Trade Liberalization, Product Variety and Growth

Occasional Paper No. 167

एक्ज़िम बैंक
EXIM BANK
भारतीय निर्यात-आयात बैंक
EXPORT-IMPORT BANK OF INDIA

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This study is based on the doctoral dissertation titled "Trade Liberalization, Product Variety and Growth" selected as the award winning entry for the EXIM Bank International Economic Research Award (IERA) 2013. The dissertation was written by Dr. Anwesha Aditya, Assistant Professor of Economics, Department of Humanities and Social Sciences, Indian Institute of Technology Kharagpur, under the supervision of Professor Rajat Acharyya and was submitted to the Jadavpur University, Kolkata.

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EXECUTIVE SUMMARY

Recent empirical evidences suggest that *what* a country exports may matter more than *how much* it exports. Increased variety and improved quality of exports are considered as two important dimensions behind the success stories of some of the fast growing developing countries like China and India during the 1980s and 1990s. During this period, many of the developing countries, including the fast growing countries, have opened up their domestic markets significantly through liberal trade policies. Given these observations, a necessary question that arises is what implications may such trade liberalization policies have regarding diversification and composition of export basket of a country. If trade liberalization increases variety and improves quality of export basket, it will not only indicate whether but also how trade liberalization may actually foster growth of outward countries. However, these issues have remained relatively less explored in the existing literature.

The present study intends to offer some new insights on these dimensions by studying links between trade liberalization, diversification and composition of export basket and economic growth, both theoretically and empirically. In particular, the present study first examines the implications of trade liberalization policies on diversification and quality content of export baskets of small and large open economies in alternative theoretical frameworks. Second, it provides further evidence on growth implications of these dimensions of exports by refining the methodology for empirical estimates like using a different country classification, a two-stage approach of estimation and a new set of control variables. We also investigate whether the trade-growth relationship may depend on institutions, like multilateral and regional trading arrangements and country-specific institutions such as political regimes of countries, and the productivity constraints, like human capital and research and development (R&D).

Policy Implications

- Tariff reductions appear as export promotion policies since export baskets may become more diversified as well as contain better quality goods.
- The liberal trade policies that India is pursuing since the mid-1990s have the potential to make Indian exports more sophisticated in terms of increased varieties as well as improved quality of export goods, both of which are important preconditions of export-led growth in the present era of globalization.
- For countries large enough to influence the world prices of goods they trade, trade liberalization policies or tariff reductions may promote output growth through diversification (or expansion) of their export baskets.
- When countries adopt liberal trade policies simultaneously, they may have different tariff-reduction induced export-led growth experience since export basket of countries may not be diversified symmetrically.
- For India, it means that entering into regional or bilateral trade agreements might be favourable for her growth objective.
- What a country exports, rather than how much it exports, is the important factor for ensuring higher output growth rates. Thus, to experience sustained growth effect of trade openness, policies should be adopted so as to make India's export basket not only sufficiently diversified but also it should contain high value addition products. Tariff reductions may be one such policy as indicated above.
- The *volume* of exports may still matter as it strengthens the impact of export composition. In particular, export diversification has a larger impact for those countries whose level of manufacturing exports is greater than the world average or is growing at a faster rate.
- To foster GDP growth, countries should adopt policies for human capital formation, such as *investing more in higher education and skill formation.*
- *Public investment in infrastructure development* is important since improved infrastructure facilitates exports and consequently can be instrumental in making the export-led growth effect stronger. This is particularly important for the Asian countries, and, therefore, for India.
- Faster output growth can also be achieved through accession to WTO and regional trade agreements provided these institutions ensure larger market access for exporters. Thus, the *Government of India should put more efforts in multilateral, regional and bilateral trade negotiations and reciprocations to ensure larger market access for India's exporters.*

1. ISSUES AND PERSPECTIVE

1.1. The Perspective

The relationship between exports and economic growth has been a much researched area in international economics since the time of Adam Smith. More recent empirical analyses by Hausmann, Hwang and Rodrik (2007), Rodrik (2006), Agosin (2007) and Hesse (2008), however, suggest that *what* a country exports may matter more than *how much* it exports. Accordingly there has now been a shift in the research question from *whether* trade promotes growth to *when and how* trade promotes growth.

In contrast to the productivity theory of Adam Smith, which emphasizes upon specialization and dynamic gains from trade, the structuralist theories were skeptical regarding specialization driving growth as they predicted declining terms of trade for primary commodities exported by the developing countries (Prebisch, 1959; Singer, 1950). Similar observation was made by Michaely (1962), and Hesse (2008). There are many dimensions of this line of argument that include foreign exchange reserves of these countries becoming prone to fluctuations and uncertainty in world prices, thereby constraining their ability to afford imported inputs. On the other hand, exports of poor quality and less sophisticated (or low-technology intensive) goods by the developing countries often make it difficult for them to sustain export growth and consequently promote faster output growth. Along with scarcity of physical and human capital, backward technology and lower rate of innovation, the problems of asymmetric information, moral hazard and adverse selection contribute to the low quality of developing country products[1]. The situation has become even worse with non-tariff barriers in the form of quality regulations and environmental standards imposed by the developed countries on the imports from the developing countries.

[1]See Acharyya (2005) for a documentation of this poor quality phenomenon

Therefore, diversification of exports in high value addition products is required to achieve more sustained growth effect of openness. Whereas cross-country studies by Lederman and Maloney (2007) and Agosin (2007) reveal that export diversification leads to faster economic growth, those by Rodrik (2006) and Hausmann, Hwang and Rodrik (2007) observed that the countries which produce high-productivity goods enjoy faster growth than the countries with low-productivity goods.

The present study is contextualized in this perspective. It broadens this research question by bringing in the implications of trade liberalization policies on diversification and composition of export basket of a country, and, therefore, on growth. Broadly, there are two objectives of the study. First is to explore the link between trade liberalization, export diversity and quality. This link is examined in terms of appropriate trade theoretic models with economies of scale and differentiated products. Second is to estimate to what extent such diversification and composition of export basket steps up the export-led growth. Such cross-country estimation is based on a disaggregate analysis in terms of a different country classification than is usually adopted in the literature, a two-stage estimation process and a new set of control variables.

1.2. Research Questions

The existing theoretical literature offers very little on the relationship between trade liberalization and export promotion through increased diversification and improved quality of exports. This sets the first research question to be addressed in the study as follows:

1. **How does trade liberalization affect export diversification and composition through the development of new product varieties and improvement of quality?**

   Though a lot of empirical studies have investigated the trade-growth association, most studies investigate the relationship at an aggregated level. Moreover, the growth implications of export diversification and export composition (or quality) are studied separately in almost all these studies. This gives rise to the motivation for the second issue to be analyzed in the study:

2. **What roles do diversification and composition of export**

basket of countries have on output growth for separate country groups classified on the basis of their (volume of) export and economic growth relationship?

Though many empirical studies find that increased volume of trade fosters output growth, Rodriguez and Rodrik (2000) were skeptical about such findings on measurement of openness and various methodological grounds. Rodrik, Subramanian and Trebbi (2002), on the other hand, argued that the trade-growth association might not be robust once the effect of institution is controlled for. There is also a sizeable literature that suggests the importance of productivity constraints like human capital, research and development (R&D) on the trade-growth relationship. These issues make it imperative to undertake similar robustness check for our above-mentioned cross-country estimates of the relationship between diversification and composition of export basket and output growth of countries:

3. **To what extent do institutions and productivity constraints influence the cross-country relationship between diversification and composition of export basket and output growth?**

The present study, however, differs from the existing literature in terms of the different ways in which institution is captured. The main focus is on the trading institutions like multilateral and regional trading arrangements, and country-specific institutions like political regimes.

1.3. Outline of the Study

These three issues have been analyzed in greater detail with the review of the related literature in the four core chapters of the study. In Chapters 2 and 3 the implications of trade liberalization on diversification and composition of a country's export basket have been examined theoretically. We begin by examining how trade liberalization changes product variety, and therefore export diversification through its resource reallocation effect in **Chapter 2** by extending the love-of-variety approach of Krugman (1979) and the export quality choice model of Acharyya and Jones (2001). First, Krugman's (1979) monopolistic competition model with economies of scale is extended by introducing a homogeneous import competing constant-returns-to-scale (CRS) good produced under perfect competition. The benchmark model

considers a small open economy with constant elasticity of demand and fixed coefficient production technology in the import competing sector. In this framework it is found that trade liberalization in the form of tariff reduction in the traditional CRS sector can lead to greater diversification in terms of increased variety in the modern increasing-returns-to-scale (IRS) sector if the imported homogeneous good is relatively capital intensive. The result is reinforced with flexible coefficient production technology and variable elasticity of demand for different varieties.

Two extensions of the benchmark model are considered to reexamine the same research question. First is a two country world economy that allows us to endogenize the terms of trade. In such a context, diversification is defined in two ways: inter-industry or across sectors and intra-industry or within sectors. The two countries are assumed to produce the homogeneous good to completely specialize in two sets of horizontally differentiated goods. The country which exports the homogeneous good along with a differentiated good has an export basket that is more diversified in the inter-industry sense, whereas the other country has an export basket which is more diversified in the intra-industry sense.

The second extension involves introduction of a vertically-differentiated export good following Acharyya and Jones (2001) into the benchmark two-good model. The purpose is to study whether reduction of tariff on imports of the homogeneous good by a small open economy increases variety of the horizontally-differentiated exported good and improve the quality of the vertically-differentiated export good. It is shown that a tariff reduction raises the quality of the vertically differentiated export good, but, again, increases the number of varieties of the horizontally differentiated export good only if it is relatively more labour intensive than the import competing homogeneous good.

Chapter 3 considers a more generalized approach to examine the implications of trade liberalization policy for diversification of exports both across and within sectors. The two country world economy model of Chapter 2 is extended by considering the perfectly competitive homogeneous sector producing a continuum of goods defined over the unit interval [0, 1] as in Dornbusch, Fisher and Samuelson (1977). Thus, the analytical structure is a synthesis of the Dornbusch, Fisher and Samuelson (1977) and Krugman (1979) frameworks.

