes a country finds it easier to grant concession in one area (for example, strengthening intellectual property rights) and obtain concession in other areas (such as market access) on a *quid pro quo* basis to another country, by forming a preferential bloc. Since preferential blocs are proliferating at a rapid pace, the policy of not joining some PTAs will mean trade diversion for the countries left out.

Though regional integrations and numerous PTAs complicate the world trading system through their rules of origin, a common pattern observed for many countries is that they are not locking themselves in a single PTA, but are actively searching for and forming multiple PTAs. This latest trend reduces the possibilities of trade diversion or the detrimental effects that may arise from a given amount of diverted trade form a single

PTA. In the case of multiple PTAs, it is quite likely that the new sources of supplies will not be drastically inferior to the previous world standard sources, which may be the case for a single PTA. Fear of deteriorating trade balances also disappears if increased import form one agreement is offset by increased export from another. Opportunities for knowledge diffusion and productivity gains from a single PTA are also limited. Schiff (2002) has reached a similar conclusion after examining Chile's trade policy options of entering into PTAs with an array of countries including the US, the EU, and the so called four Asian tigers: Hong Kong, Korea, Singapore, and Taiwan.

In sum, among the three broad categories of liberalization mechanisms, unilateral, multi-lateral and bilateral, the first deserves assiduous consideration as the second method has been historically found to be very slow moving and the third one has been trade diverting for many regions. In the case of the South Asian regional integration, the numbers of tariff lines covered in the concession list are scanty, and at the same time important commodities that account for a lion's share of their trade remain outside the concession list. Moreover, the margins of preferential benefits are shrinking with widespread unilateral trade reforms. Whatever little preferences are available, tend to be offset by the presence of non-economic barriers and the rules of origin issue. However, since the world trading system is dominated by the discriminatory trades of the NAFTA and the EU, the results of the study suggest that the South Asian countries can strive for a larger Asia-wide regional bloc including China to counteract the detrimental effects of preferential trade arising from outside the region. Alternatively, they can engage in several FTAs that befit each country.

6.4 Limitations and Areas of Future Research

Like any other study, the current research is also limited by its scope, methodology, and some practical considerations. First, the findings of this study reflect the effects of the preferential tariffs only, since in the SAFTA, the members are legally obligated to grant the agreed-upon concession through this channel only. Other areas of cooperation, like investment measures, depend on the goodwill gesture of the member countries. The impact of tariff reform, however, represents only one dimension of the regional integration and tariffs are often an insignificant part of total trade costs. Average tariffs on food in Latin America, for example, contribute 3 to 12 per cent of product values, while transport costs account for around 50 per cent of the value (Schwartz *et al.* 2009).

Successful integration requires holistic measures. Building institutions, establishing a common or regional currency, improving transport and logistic infrastructure, easing custom procedure, harmonizing standards, and trade facilitation measures are essential to make tariff concession effective in increasing trade. Moreover, regional integration is often directed toward achieving non-trade goals like managing common resources (Limão, 2006). A proper evaluation of the regional bloc SAFTA, thus, requires a more broad based study in the future.

Secondly, the study findings are based on country-level aggregated data form the South Asia Region. The aggregate nature of the data imposes some limitations on analysing and explaining the productivity growth outcome of the regional integration. Some aspects of productivity growth that are not linked to aggregate inputs, such as the structural change in the economy, reflecting the movement of economic activities form agricultural to the manufacturing sector, are not explained in the current study. Similarly, because of relying on macro data, the impact on productivity from firm dynamics like entry-exit and spatial reallocation of firms in response to trade reforms remain outside the scope of this thesis. Even at the aggregate level, time-series information on some relevant variables like research and development expenditure is not available for the South Asian countries. Finding appropriate proxies and incorporating them into the productivity analysis deserve attention in future research works.

Thirdly, the welfare analysis conducted in this study can be extended or supplemented in several directions in future work. First, the ten-sector level aggregation considered here may not be sufficient for some practical trade policy problems. Trade policy measures are often taken at finer level of disaggregation, focusing on particular industries. The negotiations of the USA with her trading partners over the voluntary export restraints (VERs), for example, have been centred on the steel industry. A sector-focused general equilibrium model is required to analyse the effect of policy changes in such a situation.

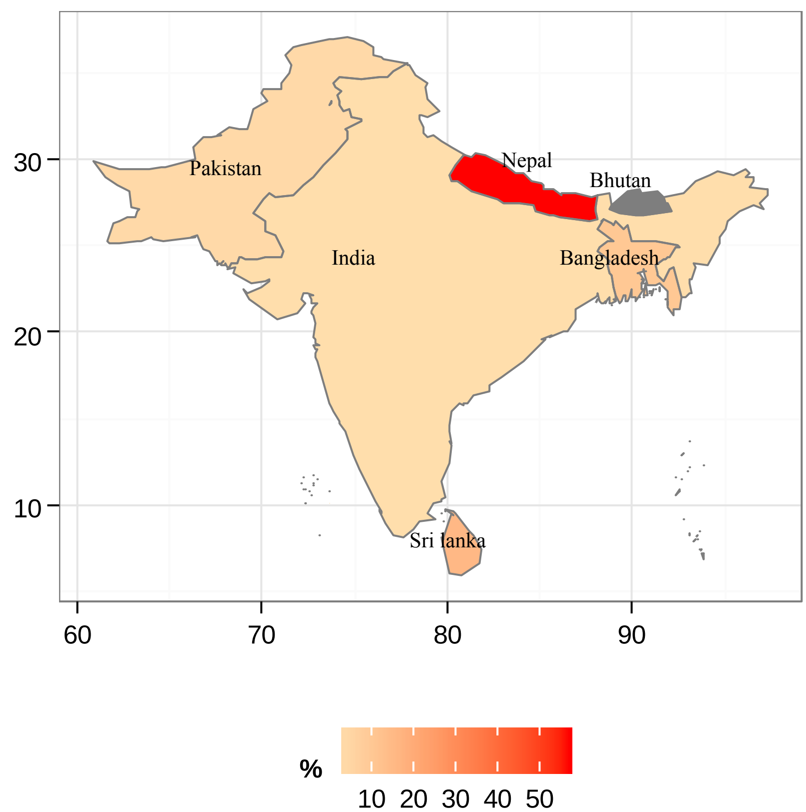
Since clothing is an important industry in South Asia, sector-focused CGE models for the South Asian countries can be built to determine the effect of policy shocks or external shocks on this and other related sectors. Highlighting a few related industries at finer levels and relegating others into few broad sectors through flexible aggregation will make the effects on upstream and downstream industries more transparent. In case of broadly aggregated sectors without isolating some key industries, as has been done in this study, backward and forward linkages are hard to disentangle from the results.

Finally, intra-regional trades in South Asia are more obstructed by non-tariff barriers and the complicated rules of origin. Quantification of these trade barriers or finding their tariff equivalents is important to investigate the impact of relaxing these constraints on bilateral trade flows. Further works are needed in this area and results from such exercises will be interesting.