This synthesis approach, with appropriate modifications, enables us to theorize diversification of export basket in terms of a set of homogeneous goods and in terms of varieties of a horizontally differentiated good. The advantage is that the pattern of trade in the continuum of homogeneous goods is endogenously determined according to comparative (cost) advantages of the countries instead of making an assumption of which country exports what as in Chapter 2. The essential question in this many-goods-many-varieties set up is whether there exists any trade-off between diversification of export basket in terms of larger set of different homogeneous goods and larger number of varieties of the differentiated good. Moreover, the higher indexed goods using more labour per unit of output than the lower indexed goods, the continuum of homogeneous goods can be interpreted as essentially goods of different qualities. Thus the trade-off, if any, can be re-interpreted as between quality and variety of exports.

In the above set up we show that bilateral tariff reductions may cause export baskets of both countries more diversified in terms of an expanded subset of continuum of goods being exported. On the contrary, unilateral tariff reduction by the liberalizing country may lead to greater diversification of its export basket – in terms of larger number of goods as well as varieties so that the trade-off between export quality and variety may not arise. Under bilateral tariff reduction, on the other hand, the country in whose favour the ratio of national wages moves is more likely to experience an increase in the number varieties along with an expanded set of distinctly different goods being exported. This means that the trading nations may have different export-led growth experiences.

Chapter 4 makes an empirical investigation of the export and growth relationship at disaggregated levels – disaggregation both at the country level and at the level of exports – focusing on the diversification and the composition of exports of countries. In a sample of sixty five countries for the period 1975-2005, the GMM dynamic panel estimation reveals that export diversification is associated with economic growth after controlling for the effects of exports, lagged output, and investment. Moreover, the relationship is found to be non-linear which is consistent with the findings of Imbs and Wacziarg (2003) and Hesse (2008). It is also found that the level of exports matters as the impact of export diversification is stronger when exports of a country are greater than world average exports. Export composition as

measured by share of high technology exports in manufacturing exports also contributes to the output growth, with its impact being stronger for countries whose level of manufacturing exports is greater than the world average or is growing at a faster rate. These results indicate that the volume of exports cannot be ignored altogether though what is being exported matters. These results are robust even when the dataset is classified in four sub-panels based on the export-economic growth relationship. By estimating different sub-samples separately we try to solve to some extent the "lump-together" problem inherent in estimates of panel data.

We re-examine whether the diversification and the composition of exports augment output growth in a two-stage estimation procedure. In the first stage the impact of exports on output is estimated controlling for the impacts of lagged output and investment; in the second stage, the impacts of the diversification and the composition indices on the export-induced growth component are estimated after controlling for infrastructure development of countries which is taken as a proxy for domestic sources of growth. The idea here is that the impacts of these dimensions of export basket of a country on its output growth is at best an indirect one. Thus, it seems more reasonable to estimate the impacts of the diversification and the composition of exports on the export-induced growth component, rather than on the overall output growth. *The two-stage estimation produces even stronger results* and reconfirms the importance of the diversification and the composition of exports in the growth processes of the countries when the impact of infrastructure development is controlled for.

Chapter 5 then examines the role of institution and productivity constraint in the context of trade-growth relationship. Institution has been incorporated more broadly in different layers. First, political regimes of countries are considered as within country or country-specific institutions. Second, formation of regional trading arrangements and free trade areas (RTAs/FTAs) by group of countries is considered as (trade-policy) institutions at the regional level and GATT/WTO as global institutions.

GMM dynamic panel results for a two-stage estimation method as used in Chapter 4 reveal that both trade and institution matter for growth in a sample of sixty five countries for the period 1975-2005. It is found that autocratic regimes are associated with faster growth, which is consistent with the argument of Varshney (2002). WTO formation is also found

to strengthen the trade-growth association. Overall, both export diversification and composition remain important determinants of the trade-growth nexus even after controlling for different types of institutions and productivity constraints like human capital and R& D. Thus, the results of Chapter 5 provide a robustness check of the results obtained in Chapter 4.

Furthermore, this chapter includes a comparative study of regional growth experiences of Asia and Latin America with the object to investigate the roles of trade and institutions in explaining their differential growth performances. The GMM dynamic panel estimation for the period 1975-2005 reveals that there are some common determinants of growth in the two regions such as exports, investment, public debt, human capital and diversification and composition of export baskets. On the other hand, the differentiating factors on the diverging growth experiences of Asia and Latin America are infrastructure, institutional aspects like patent protection, regional integration, and market access effect of WTO.

Finally, **Chapter 6** concludes the study by summarizing the results obtained in the four core chapters, i.e., Chapters 2 - 5. The concluding chapter also discusses the policy implications that emerge from the study and sets the direction of future research.

2. TRADE LIBERALIZATION, PRODUCT VARIETY AND QUALITY

2.1. Introduction

Increased variety and improved quality of exports are two important aspects behind the success of many fast growing Asian countries like China and India. However, the existing theoretical literature is not sufficient to explore the implications of trade liberalization on variety and quality of exports. This is where the present chapter intervenes. It examines how trade liberalization affects export diversification and composition through the development of new product varieties and improvement of quality. The chapter starts with a brief review of literature on quality and variety. Then we examine whether trade liberalization leads to greater diversity with an extension of Krugman's (1979) monopolistic competition model by introducing an import-competing good produced under constant returns to scale (CRS) technology. First we set the benchmark model of a small open economy with fixed coefficient production technology and constant elasticity of demand which is then extended to two country world economy. In an extension of the benchmark model that takes into account choice of quality of the good produced under CRS technology, it is further examined whether trade liberalization improves the quality of exports. Specification of such choice of quality of goods exported follows Acharyya and Jones (2001).

2.2. Review of Literature

The existing literature defines export diversification in two ways. First in the inter-industry sense, specialization and composition of export basket are defined across different industries and are driven by comparative advantage. The neoclassical trade theories talk about specialization or diversification in terms of fundamentals (like technology and endowment) rather than diversification induced by trade policy. The Ricardian approach emphasizes technological differences between countries and predicts that specialization and exports according to cost advantage makes countries better off. On the other hand, the Heckscher-Ohlin-Sameulson model

talks about both diversification and specialization. Based on the endowment differences of productive factors it predicts the poor countries to specialize in goods intensive in unskilled labour and land, and rich countries to specialize in goods intensive in human and physical capital. However, generalized Heckscher-Ohlin-Sameulson model predicts the countries to completely specialize in goods that are at the two ends of the intensity ranking and produce in common a middle good. Such patterns of production and specialization arise when there are fewer domestic factors of production than the number of traded goods and endowment pattern of the countries are significantly different (Jones, 1979; Marjit and Acharyya, 2003). But neither the Ricardian nor the Heckscher-Ohlin-Sameulson models bring in the impact of trade policy on diversification/specialization. Notable exception, however, is the continuum goods model of Dornbusch-Fisher-Samuelson (1977) where tariff reduction leads to more goods being traded.

Second, in the intra-industry sense export diversification is defined in terms of product variety within an industry. There are two types of intra-industry trade: horizontal and vertical. Trade in varieties of a product characterized by different attributes is horizontal intra-industry trade, and when it is characterized by different qualities it is vertical intra-industry trade. Most previous studies on intra-industry trade have been concentrated on horizontal intra-industry trade. Two approaches are relevant here – the characteristic approach and the love of variety approach. The characteristic approach, based on the work of Lancaster (1980), views goods as bundles of characteristics. Consumers are heterogeneous but everyone has one ideal variety. The structure of the model is Heckscher-Ohlin-Samuelson type with monopolistically competitive market for the differentiated variety. With trade consumers will benefit as they get models much closer to their ideal specification.

The idea of love-of-variety, based on the seminal work of Dixit and Stiglitz (1977) in the context of a closed economy with Chamberlinian monopolistic competition, was applied to the open economy by Krugman (1979). This approach was later used by Krugman (1980) and Helpman and Krugman (1985). Krugman's (1979) approach is based on two key assumptions. First, consumers derive utility from product variety. Second, production of each variety displays economies of scale. These assumptions, along with free entry and close possibility of substitution among the varieties, lead to monopolistic

competition. Economies of scale then ensures different countries to specialize in different varieties of the same good. Love-of-variety, on the other hand, implies that countries trade different varieties of the same good. Countries in equilibrium produce an endogenous number of varieties which is proportional to the size of the economy. There are two sources of gains from trade in the love of variety approach: first is the gain from decline in cost. Given scale economies, as labour force grows the unit cost (measured in real terms by the ratio of price to wage, p/w) falls implying an increase in the real wage (w/p). Thus, labour being the only factor of production, the economy experiences real income gains. Second is the increase in number of variety produced by each country, which makes consumers better off because of the underlying love-for-variety preferences.

Thus both the characteristic approach and the love of variety demonstrate that opening up of trade leads to more variety within an industry. But analysis of a tariff policy is difficult because the pattern of trade remains indeterminate (that is, which country exports which varieties) in these models.

However, empirical observations reveal that the rate of variety growth is lower than that predicted by Krugman (1979, 1980). For example, Hummels and Klenow (2002, 2005) observed that the number of export varieties represent only 59 percent of a large country's exports. Armington (1969) considers the impact of trade liberalization on the intensive margin, i.e., production and exports of higher quantities per variety at lower prices in the world market and the number of varieties is fixed. Armington's model may understate the effect as it assumes away variety adjustment. In the Krugman (1979, 1980) model, on the opposite, increased variety is the source of gains from trade which may overstate the effects of gains from variety as it does not consider the terms of trade effect. In an attempt to combine the approaches of Krugman (1979, 1980) and Armington (1969), Ardelean (2006) incorporates a more general CES preference structure. In that case, the consumer faces a trade-off between buying more varieties or higher quantities per variety. Without factor price equalization, in equilibrium a larger country not only exports more varieties but also higher quantities per variety sold at lower prices in the world markets. For any value of variety lower than in Krugman's model, the expansion in variety is less than proportional to country size which is consistent with data. Ardelean (2006) estimated consumer's love-of-variety as the elasticity of relative imports to extensive margin and found it to be

42 percent lower than that assumed in Krugman's model.