In spite of these limitations, the study provides some general results on the economic consequences of the shallow regional integration in South Asia. These results should be of interest to both policy makers and researchers. In particular, this study shows that the ex-post outcome of policy changes might not be in accordance with the ex-ante expectation. When SAFTA was launched in 2006, it was expected that the South Asian economies would become more regionally integrated. However, controlling for the relevant variables, this thesis has demonstrated that this has not been the case for the South Asian countries. There are some costs involved in maintaining the agreement. These include, among others, maintaining a secretariat, arranging regular meetings, overseeing the implementation of the agreement, and setting up a dispute settlement mechanism. The study findings indicate that to make these costs worth incurring, the depth and coverage of the concessions offered through SAFTA should be made more appealing so that traders become more willing to take advantage of them and turn South Asia into a more integrated region.

APPENDIX TO CHAPTER 2

Figure A2.1: South Asian Countries and their Intra-regional Trade Dependencies (2010)



Notes:

- *Trade dependency is indicated by colour depth (as in choropleth map)*
- *Intra-regional trade dependency for Bhutan is not shown because of data unavailability*

Source: Author, based on data obtained from the "mapdata" package of R.

Table A2.1: Top Ten Export Items from the South Asian Countries

Country: Bangladesh (2007)

HS Code	Item Description	Values (mil $)	% of Total	Cum %
6203	Men’s or boy’s suits, ensembles, jackets, blazers, trousers	2183.8	16.62	16.62
6109	T-shirts, singlets, and other vests, knitted or crocheted	2087.1	15.88	32.50
6110	Jerseys, pullovers, cardigans, waist-coats, and similar articles	1300.0	9.89	42.39
6204	Women’s or girl’s suits, ensembles, jackets, blazers, dresses, skirts	1033.6	7.86	50.25
6205	Men’s or boy’s shirts	841.3	6.40	56.65
0306	Crustaceans, whether in shell or not	612.6	4.66	61.31
6105	Men’s and boy’s shirts, knitted or crocheted	359.6	2.74	64.05
6108	Women’s or girl’s slips, petticoats, briefs, panties, knitted or crocheted	389.6	2.96	64.14
6302	Bed linen, table linen, toilet linen, and kitchen linen	247.1	1.88	67.11
5209	Woven fabrics of cotton, containing 85% or more by weight of cotton	12.3	0.09	68.99

Country: Bhutan (2009)

HS Code	Item Description	Values (mil $)	% of Total	Cum %
2716	Electrical Energy	208.5	42.05	42.05
7202	Ferro-alloys	90.3	18.21	60.27
2523	Portland cement, aluminous cement, slag cement	29.5	5.95	66.22
2849	Carbides, whether or not chemically defined	21.0	4.24	70.45
7408	Copper wire	20.1	4.05	74.51
7214	Other bars and rods of iron or non-alloy steel	18.0	3.63	78.14
8523	Prepared unrecorded media for sound recording	12.8	2.58	80.72
2518	Dolomite, whether or not calcinated or sintered	11.8	2.38	83.10
0910	Ginger, saffron, turmeric, thyme, bay leaves, curry and other spices	0.5	0.10	83.20
1516	Animal and vegetable fat and oils	--	--	--

Country: India (2009)

HS Code	Item Description	Values (mil $)	% of Total	Cum %
2710	Petroleum oils, other than crude	23226.0	13.14	13.14
7102	Diamonds, whether or not worked, but not mounted or set	16689.2	9.44	22.58
7113	Articles of jewelry and parts thereof, of precious metal	10604.1	6.00	28.58
9999	Commodities specified not according to kind	7719.4	4.37	35.94
2601	Iron ores and concentrates	5298.6	3.00	31.58
3004	Medicaments (excluding goods of heading 30.02, 30.05, or 30.06)	3969.4	2.25	38.19
8703	Motor cars and other motor vehicles principally designed for transport	2904.8	1.64	42.43
1006	Rice	2398.2	1.36	39.55
2942	Other organic compounds	2185.4	1.24	40.78
6204	Women’s or girl’s suits, ensembles, jackets, blazers, dresses, skirts	1966.7	1.11	43.54

Table A2.1: Top Ten Export Items from the South Asian Countries (cont.)

Country: Maldives (2008

HS Code	Item Description	Values (mil $)	% of Total	Cum %
0303	Fish, frozen, excluding fish fillets	66.5	52.61	52.61
0304	Fish fillets and other fish meat (whether or not minced)	26.5	20.97	73.58
1604	Prepared or preserved fish, caviar	9.9	7.83	81.41
0302	Fish, fresh or chilled, excluding fish fillets	9.6	7.59	89.00
0305	Fish, dried, salted or in brine	8.7	6.88	95.89
0301	Live fish	1.4	1.11	96.99
7204	Ferrous waste and scrap; re-melting scrap ingots of iron or steel	1.2	0.95	97.94
2301	Flours, meals and pallets, of meat or meat offal	1.0	0.79	98.73
0307	Molluscs, whether in shell or not	0.6	0.47	99.21
7404	Copper waste and scrap	0.5	0.40	99.60

Country: Pakistan (2010)

HS Code	Item Description	Values (mil $)	% of Total	Cum %
6302	Bed linen, table linen, toile linen, and kitchen linen	2639.2	12.33	12.33
1006	Rice	2277.1	10.63	22.96
5205	Cotton yarn (other than swing thread), containing 85% or more	1628.7	7.61	30.57
2710	Petroleum oils, other than crude	1196.6	5.59	36.15
6203	Men’s or boy’s suits, ensembles, jackets, blazers, trousers	849.2	3.97	40.12
5209	Woven fabrics of cotton, containing 85% or more by weight of cotton	707.9	3.31	43.43
5208	Woven fabrics of cotton, containing 85% or more by weight of cotton	668.6	3.12	46.55
4203	Articles of apparel and clothing accessories, of leather	590.7	2.76	49.31
6105	Men’s or boy’s shirts, knitted or crocheted	583.1	2.72	52.03
2523	Portland cement, aluminous cement, slag cement	460.7	2.15	54.18

Country: Sri Lanka (2010)

HS Code	Item Description	Values (mil $)	% of Total	Cum %
0902	Tea, whether or not flavoured	1366.8	16.46	16.46
6204	Women’s or girl’s suits, ensembles, jackets, blazers, dresses, skirts	584.2	7.04	23.49
6108	Women’s or girls’ slips, petticoats, briefs, panties, knitted or crocheted	407.0	4.90	28.40
6203	Men’s or boys’ suits, ensembles, jackets, blazers, trousers	368.9	4.44	32.84
6109	T-shirts, singlet, and other vests, knitted or crocheted	345.6	4.16	37.00
6212	Brassieres, girdles, corsets, braces, suspenders, garters	326.7	3.93	40.93
7102	Diamonds, whether or not worked, but not mounted or set	310.6	3.74	44.67
6104	Women’s or girls’ suits, ensembles, jackets, blazers, dresses, skirts	239.7	2.89	47.56
4012	Re-treaded or used pneumatic tyres of rubbers	200.7	2.42	49.98
9999	Commodities not specified according to kind	132.5	1.60	51.57

Note: four digit HS codes are according to harmonized system definition 2002; figures for Nepal not available from Comtrade.
Source: UN Comtrade database, 2010

Table A2.2: Top Ten Import Items of the South Asian Countries

Country: Bangladesh (2007)

HS Code	Item Description	Values (mil $)	% of Total	Cum %
2710	Petroleum oils, other than crude	1558.8	8.85	8.85
5201	Cotton, not carded or combed	1041.4	5.91	14.75
1511	Palm oil and its fractions	906.1	5.14	19.90
1507	Soya-bean oil and its fractions	621.5	3.53	23.42
1001	Wheat and meslin	590.4	3.35	26.77
8525	Transmission apparatus for radio telephony, radio broadcasting	522.8	2.97	29.74
8908	Vessels and other floating structure for breaking up	401.8	2.28	32.02
1006	Woven fabrics of cotton, containing 85% or more by weight of cotton	393.3	2.23	34.25
2523	Portland cement, aluminous cement, slag cement	324.3	1.84	36.09
1701	Cane and beet sugar and pure sucrose, in solid form	305.6	1.73	37.83

Country: Bhutan (2009)

HS Code	Item Description	Values (mil $)	% of Total	Cum %
2710	Petroleum, other than crude	62.4	11.79	11.79
8703	Motor Cars and other motor vehicles principally designed for the transport	24.7	4.67	16.45
7203	Ferrous products obtained by direct reduction of iron ore	20.6	3.89	20.34
8429	Self-propelled bulldozers, angle dozers, graders, levelers, scrapers	15.2	2.87	23.21
1006	Rice	14.9	2.81	26.03
8704	Motor vehicle for transport goods	12.8	2.42	28.45
7408	Copper wire	12.2	2.30	30.75
7204	Ferrous waste and scrap, re-melting scrap ingots of iron or steel	10.7	2.02	32.77
8517	Electrical apparatus for line telephony or line telegraphy	7.7	1.45	34.23
1511	Palm oil and its fractions	0.1	0.02	34.25

Country: India (2009)

HS Code	Item Description	Values (mil $)	% of Total	Cum %
2709	Petroleum oils, crude	64,899.5	24.36	24.36
7108	Gold (including gold plated with platinum)	23365.1	8.77	33.13
7102	Diamonds, whether or not worked, but not mounted or set	15226.4	5.72	38.85
2701	Coal, briquettes, ovoid, and similar solid fuels manufactured coal	7589.5	2.85	41.70
9999	Commodities not specified according to kind	5457.2	2.05	43.75
2710	Petroleum oils, other than crude	4563.2	1.71	45.46
8802	Other aircraft (for example, helicopters, aero planes), spacecraft	4292.3	1.61	47.07
2711	Petroleum gases and other gaseous hydrocarbons	4097.0	1.54	48.61
8525	Transmission apparatus for radio telephony, radio broadcasting	3598.2	1.35	49.96
2603	Copper ores and concentrates	3020.8	1.13	51.09

Table A2.2: Top Ten Import Items of the South Asian Countries (contd.)

Country: Maldives (2008)

HS Code	Item Description	Values (mil $)	% of Total	Cum %
2710	Petroleum oils, other than crude	278.5	20.07	20.07
8905	Light vessels, fire floats, dredgers, floating cranes and other vessels	57.7	4.16	24.23
2711	Petroleum gases and other gaseous hydrocarbons	34.8	2.51	26.74
4407	Wood sawn or chipped lengthwise, slices or peeled	30.6	2.21	28.94
8525	Transmission apparatus for radio telephony, radio broadcasting	24.9	1.79	30.74
2523	Portland cement, aluminous cement, slag cement	20.9	1.51	32.25
8517	Electrical apparatus for line telephony or line telegraphy	19.2	1.38	33.63
8471	Automatic data processing machines and units thereof	17.7	1.28	34.90
9403	Other furniture and parts thereof	17.5	1.26	36.17
8544	Insulated (including enamelled or anodized) wire, cable	16.7	1.20	37.37

Country: Pakistan (2010)

HS Code	Item Description	Values (mil $)	% of Total	Cum %
2710	Petroleum oils, other than crude	7238.6	19.28	19.28
2709	Petroleum oils and oils obtained from bituminous minerals, crude	3516.3	9.37	28.65
1511	Palm oil and its fractions	1659.2	4.42	33.07
8517	Electrical apparatus for line telephony and line telegraphy	835.1	2.22	35.30
5201	Cotton, not carded or combed	760.2	2.03	37.32
8703	Motor cars and other motor vehicles principally designed for transport	618.7	1.65	38.97
8502	Electric generating sets and rotary converters	588.4	1.57	40.54
7204	Ferrous waste and scrap; re-melting scrap ingots of iron or steel	557.6	1.49	42.02
2701	Coal, briquettes, ovoids, and similar solid fuels manufactured from coal	484.2	1.29	43.31
1001	Wheat and meslin	18.2	0.05	43.36

Country: Sri Lanka (2010)

HS Code	Item Description	Values (mil $)	% of Total	Cum %
2710	Petroleum oils, other than crude	1128.6	9.14	9.14
2709	Petroleum oils and oils obtained from bituminous minerals, crude	751.6	6.08	15.22
8703	Motor cars and other motor vehicles principally designed for transport	445.8	3.61	18.83
6006	Other knitted or crocheted fabrics	372.3	3.01	21.84
1701	Cane or beet sugar and chemically pure sucrose, in solid form	359.1	2.91	24.75
5209	Woven fabrics of cotton, containing 85% or more by weight of cotton	297.5	2.41	27.16
7102	Diamonds, whether or not worked, but not mounted or set	274.1	2.22	29.38
0402	Milk and cream, concentrated or containing added sugar	247.4	2.00	31.38
1001	Wheat and meslin	236.5	1.91	33.29
2523	Portland cement, aluminous cement, slag cement	189.7	1.54	34.83

Note: four digit HS codes are according to harmonized system definition 2002; figures for Nepal not available from Comtrade. Source: UN Comtrade database, 2010

Table A2.3: Changes in Income and Inequality in South Asia

Country	Year	R/P Ratio	GNI Index
BD	1982	6.9	0.39
BD	2004	11.1	0.45
BH	2004	7.6	0.42
IN	1990	4	0.28
IN	2000	4	0.28
NE	1996	5.9	0.34
NE	2004	8.6	0.41
PK	1988	5.5	0.35
PK	2002	6.8	0.41
SL	1996	9.3	0.46
SL	2002	11	0.47

Source: World Development Report (2006), and UNDP Human Development Report (2005)