Arkolakis et. al. (2008) constructed a model with firm-level increasing returns, differentiated goods, monopolistic competition, endogenous variety and free entry to establish that with trade liberalization total variety (domestic plus imported) can increase, decrease or remain constant. This is because there is evidence that trade liberalization leads to exit by domestic firms (Tybout, 2003) reducing the number of domestic varieties.

What emerges from the above review of literature is that most existing studies on the impact of trade liberalization on changes in product variety consider the impact of tariff reduction leading to changes in number of variety through increased imported variety. The point of departure of our analysis is that we consider the impact of trade liberalization in the form of tariff reduction in one sector on the locally produced varieties in the other sector through the reallocation of resources across the two sectors. The existing studies have not explicitly captured this additional impact of trade liberalization on variety. In this context more relevant is the idea of Krugman's (1984) tariff protection as export promotion. Krugman (1984) formalized the notion of import protection as export promotion with scale economies, oligopolistic competition and segmented market. Imposition of an import tariff expands the sale of domestic firms. If there are economies of scale the domestic firm's marginal cost falls. This makes the home firms competitive in foreign markets increasing home exports.

Moreover, in the present analysis we define export diversification in both the senses – inter and intra industry sense – to examine how trade liberalization through its resource reallocation effect changes product variety. We also attempt to analyze quality variation and variety simultaneously. Tariff reduction leads to change in specialization pattern by reallocating resources when the import competing sector and the export sector draw resources from the same pool. This in turn affects the variety and quality of exports of the economy.

Some worth mentioning studies in this context which analyze both quality variation and diversification together are the studies by Falvey and Kierzkowski (1987), Flam and Helpman (1987) and Acharyya and Jones (2001). The first two studies attempt to explain both intra and inter-industry trade. The models by Falvey and Kierzkowski (1987), Falvey (1981), and Flam and Helpman (1987) demonstrate how trade in

vertically differentiated products takes place between countries with different per capita incomes. Falvey and Kierzkowski (1987) analyze international trade in goods with quality difference proxied by different proportions of factors of production employed. Thus, quantity of capital used in production is an index of quality. The unit cost and hence price increase with the quality. The consumers with identical preferences prefer the variety with the highest quality. The model by Flam and Helpman (1987), on the other hand, has only one factor of production, labour. Quality differences between varieties from the North and the South originate from differences in technology.

The implication of the models of Falvey and Kierzkowski (1987) and Flam and Helpman (1987) is that the North will produce and export higher-quality varieties while the South will produce and export lower quality varieties and there will be two-way trade when there is a demand for varieties not produced in the domestic market. In these models intra-industry trade arise from the demand for qualities not produced domestically. Since incomes are not equally distributed within countries, there can be situations where low income groups in the North demand lower quality varieties produced in the South, while high income groups in the South demand higher quality varieties produced in the North.

Acharyya and Jones (2001), on the other hand, assume coexistence of such intra and inter-industry trade and focus on how a tariff policy affects export quality. In a general equilibrium framework they establish a two-way causation between policy induced changes in income distribution and export quality. A small open economy with higher rate of return to capital relative to unskilled wages will produce a lower quality variety of exports. Thus there is a supply side link between income distribution and export quality which implies that direct income distribution policies and standard trade policies can be employed to improve export quality. Since the export sector competes with the rest of the economy for scarce factor, quality variation affects domestic income distribution.

2.3. Trade Liberalization and Export Variety

2.3.1. The Benchmark Model

To examine how trade liberalization affects export diversity of a country consider the following extension of the Krugman (1979) model. A small open economy (to begin with) has two sectors: a perfectly competitive

traditional sector producing a single homogeneous import competing good and another monopolistically competitive modern sector producing differentiated varieties of export good. Production pattern follows standard Heckscher-Ohlin-Samuelson structure with two factors of production – labour and capital – used in the two sectors though in different proportions. The homogeneous good is produced under CRS technology whereas the differentiated varieties are produced under IRS technology. The number of varieties is endogenously determined as in Krugman (1979). Wage is assumed to be fixed institutionally (in keeping with the observations in many industrialized countries in Europe as well as in many developing countries, like India), though labour is fully employed which is possible because of the endogenous determination of variety. In contrast to labour being used both as fixed and variable factor in Krugman (1979) model, here capital requirement is fixed per variety, whereas labour can be varied with the output of each variety. Preference is assumed to follow love-of-variety a la Dixit and Stiglitz (1977) as in Krugman (1979, 1980).

Initially the homogeneous imported good was tariff protected. In the benchmark model, a fixed coefficient production technology in the CRS sector is assumed such that no substitution between labour and capital is possible. On the other hand, for the export good of differentiated variety, elasticity of demand is assumed not to vary with consumption per variety. Both these restrictive assumptions are relaxed later.

Figure 2.1 illustrates the determination of the number of varieties of the export good (n) and the output of the import-competing good (Z) consistent with the full employment of labour and capital. Let K and L denote, respectively, the stock of capital and total number of workers in the country. The steeper line represents locus of different combinations of n and Z that maintains full utilization of capital stock of the country. The flatter line(s), on the other hand, represents locus of different combinations of n and Z that maintains full employment of labour for any given choice of output level of each variety of the differentiated good (denoted by x). It is assumed here that the exported varieties as a whole require more labour per unit of capital compared to the import competing good. The units of capital and labour required to produce one unit of the import-competing good Z are denoted respectively by a_{KZ} and a_{LZ}. Finally, β is the units of labour required to produce one unit of i^{th} variety and ρ is the units physical capital required to produce each variety regardless of its output level.

Starting from an initial equilibrium at point E_o, with n_o number of varieties of the export good and Z_S amount of the import-competing good being produced, let us examine the impact of a reduction in import tariff in the traditional sector on the number of varieties in the modern sector. It is trivial to check that a reduction in the import tariff rate lowers the rate of return to capital. With the fall in the rate of return to capital, average cost falls in the modern sector, given the institutionally fixed money wage. Since free-entry leads to average-cost pricing so there is a downward pressure on price of each variety. But for institutionally fixed wage, a price decline due to free entry would mean a loss for firms. Hence they adjust to the decline in average cost by lowering output per variety of the horizontally differentiated good proportionately.

Thus net availability of factors of production for the homogeneous good and the number of varieties rises. As a result the number of varieties will increase if the modern sector is relatively labour intensive. This is similar to the output magnification effect in the standard Heckscher-Ohlin-Samuelson type model.

In **Figure 2.1** the labour constraint rotates up and the equilibrium after tariff cut shifts from E_0 to E_1. Output in the traditional sector falls from Z_0 to Z_1, and with the rise in the net availability of factors of production the number of varieties in the modern sector increases from n_o to n_1 *if the CRS sector is relatively more capital intensive*. Thus trade liberalization in the form of tariff reduction in the traditional sector leads to greater diversification in the differentiated good sector if this factor intensity ranking holds. Otherwise reduction of import tariff in the CRS sector lowers number of varieties of the horizontally differentiated good.

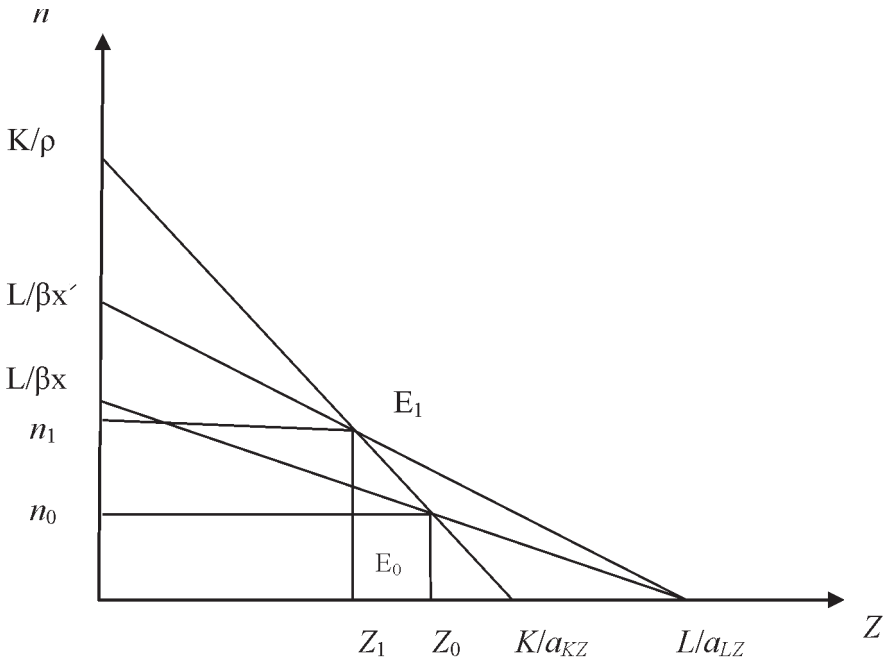
The result is summarized in the following proposition:

Proposition 2.1. *With fixed coefficient production function and constant elasticity of demand, a tariff reduction in a small open economy will increase the number of varieties of the horizontally differentiated export good and lower the output of the homogeneous import competing good if the homogeneous good is relatively capital intensive.*

2.3.2. Robustness Checks

It is easy to check that the above mentioned result is reinforced with flexible coefficient production technology and variable elasticity of demand. Now to check the importance of the assumption of given world price of good *Z* for the small country

Figure 2.1: Tariff Reduction and Number of Varieties



the benchmark model of a small open economy is extended to a two-country world economy to study the impact of terms of trade change. A foreign country similar to our home country is now considered. The countries are incompletely specialized in producing the homogeneous good but produce a different set of manufacturing goods. We continue with the assumption that the home country imports the homogeneous good. The production structure is the same as before - two factors of production, labour and capital, used in the two sectors. In addition to these equilibrium conditions now we have the world market clearing condition for the homogeneous good which says that the total demand for the homogeneous good should be equal to its total supply. Now the world price of the homogeneous good may rise or fall depending on the relative strength of the demand and supply effects. Tariff reduction influences world price in various ways from both demand and supply sides. In the supply side tariff reduction changes the output of *Z*, via its resource reallocation effect, depending on factor intensity. At the initial world price P_z^w a reduction in the tariff on imports of the homogeneous good by the Home country lowers the rate of return to capital there. Though rate of return to capital

falls, there is no factor substitution with fixed coefficient production technology. So output per variety of the differentiated good produced by the Home country falls. With the increase in net labour availability, similar to the output magnification effect, the number of varieties of good *x* will rise and output of the homogeneous good falls if the homogeneous good is relatively capital intensive. As output falls, P_Z^W increases. If on the other hand, the homogeneous good is relatively labour intensive then output of *Z* expands despite tariff reduction and world price of *Z* falls.