Table A2.4: Tariff rate, applied, simple mean, all products (%)

Year	BD	BH	IN	MA	NE	PK	SL
1990	--	--	82	--	--	--	26
1991	--	--	--	--	--	--	--
1992	--	--	56	--	--	--	--
1993	--	--	--	--	21	--	24
1994	85	--	--	--	--	--	24
1995	--	--	--	--	--	50	--
1996	--	17	--	--	--	--	--
1997	--	--	29	--	--	--	20
1998	--	--		--	22	46	--
1999	22	--	32	--	14	--	--
2000	22	--	--	21	14	--	10
2001	--	--	32	21	--	20	9
2002	21	18	--	21	15	17	--
2003	19	--	--	21	15	17	--
2004	18	22	29	21	15	16	10
2005	15	22	17	21	15	15	12
2006	15	--	--	21	13	15	11
2007	15	18	--	--	13	15	--
2008	14	--	10	22	--	14	--
2009	--	--	12	22	13	15	11
2010	--	--	--	--	13	--	9

Source: World Development Indicators, 2011

Table A2.5: Trade Liberalization and GDP Growth in South Asian Countries

Country and Time Periods	Change in average tariffs	Change in trade GDP ratios	Average GDP growth
Bangladesh (1989-2008)	-15.9	10.6	5.1
Bhutan (1996-2007)	3.2	0.8	12.5
India (1990-2009)	-20.8	6.1	9.1
Maldives (2000-2009)	0.5	2.4	9.5
Nepal (1993-2010))	-3.7	-1.4	8.2
Pakistan (1995-2009)	-10.3	0.0	8.2
Sri Lanka (1990-2010)	-10.2	-1.3	8.4

Source: Obtained from the World Development Indicators 2011(Note: Periods included here is based on the availability of data)

APPENDIX TO CHAPTER 3

Table A3.1: Structure of the Data Matrix

Obs	Exporter	Importer	Year	Trade Flow	Total GDP	GDP Shares	Exchange Rates	Exporter's Price	Importer's Price	Distance	Regional Dummies		
	i	J	t	X_{ijt}	Y_i+Y_j	s_is_j	E_{ij}	P_i	P_j	D_{ij}	RTA1	RTA2	RTA3
1	1	2	1981	20.24	210217.1	0.0852	1.8779	35	19	1421.938	0	0	0
2	1	2	1982	20.29	215747.9	0.0768	2.1238	38	20	1421.938	0	0	0
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
30	1	2	2010	307.14	1827468	0.0519	1.5438	192	149	1421.938	1	0	0
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
871	6	5	1981	126.249	11041019	0.00037	0.1051	52	19	7559.492	0	1	0
872	6	5	1982	168.830	10923731	0.00039	0.1004	55	20.5	7559.492	0	1	0
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
900	6	5	2010	1769.985	61069998	0.000598	0.0228	111	158	7559.492	0	1	0

Notes: Country codes: Bangladesh (BD) – 1, India (IN) – 2, Pakistan (PK) – 3, Sri Lanka (SL) – 4, Rest of South Asia (RS) – 5, Rest of the World (RW) – 6.

s_is_j *= (GDPi/(GDPi+GDPj))×(GDPj/(GDPi+DGPj))*

APPENDIX TO CHAPTER 4

Appendix 4.1A

Share Parameter from the CES function:

The two-factor CES frontier is

(1) $$Y = \gamma\left[\beta K^{-\rho} + (1-\beta)L^{-\rho}\right]^{-\nu/\rho}$$

Or, in log form,

(1*b*) $$\ln Y = \ln \gamma - \frac{\upsilon}{\rho}\log\left[\beta K^{-\rho} + (1-\beta)L^{-\rho}\right]$$

Taylor expansion of (1b) around ρ gives

(2) $$\ln Y = \ln \gamma + \upsilon\beta \ln K + \upsilon(1-\beta)\ln L - \frac{\rho\upsilon}{2}\beta(1-\beta)(\ln K)^2 - \frac{\rho\upsilon}{2}\beta(1-\beta)(\ln L)^2 + \rho\upsilon(1-\beta)\ln K.\ln L$$

The linear approximation to the CES shown in (2) resembles the translog function (3) below.

(3) $$\ln Y = \alpha + \alpha_K \ln K + \alpha_L \ln L + \alpha_{KK}(\ln K)^2 - \alpha_{LL}(\ln L)^2 + \alpha_{KL}\ln K.\ln L$$

Comparing the parameters in (2) and (3), the share parameters for the CES can be derived. The parameter correspondence implies,

(4) $$\alpha_K = \upsilon\beta$$

(5) $$\alpha_L = \upsilon(1-\beta)$$

(6) $$\alpha_K = \alpha_L = \frac{1}{2}\alpha_{KL} = \rho\upsilon\beta(1-\beta)$$

Equations (4), (5), and (6) can be solved for the CES share and scale parameter as,

(7) $$\alpha_K + \alpha_L = \upsilon$$

(8) $$\frac{\alpha_K}{\alpha_L} = \frac{\beta}{(1-\beta)}$$

Using the estimated values of the estimates of $\alpha_K = 0.519$ and $\alpha_L = 0.450$ form the text we find from (7), $\upsilon = 0.969$, a value close to the constant returns to scale. This is not surprising, since the CES approximation has been obtained here by taking Taylor expansion of the non-linear CES form around $\rho = 0$. The share parameter, β, which can be inferred from (8), is $\beta = 0.49$. The substitution parameter, $\rho = 0.05$, can be determined from equation (6). This implies an elasticity of substitution value of $\sigma = 1/(1+\rho) = 0.95$ which is again close to the Cobb-Douglas case of one.

Table A4.1: Technical Efficiencies Relative to the Combined South Asian and Southeast Asian Data

Counties	Overall Sample		Before SAFTA		After SAFTA	
	SFA	DEA	SFA	DEA	SFA	DEA
Bangladesh	0.8014	0.8997	0.7923	0.8654	0.6222	0.9713
Bhutan	0.3670	0.4848	0.3803	0.5168	0.1241	0.8841
India	0.7401	0.7832	0.7380	0.7630	0.9613	0.8770
Maldives	0.7006	0.7997	0.7234	0.7555	--	--
Nepal	0.5324	0.7133	0.5566	0.756	0.2403	0.6261
Pakistan	0.9408	0.9101	0.9571	0.9012	0.7278	0.9532
Sri Lanka	0.7187	0.8556	0.7472	0.8823	0.4195	0.7977
SA Average	**0.6859**	**0.7781**	**0.6993**	**0.7772**	**0.5159**	**0.8516**
Brunei	0.8079	0.8052	0.8487	0.7633	0.3816	0.8809
Cambodia	0.5109	0.7402	0.4497	0.5976	0.3418	0.9575
Indonesia	0.6724	0.8896	0.6444	0.8961	0.7813	0.9585
Lao	0.5792	0.9050	0.5538	0.8539	0.2662	0.8955
Malaysia	0.8674	0.9255	0.8608	0.8995	0.8175	0.9364
Philippine	0.7113	0.8405	0.6771	0.7967	0.7172	0.9282
Singapore	0.9777	0.7907	0.9753	0.7567	0.9770	0.8882
Thailand	0.6548	0.9250	0.6385	0.8909	0.7037	0.8740
Vietnam	0.4498	0.4850	0.4154	0.4198	0.4454	0.6375
ASEAN Average	**0.6924**	**0.8119**	**0.6737**	**0.7638**	**0.6035**	**0.8841**