Following standard trade theory, however, we assume the world price of the homogeneous good to rise, which means that the domestic price of good *Z* rises in the foreign country (which exports good *Z*) as well. In contrast, the domestic price falls in the importing home country.

Here diversification is defined in both the inter-industry sense or across sectors and in the intra-industry or within sector. A reduction in import tariff on the homogeneous good by the Home country leads to increased diversification within sector for the Home country. The Foreign country is more diversified across sectors under the assumed pattern of trade that the horizontally differentiated export good is relatively more labour intensive. A reduction in import tariff on homogeneous good by the Home country lowers the tariff inclusive domestic price of the good, raising import and lowering domestic production of the homogeneous good. As production in the traditional sector shrinks factors of production are released from this sector which are then absorbed in the modern sector. Since output per variety in which the Home country is specialized falls, as argued in the earlier section, with the increase in net labour availability the number of variety increases given the factor intensity assumption that the homogeneous good is relatively capital intensive. In contrast to that, the impact of tariff reduction on number of variety in the CRS good exporting country, or in the Foreign country, depends on how the world price changes as the price is same as the world price. If the world price increases the CRS sector expands and the number of variety falls in the Foreign country.

Therefore, across sector the Foreign country is more diversified as it exports both the homogeneous good *Z* and the horizontally differentiated variety Y in which it is specialized. When the two sectors of an economy draw resources from the same pool, expanded size of the import

competing sector means smaller number of variety. Thus, within sector the homogeneous good exporting country, or the Foreign country, is less diversified if tariff reduction increases the world price of the homogeneous good. In contrast, variety increases in the country importing the homogeneous good, which in the present case is the Home country, if the homogeneous good is relatively capital intensive.

2.4. Trade Liberalization, Export Quality and Variety

In this section we examine whether trade liberalization by a small open economy can increase variety as well as raise the quality of its export products. By quality variation we mean improvement in terms of product feature and characteristics that make a higher quality product vertically differentiated from a lower quality product. Examples of such quality variation may be higher-end processor-enabled personal computer. This quality-differentiated good is modeled along Acharyya and Jones (2001), which is produced by perfectly competitive firms under CRS technology using physical capital and sector-specific skilled labour. This good is not domestically consumed but is produced entirely for the export market.

Now we have two export goods – a quality-differentiated good, a horizontally-differentiated good – and a homogeneous import-competing good. Both the quality of the export good and the number of varieties of the other export good are determined endogenously.

There are three (domestic) factors of production: skilled workers, unskilled labour and physical capital. Endowments of these factors are given exogenously. Whereas the skilled workers are specific to production of the quality differentiated good, the unskilled workers are specific to production of horizontally differentiated and homogeneous goods. Physical capital is, on the other hand, used by all these three sectors.

For any given quality of non-traditional exports, skilled labour and capital are used in fixed proportions in production. But the production technology is such that higher quality varieties are more intensive in capital relative to lower quality varieties. In addition, we have diminishing returns to capital (with respect to quality).

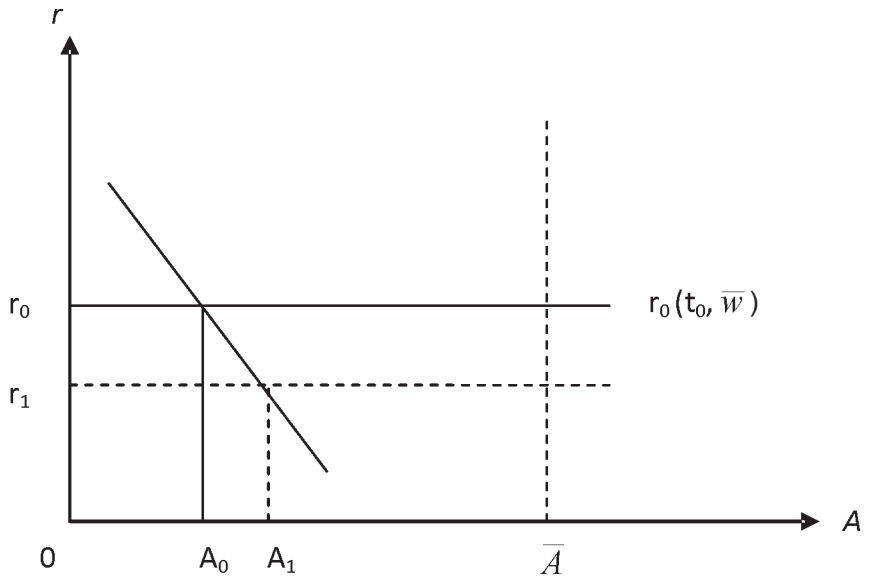
The firms exporting the quality-differentiated good choose the quality of their export by maximizing profit. Though these firms are price takers in the world market, are fully aware

that the price that they receive varies positively with the quality of the good that they export. On the other hand, higher quality good requires more capital per unit of output. Hence, by raising quality of the export good a firm can earn extra revenue but at an additional capital cost. The profit maximizing quality is achieved by an exporter for which the additional revenue earned is exactly equal to the additional (capital) cost incurred.

Such a profit maximizing choice of export quality implies an inverse relationship between quality and the return to capital which is illustrated in **Figure 2.2**. An increase in the rate of return to capital raises the (capital) cost of producing higher quality goods. Given the world prices, this lowers profit from a higher quality good. Consequently, the firms adjust and make up losses arising from higher cost of capital by lowering the export quality and thereby saving upon the use of capital per unit of labour. The horizontal line corresponding to the ad-valorem tariff rate t_o depicts the zero profit condition of the import competing good which says that the (real) rate of return depends on the import tariff rate and the fixed money wage. Thus, the profit-maximizing quality of the export good is A_o.

In such a framework, let us consider the impact of reduction in import tariff. Since a reduction in the import tariff rate lowers the rate of return to capital, the quality of the export good improves. In **Figure 2.2**, the

Figure 2.2. Relationship between Quality and Rate of Return to Capital



horizontal line shifts down inducing the producers to choose better quality. The reason is simple. As the tariff reduction lowers the (real) rate of return to capital, the marginal cost of producing higher quality falls. This raises the profit and induces the firms to improve the product quality.

Again, as higher quality requires larger physical capital so that less capital is available for production of the import-competing good *Z* and export good *X*. Following the discussion in the preceding section it is immediate that lower rate of return to capital lowers the output of each variety proportionately.

Thus, net labour available for the homogeneous good and the number of varieties produced rises. With the corresponding relative labour availability rising, similar to the output magnification effect, the number of varieties will increase if the horizontally differentiated export good is relatively more labour intensive than the import competing good. Otherwise, a tariff reduction lowers the number of varieties exported. There is a trade-off between export diversity (in terms of varieties of good *X*) and export quality in such a case. In the present model a reduction in import tariff changes the number of horizontally differentiated varieties through the resource reallocation effect which operates via two avenues– the competition effect and the output magnification effect as described in the benchmark model of small open economy in Section 2.3.1. Hence,

Proposition 2.2. *A tariff reduction unambiguously improves quality of the vertically differentiated export good. The increase in the number of varieties of the horizontally differentiated export good depends on the factor intensity condition.*

2.5. Conclusion

The present chapter examines the impact of trade liberalization on export diversification – both across and within sectors for small and large open economies. To start with we extended Krugman (1979) model for a small open economy with fixed coefficient production technology in the traditional CRS sector and constant elasticity of demand. Diversification is considered in the intra-industry sense in terms of number of varieties within the horizontally differentiated sector. The model examines how the number of differentiated varieties changes due to tariff reduction in the traditional import-competing sector. It is found that tariff reduction raises number of varieties if the homogeneous good is relatively capital intensive. The result is robust to variable demand elasticity, flexible

coefficient production technology and two country world economy.

We further examine the impact of trade liberalization by a small open economy on variety and quality of its export products. The distinctive feature of the model is that it considers both horizontal and vertical differentiation. The quality differentiated sector resembles the one constructed by Acharyya and Jones (2001). In such a framework, we show that a reduction of tariff on the homogeneous import good raises the quality of the export good. This result is similar to what Acharyya and Jones (2001) had earlier demonstrated in a competitive general equilibrium framework with a non-traded good. Thus, their result extends to a framework where we have elements of IRS and monopolistic competition in a particular export sector. The increase in the number of varieties of the other export good, however, depends on the capital intensity of the horizontally-differentiated good relative to that of the homogeneous import-competing good.

3. TRADE LIBERALIZATION, EXPORT DIVERSIFICATION AND COMPOSITION

3.1. Introduction

In the earlier chapter we have examined the implications of trade liberalization for diversity and quality of exports for a small open economy and for two large economies in a two country world. Export diversity has been defined in terms of the horizontally differentiated varieties of the same good and thus in essence has been within sector in nature. But diversified export basket of a country may comprise of many distinctly different goods as well as many varieties of a particular good. That is, diversification of export baskets can be both across and within sectors. What can be said about the implication of trade liberalization policy for such diversification of exports in a more general sense? This merits further analysis because, as we have shown, when the import competing goods and export varieties draw resources from the same pool, increased variety means smaller size of the import competing sector and vice versa. Does a similar trade-off arise when a country exports many goods and many varieties of the same good? This is the particular issue that this chapter addresses.

For this purpose, we extend our benchmark analytical framework of Section 2.3.2 of Chapter 2 by considering a continuum of perfectly competitive traded goods indexed by Z over the unit interval [0, 1] following Dornbusch, Fisher and Samuelson (1977), hereafter denoted as DFS. To keep things simple, however, we assume that these continuum of goods and the horizontally differentiated good produced under IRS are produced by only domestic labour, in fixed units. This section assumes flexible wage otherwise with one factor full employment cannot be maintained. Thus, the analytical framework that we consider here to study diversity of exports both within and across sectors (or goods) is a straightforward synthesis of the DFS (1977) and Krugman (1979) frameworks.

There are many advantages of the continuum goods framework of DFS. First, it enables us to endogenize the pattern of trade in CRS goods

and composition of export baskets of trading partners. Second, trade costs like tariffs and transport costs make some intermediate range of goods non-traded in this type of framework. Thus, for a reduction of tariff it is possible to have an equilibrium outcome where the export baskets of both the trading nations become more diversified. This is in contrast to the result we have obtained in Chapter 2 that product variety cannot increase in both the trading nations simultaneously. Third, since goods in the interval [0, 1] are distinctly different from each other in their technological requirements with higher indexed goods requiring more labour per unit than the lower-indexed goods, these goods can be interpreted as quality-differentiated goods. On this interpretation, our analysis can shed some light on the quality content of export basket of countries as a generalization of the Acharyya-Jones (2001) framework adopted in Section 2.4 of Chapter 2 where lower and higher qualities were not produced and exported simultaneously.

3.2. The Analytical Framework and the Results

Consider two countries, Home and Foreign, producing a continuum of perfectly competitive good Z under CRS and a set of horizontally differentiated good X and Y, respectively, under IRS. The set of continuum of goods that the countries can potentially produce is given by the unit interval [0, 1]. This is the feasible set of goods defined by the present state of technology. The goods over this interval differ only with respect to units of labour required to produce one unit of the good. In particular, we index the goods in a way that, in each country, higher indexed goods require more labour per unit of output.

The two countries specialize and export a different sub-set of the continuum of goods according to their pattern of comparative advantage, or according to relative average cost of production. The average cost of production depends on two things in this structure: production technology (or units of labour required to produce one unit of good Z) and the national wage rate (W and W^* for the home and foreign country, respectively). More precisely, the relevant comparison is between technology asymmetry of the two countries and relative national wages. Suppose that, relatively, the foreign country requires less additional labour than the home country to produce a higher indexed good. This means that the foreign country has relative technological advantage in producing higher indexed goods in the interval [0, 1]. This assumed technological advantage of the foreign country

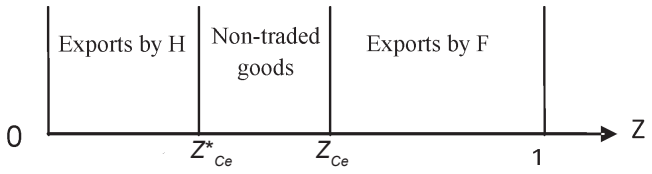
in higher order goods implies that it will be producing an upper sub-set whereas the home country will produce a lower sub-set of goods in the interval [0, 1]. The size of the subsets of goods produced by the foreign and home countries, however, depends on this relative technological advantage of the foreign country (or relative technological disadvantage of the home country) vis-a-vis the relative national wages. This is because a good will be produced abroad rather than at home only if its unit cost of production is lower abroad than at home, for which both technology and wage are important.

A tariff or any other trade costs such as transaction costs (or transport cost), however, makes some of these *Z*-goods non-traded, depending on the tariff level (or level of transport cost) relative to the unit cost of production in the two countries. **Figure 3.1** below illustrates production specialization and pattern of trade in *Z* goods. Along with the horizontally differentiated good *X*, the home country produces the set of goods $Z\epsilon [0, Z_{Ce}]$. Similarly, the foreign country produces the horizontally differentiated good *Y* and the set of goods $Z\epsilon [Z^*_{Ce}, 1]$. Amongst these set of goods produced in the two countries, the commonly produced set of goods $[Z^*_{Ce}, Z_C]$ are non-traded whereas all goods $Z\epsilon [0, Z^*_{Ce}]$ will be exported by the Home country and all goods $Z\epsilon [Z_{Ce}, 1]$ will be exported by the Foreign country. Note that home (foreign) country also exports *n* (or *n**) varieties of good *X* (good *Y*).

Suppose initially each country government had imposed ad-valorem tariffs on imports of *Z* goods, which generates tariff revenue for the government. We assume, following DFS, that these tariff revenues are redistributed to the domestic citizens in lump sum manner. This means that income of a domestic citizen is larger than her wage income by the magnitude of the share of tariff revenue that she receives.

In the above set up, the following results are obtained when the home country reduces its tariff on imports of good *Z* from the foreign country:

Figure 3.1: Production Specialization and Pattern of Trade



Proposition 3.1.

a) *The relative home wage, W/W*, will fall.*
b) *The sub-set of goods produced abroad will unambiguously contract though the sub-set of goods produced at home may not contract. The initial tariff rate is important determinant for whether the sub-set of goods produced at home falls or not.*
c) *The set of non-traded goods contracts unambiguously and consequently more goods are now traded by the two countries.*
d) *The number of varieties of the homogeneous good exported by the home country may increase.*

There are many contrasting effects of tariff reduction on the relative wage. First of all, the initial contraction of the production set in the Home country causes a fall in the demand for labour there, which tends to pull down the relative wage. Then there are the revenue and income effects of a reduction in the tariff rate. But there are forces as well that tend to raise the relative wage. Most important of which is the resource allocation effect in the Home country of a reduction in tariff rate. Labour released from the *Z*-sector due to the initial contraction of the set of *Z*-goods being produced and fall in demand for and production of each *Z*-good, moves to the *X*-sector and causes an expansion of the number of varieties. But if additional varieties being produced require more labour than released from the *Z* sector, there will emerge an excess demand for labour, which will push up the Home relative wage. Taking into account all these effects, we, however, find a fall in the relative home wage as stated above.

This means that given the technological conditions, some of the goods that were previously produced abroad can now be produced at home at a lower relative cost. As a result the set of goods produced in the foreign country falls. But this does not necessarily mean that the set of goods produced in the home country will increase. Note that the countries were producing a common set of non-traded good before the tariff reduction. So reduction in number of *Z*-goods produced by the foreign country only means that the set of non-traded good will contract and more goods will now be traded.

The reason for the home country not necessarily being able to produce a larger set of goods now is the following. A reduction of tariff by the home country makes the tariff-inclusive price of foreign goods lower in the home country. Due to this pro-competitive effect of tariff reduction, a lower set of goods will now be

produced in the home country. The fall in the equilibrium relative wage as stated above then means that we have contrasting pro-competitive and wage effects of a tariff reduction on the equilibrium set of Z-goods being domestically produced in the Home country. Whereas tariff reduction by the Home country lowers the set of goods domestically produced through the pro-competitive effect, it establishes comparative advantage in a larger set (and in relatively higher qualities) of Z-goods by lowering the relative Home wage. If this wage effect is weaker, a tariff reduction implies a smaller set of the homogeneous good will be produced in the Home country at the new equilibrium. This is more likely the case if initially the Home tariff was very high, because then a one percent reduction in the home tariff will generate a very large pro-competitive effect causing the sub-set of goods produced in the home country to contract.

The above results have the following implications. First, for a ceteris paribus reduction in the (uniform) tariff on imports of homogeneous goods by the Home country, the home exports become more diversified since the set of goods produced in the foreign country now falls, and some of the goods it was producing earlier will now be imported from the home country. Second, under the assumption of stronger pro-competitive effect of tariff reduction by the Home country, exports of Z-goods by the Foreign country become more diversified for similar reasons. Thus, despite the set of goods produced in each country contracting, the export baskets are now more diversified. But in case of stronger wage effect in the Home country, exports of the homogeneous goods by the Foreign country becomes less diverse since its set of exports contracts.

Figure 3.2: Unilateral Tariff Reduction by Home country and Pattern of Trade

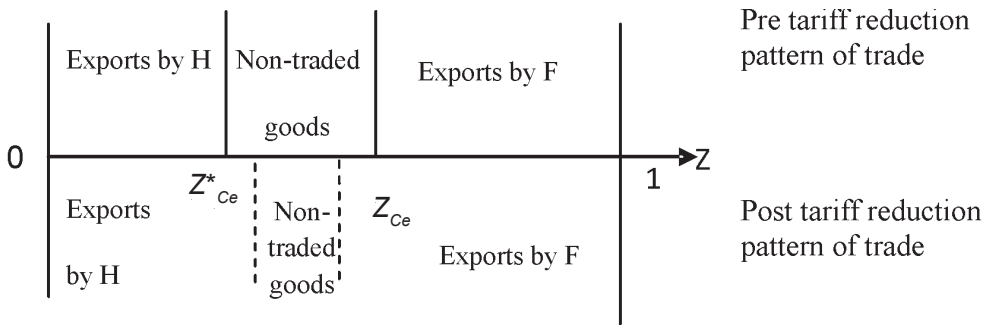


Figure 3.2 illustrates this reduced set of non-traded goods for a stronger pro-competitive effect of tariff reduction by the Home country.

Finally, in case of reduction in tariffs on imports of the Z-goods by *both the countries,* the results stated above regarding the contraction of set of Z-goods produced in both the countries and expansion of set of Z-goods exported by both countries get reinforced or stronger. Again the desired export diversification may not be achieved by both countries. The country in whose favour the ratio of national wages (or the Ricardian double-factoral terms of trade) moves is more likely to experience an increase in the number varieties of the horizontally-differentiated good along with an expanded set of distinctly different goods being exported. For example, a fall in the Home wage relative to the Foreign wage makes the Home country a more likely achiever of the desired export diversification.