APPENDIX TO CHAPTER 5

Figure A5.1: Production Structure

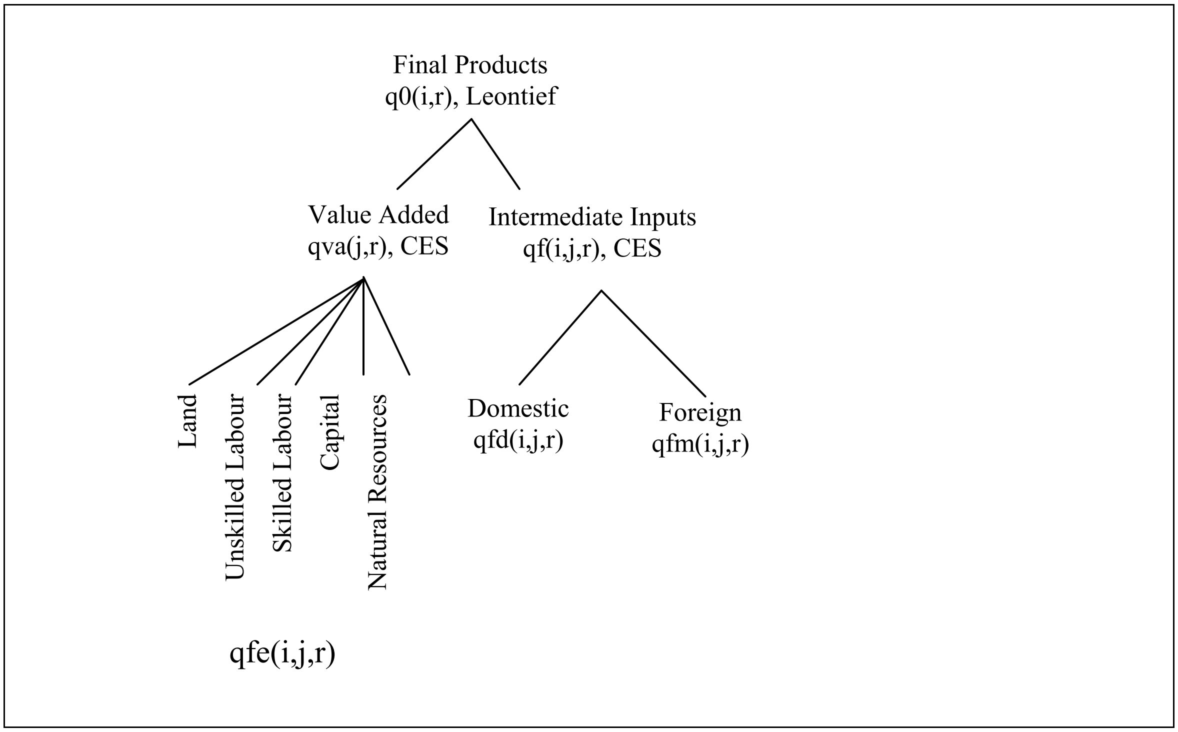


Figure A5.2: Consumption Pattern

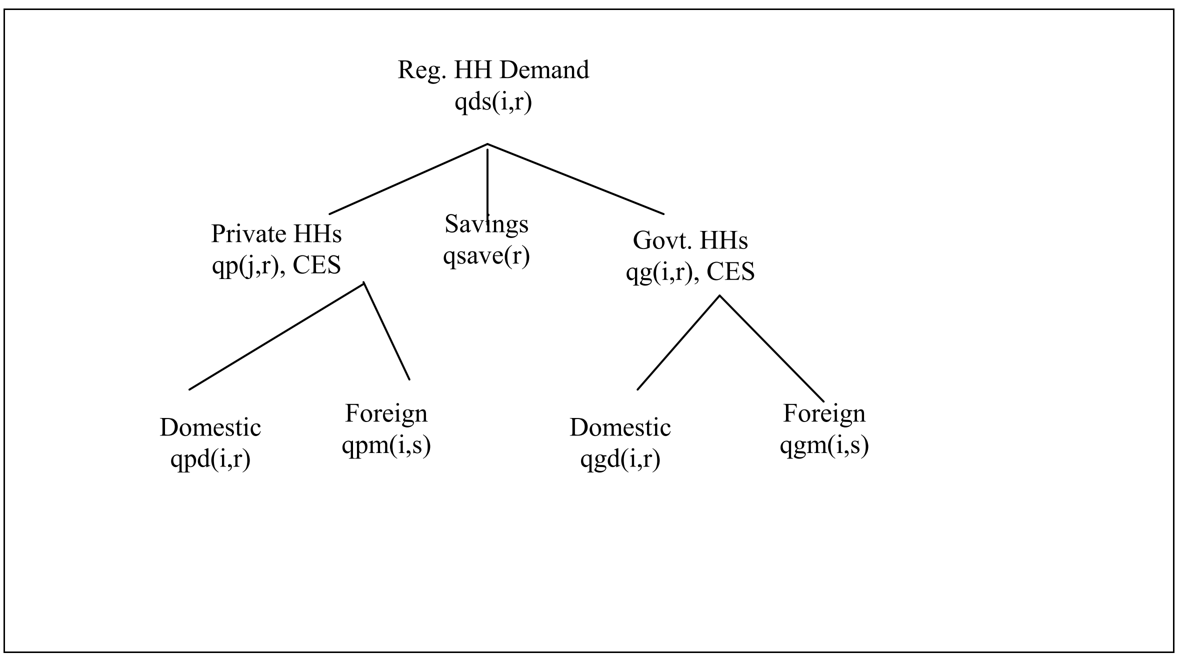


Table A5.1: Mapping of 134 GTAP Countries into 15 Aggregated Regions

Serial	Aggregated Regions	Original GTAP Regions
1	Oceania	Australia, New Zealand, Rest of Oceania
2	East Asia	China, Hong Kong, Japan, Korea, Mongolia, Taiwan, Rest of East Asia.
3	Southeast Asia	Cambodia, Indonesia, Lao Peoples' Democratic Republic, Malaysia, Philippines, Singapore, Thailand, Vietnam, Rest of Southeast Asia.
4	Bangladesh	Bangladesh
5	India	India
6	Nepal	Nepal
7	Pakistan	Pakistan
8	Sri Lanka	Sri Lanka
9	South Asia	Rest of South Asia
10	North America (NAmerica)	Canada, USA, Mexico, Rest of North America.
11	Latin America (LatinAmer)	Argentina, Bolivia, Brazil, Chile, Ecuador, Columbia, Paraguay, Peru, Uruguay, Venezuela, Rest of South America, Costa Rica, Guatemala, Honduras, Nicaragua, Panama, El Salvador, Rest of Central America, Caribbean.
12	European Union 25 (EU_25)	Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxemburg, Malta, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, United Kingdom.
13	Middle East and North Africa (MENA)	Rest of Western Asia, Egypt, Morocco, Tunisia, Rest of North Africa,
14	Sub-Saharan Africa (SSA)	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,
15	Rest of World	Switzerland, Norway, Rest of EFTA, Albania, Bulgaria, Belarus, Croatia, Romania, Russian Federation, Ukraine, Rest of Eastern Europe, Rest of Europe, Kazakhstan, Kyrgyzstan, Rest of Former Soviet Union, Armenia, Azerbaijan, Georgia, Bahrain, Islamic Republic of Iran, Israel, Kuwait, Oman, Qatar, Saudi Arabia, Turkey, United Arab Emirates, Rest of the World.

Note: For dynamic analysis, regions 1, 2, 11, 13, and 14 have been aggregated into the rest of the world.

Table A5.2: Aggregated Sectors Mapped from GTAP Sectors

Serial	Aggregated Sectors	GTAP Sectors
1	Grains and Crops (GrainsCrops)	(i) paddy rice (ii) wheat (iii) cereal grains nec, (iv) vegetables, fruits, nuts (v) oil seeds (vi) sugar cane, sugar beet (vii) plant-based fibres, (viii) crops nec, (ix) processed rice
2	Livestock and Meat Product (MeatLstk)	(i) cattle, sheep, goat, horses (ii) animal products nec (iii) raw milk (iv) wool, silk-worm, cocoons (v) meat: cattle, ship, goat, horse (vi) meat product nec
3	Extraction (Extraction)	(i) forestry (ii) fishing (iii) coal (iv) gas (v) mineral nec (vi)
4	Processed Food (ProcFood)	(i) vegetable oils, fats (ii) dairy products (iii) sugar (iv) food products nec (v) beverage and tobacco products
5	Textile and Clothing (TextWapp)	(i) textiles (ii) wearing apparels
6	Light Manufacturing (LightMnfc)	(i) leather products (ii) wood products (iii) paper products, publishing (iv) metal products (v) motor vehicles and parts (vi) transport equipment nec (vii) manufactures nec