3.3. Conclusion

This chapter examines the implications of tariff reductions for diversification of exports of many goods and many varieties. Such an analysis is worthwhile from the perspective of growth implications of liberal trade policies, since recent empirical findings suggest that diversification and composition of export basket of countries are crucial determinants of stronger export-growth relationship. The results obtained here, however, indicate that tariff reductions may have asymmetric effect on the diversity of export basket of countries. In case of unilateral tariff reduction by the home country, it is more likely that the export basket of the foreign country will get diversified whereas the export basket of the home country may not. For bilateral tariff reductions (which is extremely relevant in the present era of globalization and trade liberalization), on the other hand, the country in whose favour the ratio of national wages moves is more likely to have a diversified export basket.

4. EXPORT DIVERSIFICATION, COMPOSITION AND ECONOMIC GROWTH

4.1. Introduction

Earlier chapters have examined the impact of trade liberalization on diversification and quality content of export baskets of small and large open economies. These dimensions of export basket have some far reaching growth implications as recent empirical studies on trade and growth suggest. The present chapter focuses on this dynamic or growth aspect of trade and the nature of export basket. Our investigation, however, is empirical rather than theoretical.

Most of the empirical studies on export-led growth either pool countries together or consider level or growth rates of aggregate exports. That is, they investigate the trade-growth relationship at an aggregated level which may not capture the asymmetric country effects and ignore the impacts of the nature and the composition of exports that may be important in explaining such asymmetric country effects. The present chapter analyzes the trade and growth relationship at two levels of disaggregation – at the country level and at the level of exports – focusing on the diversification and the composition of exports of the countries. However, instead of drawing only upon the results derived in the theoretical chapters, other existing theories have also been used to enrich our empirical estimates.

Empirical studies linking these aspects of export baskets like the diversification and the composition of exports and economic growth, especially at the cross-country level, are still limited. Lederman and Maloney (2007), Agosin (2007) and Hesse (2008) investigated the relationship between export diversification and economic growth at the cross-country level. Rodrik (2006) and Hausmann, Hwang and Rodrik (2007), on the other hand, found the importance of productivity of export basket. The present chapter extends these studies in the following directions.

First, to solve the "lump-together" problem inherent in estimates of panel data, we carry out our empirical

estimation for separate country groups classified into sub-groups based on the difference in export-economic growth relationship across countries.

Second, to bridge the gap between the analysis by Agosin (2007) and Hesse (2008) on one hand, and Rodrik (2006) and Hausmann et al. (2007) on the other, we take into account both these aspects of diversification and composition of export basket of countries.

Third, we re-examine whether diversification and composition of exports augment output growth in a two-stage estimation procedure. Note that since the impact of diversification and composition of export basket of a country on its output growth is at best an indirect one, it seems more reasonable to estimate the impacts of these dimensions of exports on the export-induced growth component, rather than on the overall output growth. For the purpose, in the first stage the impact of exports on output is estimated controlling for the impacts of lagged output and investment; in the second stage, the impact of the diversification and composition indices on the export-induced growth component are estimated after controlling for infrastructure development of countries, which is taken as a proxy for domestic growth policies.

4.2. Review of Literature

The earliest argument for trade propelling growth dates back to Adam Smith's (1776) 'productivity' theory in the eighteenth century. Thereafter Keynes and Kalecki elaborated upon the demand augmenting effect of increased net exports as one of the sources of export-led growth. Both the productivity theory of Smith and arguments of trade as an engine of growth emphasize upon the importance of production specialization and trade. The basic argument lies in the static gains from trade emanating from production specialization according to comparative advantage, and the dynamic gains from trade resulting from division of labour and exploitation of economies of scale.

But the structuralist theories cast serious doubts on such theoretical proposition of specialization driving growth as the developing countries experienced secular deterioration in their terms of trade as they specialized in primary commodities according to their comparative advantages (Prebisch, 1959; Singer, 1950). This suggests that a change in the composition of exports from primary to manufactured products or vertical diversification is required in

sustaining growth (Chenery, 1979; Syrquin, 1989: Agosin, 2007).

Again, during the late 1970s and early 1980s, there was revival of the theory of 'trade as an engine of growth'. One of the reasons behind this revival was the success of the outward oriented economies of East Asia like Hong Kong, Singapore, Korea, Taiwan (Balassa, 1978; Krueger, 1990). The 'new trade theories' and new growth theories together seem to explain, at least partly, these success stories. The 'new' trade models, as developed by Krugman (1979, 1980), emphasize the extensive margin of trade, that is, wider variety of goods, to explain export diversification.

The new growth theories further locate the sources of growth in increasing product varieties (Romer, 1990; Grossman and Helpman, 1991) and rising product quality (Aghion and Howitt, 1992; Grossman and Helpman, 1991). These models specify various channels through which openness can promote long-run economic growth. For example, Grossman and Helpman (1991) consider technology diffusion as the key to long run growth and predicted higher steady-state growth rate for more open economies. Lucas (1988) and Young (1991), on the other hand, emphasize upon learning-by-doing. In Romer's (1990) endogenous growth model openness accelerates the growth rate of a backward economy by creating opportunities to specialize and to adapt more advanced technologies from developed countries. According to the product cycle literature export diversification takes the form of the North innovating and the South imitating and ultimately export takes place from the cheap labour abundant countries (Vernon, 1966; Grossman and Helpman, 1991).

The implications of the new growth theories are that the countries with a relatively diversified export basket with better quality of such exports would experience a more sustained growth effect of openness than other countries. A change in the composition of exports from primary commodities into high-skilled, high-technology goods is desirable because trade in these products allows for more scope of growth through productivity gains, spillover effects, and learning-by-doing.

These theoretical conjectures essentially suggest two things. First, narrow specialization, especially in primary and agricultural goods, may make countries vulnerable to external shocks, and thus, retard their growth through terms of trade deterioration. Most of the sub-Saharan African countries, in particular, depending heavily on two or three commodities

for most of their export earnings, are glaring examples. But when larger number of goods is exported by a country, asymmetric movements in the world prices of individual goods will offset each other and the country's export price level will tend to be relatively stable. Export diversification, thus, helps in stabilizing export earnings in the long run (Michaely, 1962; Acharyya, 2007; Acemoglu and Zilibotti, 2007).

Second, it is not just how much countries export, but what countries export may matter. Neither specialization nor diversification aids growth as long as exports comprise of predominantly low value added commodities. This implies that the countries which produce high-productivity goods enjoy faster growth than the countries with low-productivity goods as was the case with China and India (Rodrik, 2006; Hausmann et al., 2007).

The empirical findings on trade and growth are also mixed. Individual country experiences of some of the OECD countries during the 1960s and 1970s support the export-led growth argument. Trade liberalization in those countries during the 1960s and 1970s had led to sustained and higher growth (Srinivasan and Bhagwati, 1999). These individual country experiences have been generalized in the cross country analysis. Studies by Dollar (1992), Edwards (1992), Sachs and Warner (1995), Frankel and Romer (1999) established positive association between greater trade openness and faster growth. Dollar and Kraay (2001) observed that the post-1980 globalizers (like China, India, Malaysia, Mexico) experienced faster growth rate than the rich countries while at the same time the growth rate declined for the nations which followed protectionist trade regime.

But in a critical survey of this literature Rodriguez and Rodrik (2000) were skeptical about the robustness of these studies regarding measurement of openness, correlation with other sources of poor economic performance, statistically sensitive specifications. While investigating cross-country differences in income levels, Rodrik, Subramanian and Trebbi (2002) found that once the effect of institution is controlled for, the impact of trade and geography become insignificant. We will return to this aspect in the next chapter.

Regarding the nature of export basket, on the other hand, when a country's export basket is highly concentrated, any change in the world prices of those goods will produce similar change in the country's export price leading to export instability of

the countries which are dependent on these products. This may discourage investment by risk averse firms, increase macroeconomic uncertainty, and deter long term economic development. Brainard and Cooper (1968) suggested that risk averse countries should diversify their exports because of the co-variability of world prices of different export items. Specialization according to comparative advantage may not always hold, especially under uncertainty which reduces production of primary products of risk-averse producers leading to fall in overall world trade (Ruffin, 1974; DeRosa, 1991). Saint-Paul (1992) showed that under incomplete market structure diversification results as an incentive to get insured and countries specialize with greater accessibility of financial markets so that the portfolio motive can no longer outweigh gains from specialization according to comparative advantage. Thus diversification of exports is needed to offset uncertainty if financial institutions providing insurance are lacking, as in many African countries (Chang, 1991).

Using cross-country data Strobl (2005) concluded that there are significant welfare gains for countries diversifying into a more 'optimal' export structure though the magnitudes of these gains are country specific. In a dynamic panel model for a sample of sixty five countries for the period 1980-1999, Lederman and Maloney (2007) found evidences of export concentration adversely related to growth. After controlling for the effects of investment and rule of law, Agosin (2007) found export diversification and an interaction term of export diversification with per capita export growth (a measure of diversification-weighted export growth rate) to be significant in explaining per capita GDP growth over the period 1980-2003 in Asia and Latin America. He concluded export diversification to be an important factor contributing to the differences in growth performance of Asia relative to Latin America. In a dynamic growth framework of 99 countries for the period 1962-2000 Hesse (2008) found that the relationship between export diversification and economic growth is nonlinear with the developing countries benefiting from diversifying their exports whereas the advanced countries performing better with export specialization.

In the recent years diversification and specialization have been considered as part of endogenous outcome of a country's stages of development whereby producers invest in a wide range of risky assets leading to sectoral diversification (Acemoglu and Zilibotti, 1997). Imbs and Wacziarg (2003)

argue that low income countries tend to diversify their production to reduce risk associated with the sector-specific idiosyncratic shocks. Based on the preference approach they conclude that with increasing income levels economic agents demand a larger diversity of goods for consumption which follows from the Engel effect. The stages of diversification are endogenously determined from the interaction of rising productivity and falling trade costs. In a wide cross section of countries they found that the relationship between sectoral concentration and per capita income follows a U-shaped pattern so that countries first diversify and specialize beyond a certain threshold level of income. Though the study focuses on country's production structure, they have implications for export structure, given the nexus between production and export. Cabellero and Cowan (2006) and Klinger and Lederman (2006) found this pattern of domestic diversification and specialization to hold for countries' exports also, but the turning point is achieved at a higher GDP per capita so that mainly very advanced economies might benefit from concentrating their exports.

A recently developed strand of literature suggests that change in export composition is required for moving resources into more sophisticated products and the countries that export high productivity goods will grow more rapidly (Hausmann, Hwang and Rodrik, 2007). The main hypothesis of Hausmann et al. (2007) is that 'countries become what they produce'. Thus rich countries are those that export 'rich-country' products and countries which continue to produce 'poor country' goods remain poor. Rodrik (2006), on the other hand, argues that it is not the volume of exports or specialization according to comparative advantage in labour-intensive exports that has led to China's rapid growth. Rather, China's export of highly sophisticated products, which is usually not expected of a poor, labour abundant country, has been the main driver of its rapid growth.

4.3. The Export-GDP Growth Association during 1965-2005 and Selection of Sub-Groups

In cross-country studies there are two main factors influencing the development pattern of countries – 'universal factors' and 'group factors'. The universal factors (like level of income and size of the economy) generate uniform pattern in the socio-economic process across countries. In contrast, the group factors differ significantly from each other and cannot be represented adequately in the overall pattern. In that case countries can be classified according

to some significant structural differences and then each group can be estimated separately. Usually, countries are classified on the basis of size, income level, natural resource endowment, inflow of foreign capital and trade orientation index (Chenery and Taylor, 1968; Chenery and Syrquin, 1975). The present study, however, adopts a somewhat different approach in categorizing countries on the basis of export-economic growth relation.

First the entire time period is sub-divided into two phases: 1965-1984 and 1985-2005 as the world economy was in post oil shock recession till 1984 and there was a revival thereafter. The average growth rates of export and GDP for the two sub-periods are then plotted in scatter diagrams 4.1 to 4.6[2]. The scatter plots in **Figures 4.1 and 4.4** are sub-divided into four quadrants for the two sub-periods. The association between exports and economic growth is positive for the countries which are in the lower left and upper right quadrants (Regions II and IV) of the scatter diagrams. The correlation coefficients between exports and GDP growth are 0.8 and 0.84 in the two sub-periods for this group of countries. While positive relation between trade-growth is predicted, the relationship is negative for the countries in the upper left and lower right quadrants ((Regions I and III). The correlation coefficients are (-0.64) and (-0.6) in the two periods. In Region I GDP growth of the countries is not due to exports. Many African countries like Algeria, Benin, Egypt, Morocco, Nigeria, Senegal, Tunisia are in this region. In Region III, however, growth in exports has not led to growth in income. Some high income countries like Germany, the US, Netherlands can be seen in this region[3]. **Figures 4.2, 4.3, 4.5 and 4.6** plot the countries separately depending on whether export-growth relationship is positive or negative in the two periods.

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[2] Before plotting scatter diagrams, box plots of the growth rates of GDP and exports for the two sub-periods are drawn to identify outliers in the sample (See Figures 4.7 and 4.8 in appendix A.4.1.1). The samples are found to have slightly positively skewed distributions with a few high growing countries (like China, Korea) pulling up each group's mean above the median value. The outlying cases are deleted in final estimation of each country group as outliers can greatly influence mean and standard deviation of a distribution. However, separate estimation is done with China and Korea and the values of the estimated coefficients of exports were found to be higher.

[3] Standard trade theory (like the Heckscher-Ohlin-Samuelson theory) predicts the export-oriented sector to expand as the relative price of the exportables increases. Thus, movement of resources away from the sectors with comparative disadvantage may reduce output there. If the decline in production in the import competing sector is large enough to outweigh the positive gains from exports, economic growth may slow down.

In this way we can classify the sample into four groups of countries depending on the export-economic growth association. The first and second groups comprise of all those countries where the export-economic growth association is positive and negative in the two sub periods, respectively. The two other groups comprise of the transitional countries – for which the export-growth association changed from negative to positive or vice versa. The detailed classification of countries is presented in **Appendix A.4.1.**

Table 4.1 reports the R^2 values which indicate how much of the variations in GDP growth is explained by exports. The R^2 values corroborates to the finding of improved export-growth relation in the individual country groups than the pooled sample which implies significance of sub-division of sample (Chenery and Syrquin, 1975). Moreover, the R^2 values improved during 1985-2005 from that in 1965-1984. This is quite expected because many developing countries started integrating with the world economy during the period.