7	Heavy Manufacturing (HeavyMnfc)	(i) petroleum, coal products (ii) chemical, rubber, plastic products (iii) mineral products nec (iv) ferrous metals (iv) metals nec (v) electronic equipment (vi) machinery and equipment nec
8	Utility and Construction (Util_Cons)	(i) electricity (ii) gas manufacture, distribution (iii) water (iv) construction
9	Transport and Communication (TransComm)	(i) trade (ii) sea transport (iii) air transport (iv) communication (v) transport nec
10	Other Services (OthServices)	(i) financial services nec (ii) insurance (iii) business services nec (iv) recreation and other services (v) public administration, defence, health, education (vi) dwelling

Note: nec – not elsewhere cited; product ids are in brackets.

Table A5.3: Social Accounting Matrix for an Open Economy

	Activities 1,⋯,10	Commodities 1,⋯,10	Factors 1,⋯,5	Households	Government	Capital A/C	ROW	Total
Activities 1,⋯,10		Gross Output Sub-matrix (10*10)						Total Sales vector (10*1)
Commodities 1,⋯,10	Intermediate Demand Sub-matrix (10*10)			Consumption Vector (10*1)			Export Vector (10*1)	Aggregate Demand Vector (10*1)
Factors 1,⋯,5	Value Added Vector (5*1)						Net Factor Income and Other Foreign Transfer	Total Factor Income
Households			Net Factor Income		Government Transfer		Transfer to Domestic Residents	Household Income
Government				Direct Taxes			Tariffs	Government Income
Capital A/C				Household Savings	Government Savings			Total Savings
ROW		Imports						Foreign Exchange Expenditure
Total	Total Costs	Aggregate Supply	Total Factor Expenditure	Household Expenditure	Government Expenditure	Total Investment	Foreign Exchange Receipts	

Source: Adopted from WTO (2012) and Reinert and Ronald-Holst (1997)

Table A5.4: Details of the Parameter File

ESUBD(i) and ESUBM(i) #

	ESUBD(i)	ESUBM(i)
GrainsCrops	2.57	5.05
MeatLstk	3.13	7.28
Extraction	5.12	11.67
ProcFood	2.14	4.4
TextWapp	3.73	7.45
LightMnfc	3.33	6.62
HeavyMnfc	3.41	7.27
Util_Cons	2.13	4.67
TransComm	1.9	3.8
OthServices	1.9	3.8

SUBPAR (i, r) #

	Ocea-nia	East Asia	SE Asia	Bangla desh	India	Nepal	Pakis-tan	Sri Lanka	Rest of SA	North Amer	Latin Amer	EU_25	MEN A	SSA	ROW
GrainsCrops	0.97	0.91	0.87	0.91	0.88	0.92	0.88	0.88	0.91	0.98	0.91	0.98	0.87	0.89	0.89
MeatLstk	0.38	0.68	0.77	0.83	0.8	0.84	0.82	0.8	0.83	0.31	0.73	0.38	0.78	0.79	0.67
Extraction	0.33	0.63	0.78	0.84	0.78	0.85	0.82	0.79	0.84	0.27	0.69	0.3	0.75	0.78	0.6
ProcFood	0.35	0.56	0.79	0.88	0.84	0.88	0.85	0.82	0.88	0.33	0.73	0.34	0.8	0.81	0.63
TextWapp	0.28	0.52	0.71	0.85	0.79	0.85	0.81	0.77	0.85	0.22	0.64	0.26	0.74	0.76	0.5
LightMnfc	0.23	0.45	0.62	0.84	0.77	0.85	0.79	0.73	0.84	0.2	0.57	0.22	0.68	0.71	0.4
HeavyMnfc	0.23	0.42	0.66	0.84	0.77	0.84	0.79	0.73	0.85	0.2	0.57	0.23	0.7	0.72	0.44
Util_Cons	0.23	0.45	0.65	0.83	0.76	0.84	0.78	0.73	0.83	0.19	0.57	0.24	0.69	0.72	0.49
TransComm	0.22	0.35	0.62	0.82	0.75	0.82	0.78	0.72	0.82	0.2	0.56	0.22	0.68	0.71	0.41
OthServices	0.22	0.34	0.59	0.8	0.71	0.82	0.76	0.68	0.81	0.18	0.53	0.2	0.65	0.62	0.32

INCPAR (i, r) #

	Ocea-nia	East Asia	SE Asia	Bangla desh	India	Nepal	Pakis-tan	Sri Lanka	Rest of SA	North Amer	Latin Amer	EU_25	MEN A	SSA	ROW
GrainsCrops	0.03	0.23	0.41	0.58	0.47	0.56	0.56	0.47	0.59	0.02	0.18	0.01	0.42	0.58	0.2
MeatLstk	0.55	0.67	0.71	1.09	0.87	1.1	0.88	0.77	1.09	0.58	0.53	0.54	0.75	0.89	0.54
Extraction	0.6	0.75	0.74	1.05	0.95	1.03	0.9	0.84	1.05	0.9	0.72	0.82	0.82	1.07	0.89
ProcFood	0.58	0.6	0.6	0.7	0.63	0.74	0.72	0.67	0.75	0.6	0.54	0.58	0.66	0.66	0.54
TextWapp	0.82	0.83	0.81	0.96	0.89	0.95	0.93	0.92	0.98	0.84	0.8	0.82	0.88	0.93	0.81
LightMnfc	1.03	1.01	1.02	0.99	1.02	0.98	1.05	1.14	1.02	1	1.05	1.01	1.12	1.1	1.09
HeavyMnfc	0.99	1.01	1.02	1.06	1.04	1.05	1.09	1.13	1.01	0.99	1.05	0.99	1.1	1.11	1.07
Util_Cons	1	1.02	1.03	1.11	1.07	1.09	1.12	1.15	1.11	0.99	1.04	0.99	1.13	1.12	1.09
TransComm	1.06	1.08	1.13	1.21	1.18	1.24	1.12	1.24	1.25	1.03	1.09	1.04	1.2	1.22	1.13
OthServices	1.08	1.13	1.27	1.38	1.43	1.27	1.33	1.52	1.31	1.05	1.22	1.17	1.48	1.44	1.26

Table A5.5 Initial Bilateral Tariff Structure of the South Asian Countries (Percentages) (TMS(i, r, s), $i \in Traded\ Comm,\ r \in REG,\ s \in REG$))

Bangladesh

	Oceania	East Asia	SE Asia	Bang-ladesh	India	Nepal	Pakistan	Sri Lanka	Rest of SA	North America	Latin America	EU_25	MENA	SSA	ROW
GrainsCrops	0.006	0.719	5.11	0	8.99	8.56	5.46	0	2.49	25	7.11	1.52	1.9	6.45	0.998
MeatLstk	0	0.269	1.24	0	24.1	8.85	0	0	0	0	0	0	2.35	0.555	3.9
Extraction	0	8.22	2.52	0	3.78	0	9.94	0	0	0.234	4.52	0	0.649	0.713	4.25
ProcFood	0.047	2.37	3.71	0	22.8	11.1	11.8	4.99	42.1	0.078	4.6	0	16.8	16	3.91
TextWapp	0.392	4.23	10.5	0	6.86	20	11.3	1.83	27.3	9.98	17	0	14.5	19.1	5.35
LightMnfc	0.26	1.65	4.8	0	8.99	18.9	14.8	12.4	17.4	3.15	12.1	0	20.6	15.9	4.59
HeavyMnfc	0.076	2.65	1.94	0	5.34	13.3	10.2	8.81	7.25	0.213	8.86	0.002	3.18	12.6	3.04
Util_Cons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TransComm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OthServices	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

India

	Oceania	East Asia	SE Asia	Bang-ladesh	India	Nepal	Pakistan	Sri Lanka	Rest of SA	North America	Latin America	EU_25	MENA	SSA	ROW
GrainsCrops	0.131	15.6	4.33	7.66	0	9.76	5.74	8.09	5.19	1.1	12.4	3.94	8.89	11.8	2.63
MeatLstk	0.365	1.98	9.23	7.47	0	9.88	5.06	19.1	4.05	0.183	0.674	2.56	6.98	12.4	6.88
Extraction	0.342	0.089	2.75	9.31	0	8.66	6.17	13.7	12.2	0.731	2.81	0.214	6.76	5.05	1.99
ProcFood	2.45	4.61	3.11	4.78	0	15.2	9.93	5.53	5.02	2.28	11	7.46	11.4	20.5	12.9
TextWapp	9.4	5.49	9.17	15.6	0	9.65	12.9	0.617	5.16	9.8	13.6	7.89	12.7	18.5	6.27
LightMnfc	4.05	1.79	4.48	17.7	0	28.1	17.2	8.38	6.32	0.978	13.6	1.34	16.3	12.1	4.02
HeavyMnfc	2.69	2.93	3.14	10.8	0	14.4	9.36	8.51	5.5	0.865	4.03	0.242	7.54	7.46	3.96
Util_Cons	0	0	0	0	0	12.8	0	0	0	0	0	0	0.018	0	0
TransComm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OthServices	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Nepal

	Oceania	East Asia	SE Asia	Bang-ladesh	India	Nepal	Pakistan	Sri Lanka	Rest of SA	North America	Latin America	EU_25	MENA	SSA	ROW
GrainsCrops	0	1.58	0	0	58.3	0	7.05	0	0	0	0.109	0	0	0	0.58
MeatLstk	0	0	0.028	0	8.34	0	0	0	0	0	0	0	0	0	0
Extraction	0	0.053	0.337	0	15.7	0	10.9	0	0	0	0	0	0.086	0.2	0
ProcFood	0	16.2	5.6	0	29	0	30.3	0	0	0.383	0.573	105	19.4	5.2	11.3
TextWapp	0.101	3.74	3.81	0	10.2	0	17	13.3	0	4.54	12.3	0	14.4	28.3	1.28
LightMnfc	0.138	3.8	5.7	1.15	9.89	0	5.88	15.5	8.47	1.21	5.58	0.001	14.1	10.9	4.91
HeavyMnfc	0.68	6.91	1.13	6.81	11.7	0	9.46	3.89	0	0.642	1.99	0	4	4.61	1.04
Util_Cons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TransComm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OthServices	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Pakistan

	Oceania	East Asia	SE Asia	Bang-ladesh	India	Nepal	Pakistan	Sri Lanka	Rest of SA	North America	Latin America	EU_25	MENA	SSA	ROW
GrainsCrops	0.009	78.3	9.69	3.89	47.5	8.42	0	1.29	4.26	0.844	5.11	9.84	0.92	4.47	17.7
MeatLstk	0	2	11.5	12	12.1	0	0	3.46	4.67	0.011	0.014	0.195	5.36	12.7	1.64
Extraction	1.03	0.669	3.73	11.6	16	0	0	7.29	4.66	0.129	3.77	0.133	7.99	8.17	1.44
ProcFood	2.98	22.1	6.16	14.6	41.1	0	0	7.89	5.04	3.04	11.5	2.34	13.5	18.9	4.7
TextWapp	11.2	3.1	13.6	18.7	14.2	8.9	0	1.02	7.18	10.4	12.8	7.46	17.3	21.5	7.06
LightMnfc	3.58	6.38	6.28	10.6	11.2	7.1	0	11.4	6.91	2.16	14.3	1.24	17.4	15.8	4.99
HeavyMnfc	1.77	2.77	5.15	8.07	14.6	6.13	0	5.62	4.54	1.54	6.62	0.549	6.46	12.1	3.49
Util_Cons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TransComm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OthServices	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sri Lanka

	Oceania	East Asia	SE Asia	Bang-ladesh	India	Nepal	Pakistan	Sri Lanka	Rest of SA	North America	Latin America	EU_25	MENA	SSA	ROW
GrainsCrops	0.332	5.34	7.62	5.51	0.049	6.91	0.176	0	15.3	0.841	8.3	0.289	7.56	11.3	19
MeatLstk	1.69	2.31	7.39	0	0	8.96	1.64	0	17.2	0	0	0.085	2.68	1.26	3.09
Extraction	0.041	2.98	0.328	23.7	0	0	19.5	0	19.6	0.773	2.17	0	7.62	7.23	2.14
ProcFood	1.14	6.7	5.28	18.4	0.037	17.8	1.16	0	15	2.07	15	0.108	5.01	13.7	19
TextWapp	7.41	6.88	11.6	22.5	11.2	17.2	5.43	0	25.7	11.6	12.6	0	16.2	24.8	5.74
LightMnfc	4.13	2.02	4.73	16.8	0.435	0	6.82	0	21.9	0.877	11.2	0	7.8	9.54	2.69
HeavyMnfc	3.68	2.49	3.29	9.94	0.995	6.41	1.68	0	23.2	1.17	10	0.002	12.7	8.33	3.23
Util_Cons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TransComm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OthServices	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Rest of South Asia

	Oceania	East Asia	SE Asia	Bang-ladesh	India	Nepal	Pakistan	Sri Lanka	Rest of SA	North America	Latin America	EU_25	MENA	SSA	ROW
GrainsCrops	0.493	3.8	3.09	2.29	32.6	4.89	8.07	23.4	2.71	3.17	8.55	1.31	9.72	3.46	7.71
MeatLstk	0.29	12.7	1.89	0.301	10.9	0.994	7.19	12.8	10.4	0.206	2.24	2.5	7.65	3.47	17.1
Extraction	0.15	0.234	0.719	3.05	9.94	0.131	4.42	0.801	0.268	0.001	2.8	0.02	4.34	1.3	0.488
ProcFood	1.99	5.77	4.2	14.1	61.6	4.91	16.7	2.91	15.9	2.14	10.7	8.02	23.7	9.92	7.37
TextWapp	9.13	6.44	6.8	12.4	15.6	7.52	12.4	7.19	11.9	0.67	9.64	0	9.89	7.21	5.26
LightMnfc	6.67	2.06	3.55	8.9	9.97	13.5	26.2	6.59	7.39	1.3	8.9	0.066	13.1	7.31	3.27
HeavyMnfc	3.07	1.58	1.62	5.46	15.2	5.61	10.4	6.79	10.9	0.245	5.59	0.09	4.62	4.4	1.74
Util_Cons	0	0	0.001	0	0	0	0	0	0	0.001	0.001	0	0.064	0.218	0.001
TransComm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OthServices	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table A5.6: Terms of Trade Effect of the 15 per cent SAFTA Tariff Preference

Region	% ΔTOT
Oceania	0
EastAsia	0
SEAsia	0
Bangladesh	-0.06
India	0.04
Nepal	0.48
Pakistan	0.06
SriLanka	-0.02
SouthAsia	0.27
NAmerica	0
LatinAmer	0
EU_25	0
MENA	0
SSA	0
RestofWorld	0

Table A5.7: Macroeconomic Projection for the Variables in the Base Run

Skilled Labour Growth

	Y2012	Y2017	Y2022	Y2027	Y2032	Y2037	Y2042	Y2047	Y2050
NAFTA	16.5	9.2	8.5	8.6	8.7	8.5	8	7.3	4
EU25	20.4	8	5.7	4.7	4.9	5	4.9	4.6	2.6
ROW	34.8	16.5	14.4	13.5	13.7	13.6	12.4	11.4	6.4
ASEAN	43.8	21.2	18.6	16.9	15.7	14.5	12.5	10.8	6
Bangladesh	49.2	23.1	20.2	18.5	15.5	13.1	11	9	4.8
India	43.1	22.9	20.9	19	17.1	15	13.1	11.2	5.8
Pakistan	70.9	33.9	28.7	24.1	22.4	20.9	19.5	17.5	9.3
Sri Lanka	25.8	11.7	10.6	10.4	9.9	9.2	6.8	4.7	2.8
RSA	57.8	29.8	25.8	22.1	19.9	18	16.2	14.2	7.5

Unskilled Labour Growth

	Y2012	Y2017	Y2022	Y2027	Y2032	Y2037	Y2042	Y2047	Y2050
NAFTA	7.1	2.6	0.8	-0.5	-1.1	-1.8	-2.7	-3.6	-2.5
EU25	-2.1	-5	-6.7	-8.3	-9.7	-10.2	-10.5	-11.1	-7.3
ROW	8.9	3.6	2.7	2.4	1.8	1.2	0.7	0.1	-0.3
ASEAN	10.8	4.6	3.6	2.4	1	-0.4	-1.3	-2.1	-1.7
Bangladesh	18.3	8.8	7.1	5.3	3.7	2.2	0.7	-0.5	-0.8
India	15.5	7.6	6.3	5.1	3.7	2.2	0.7	-0.9	-1.2
Pakistan	29.8	13.1	11.2	10.4	9.2	7.5	5.8	4.2	1.8
Sri Lanka	0.4	-1.8	-1.8	-1.1	-1.1	-1.7	-3.7	-5.6	-3.4
RSA	21	10.6	8.7	7	5.7	4.4	3	1.6	0.3

GDP

	Y2012	Y2017	Y2022	Y2027	Y2032	Y2037	Y2042	Y2047	Y2050
NAFTA	13.6	13.8	11.8	10.5	9.8	9.3	8.7	8.1	4.6
EU25	8.7	11.3	8.4	6.3	5.2	4.8	4.7	4.5	2.6
ROW	33.5	22.6	22.8	21.8	20.4	18.6	16.7	15.1	8.1
ASEAN	40.4	27.2	26.2	24.5	22.9	21.3	19.8	18.4	10
Bangladesh	59.9	33.6	35.6	37.2	38.1	38.3	37.6	36.2	19.5
India	82.3	40.3	39.8	38.6	36.6	34	30.8	27.3	14
Pakistan	40.6	37.7	39.8	41.3	41.9	41.5	40	37.9	20.1
Sri Lanka	58	22.8	21.5	21.1	20.2	18.9	16.4	13.9	7.7
RSA	58	44.5	46.5	47.8	48.6	48.8	48.2	46.5	24.6

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