Figure 4.1: Average Growth Rate across Countries during 1965-1984

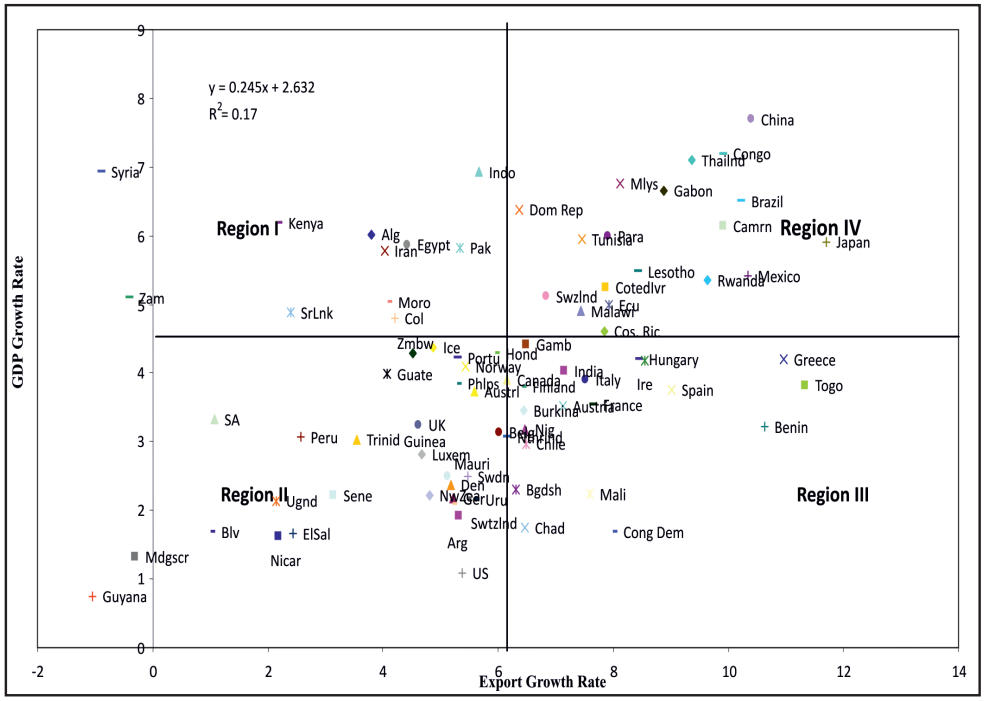


Figure 4.2: Average Growth Rate of Positive Relation Countries during 1965-1984

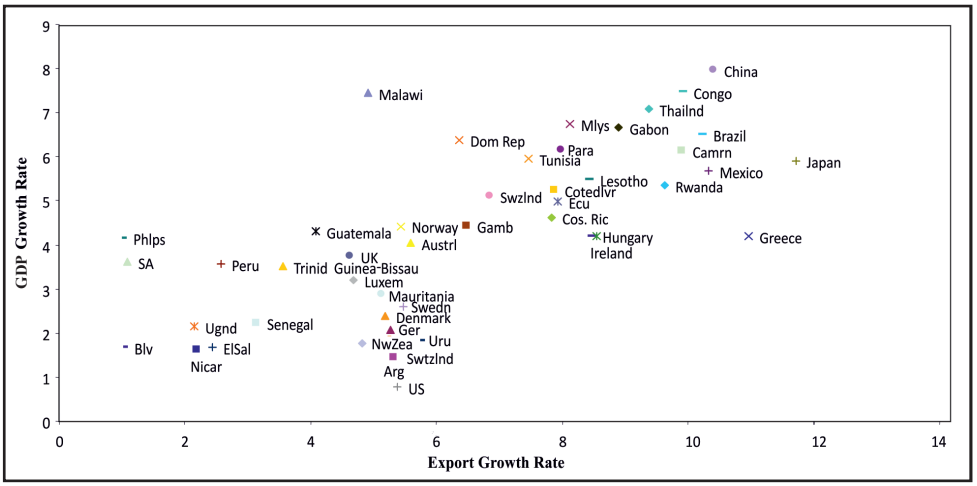


Figure 4.3: Average Growth Rate of Negative Relation Countries during 1965-1984

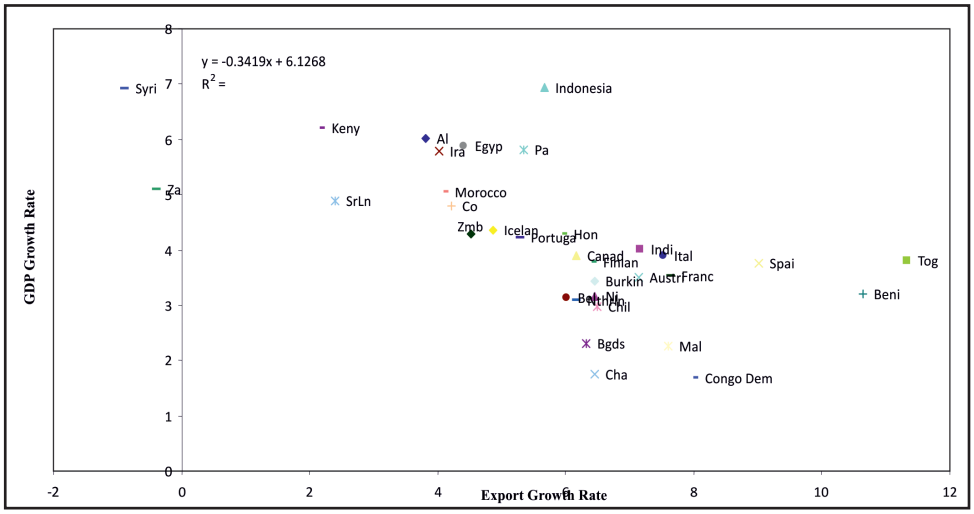


Figure 4.4: Average Growth Rate across Countries during 1985-2005

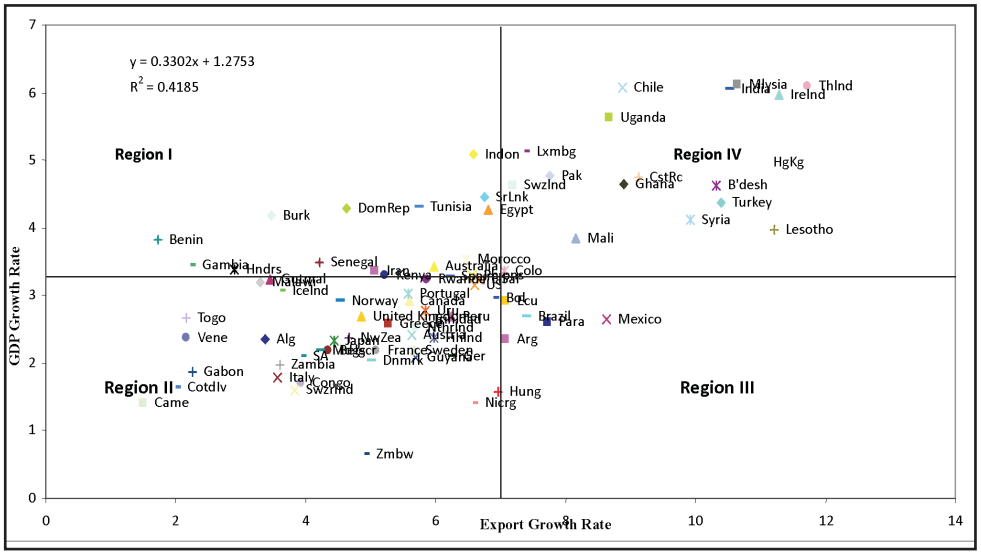


Figure 4.5: Average Growth Rate of Positive Relation Countries during 1985-2005

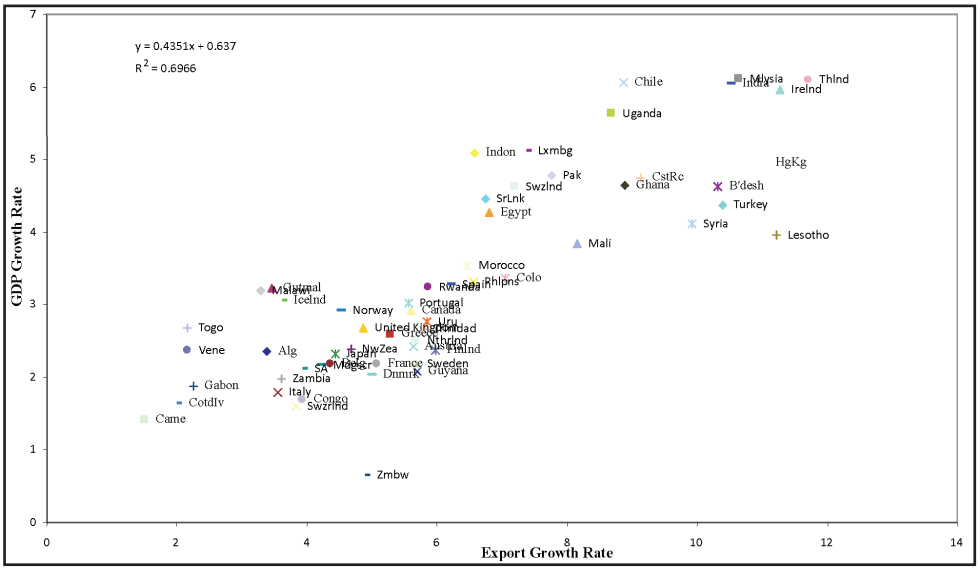
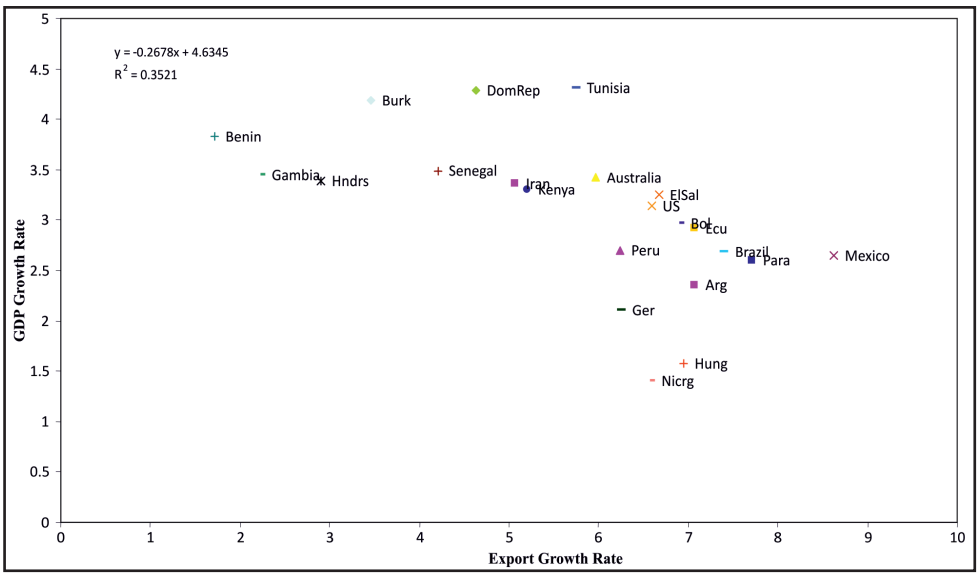


Figure 4.6: Average Growth Rate of Negative Relation Countries during 1985-2005



4.4. Model Specification, Methodology and Data Sources

To investigate the impacts of the diversification and the composition of exports on income a dynamic framework is adopted. This framework not only takes care of the specification bias that would have resulted without the inclusion of a lagged dependent variable but also provides consistent estimator of other parameters and captures the persistence in GDP growth.

4.4.1. Model Specification

Consider the following cross country growth equation:

$$Y_{ct} = \alpha_0 + \alpha_1 Y_{c\,t-k} + \alpha_2 X_{ct} + \eta_c + u_{ct} \quad (4.1)$$

where Y_{ct} is the natural log of GDP in country c at time t, $Y_{c\,t-k}$ is the k years lag of Y_{ct}, X_{ct} is a set of potential explanatory variables. The term η_c captures the unobserved country specific time-invariant effects like the impacts of geography, the role of institutions. uct is the random disturbance term that varies across both countries and years and is assumed to be uncorrelated over time.

Export diversification, as measured by the commodity concentration index (CCI), is included as an explanatory variable. The CCI of exports of country h is defined by Hirschman (1945) as

$$CCI^h = [\Sigma_k (\alpha_{kj})^2]^{1/2} \times 100$$

where α_{kj} stands for the share of

commodity-*k* in total exports of country-*h* to the destination country-*j*. The index is constructed in a way that a more diversified export basket implies smaller value of the index over the range [0, 100].

Though most of the early theories predicted a monotonic relationship between diversification and growth, some recent studies like studies by Imbs and Wacziarg (2003) and Hesse (2008) found evidences of a U-shaped pattern. The non-linearity in the relationship between export diversification and income is taken into account by adding a squared term in the basic specification of equation (4.1). On the other hand, to assess the importance of volume of exports an interaction term relating export diversification and a dummy variable representing the exports of a country relative to the world average exports is also included in the model, which takes a value 1 if exports from a country are greater than world average exports, and zero otherwise.

Export composition is measured by the share of high technology exports as percentage of manufacturing exports (denoted as HTX). This variable captures the role of vertical specialization within the manufacturing sector. However, high-technology exports may be important for only those countries which have developed a wider manufacturing export base. Therefore, an interaction term of HTX with a variable Dm1 is also included in the model where the variable D_{m1} takes the value 1 if manufacturing exports (as percentage of merchandise exports) of a country are greater than world average manufacturing exports, and zero otherwise. An interaction term of this variable with the rate of growth of high technology exports is also included because for countries like India though the share of high technology exports is not very high; its growth rate is quite high. In that case the growth rate of high technology exports can yield better measure than its level.

An alternative way to capture the manufacturing base of a country is by defining a dummy variable D_{m2} which takes value 1 if the growth rate of manufacturing exports are greater than world average manufacturing exports growth rate, and zero otherwise. HTX is also interacted with D_{m2} with the intuition that the effect of HTX is stronger for those countries where manufacturing exports are growing at a faster rate than the world average.

In the present analysis other than the lagged dependent variable, investment (measured in terms of gross capital formation), exports,

infrastructure are taken as the control variables. The role of investment as a determinant of income has been recognized in many theories starting from the Harrod-Domar model to the more recent endogenous growth theories. Infrastructure also plays an important role in economic growth as better infrastructure reduces cost, raises productivity and augments growth. Thus, infrastructure development of a country can be taken as a proxy for its domestic sources of growth. As infrastructure can be physical, financial and energy by nature, so no single variable can capture the overall quality of infrastructure. In order to arrive at a single infrastructure variable, an index, the Infrastructure Stock Index (denoted as ISI), is constructed taking into consideration all these dimensions using the Principal Component Analysis (PCA) following the methodology of Johnson and Wichern (2006)[4]. However, it should be noted that not all the explanatory variables are taken together; rather alternative specifications are estimated with different explanatory variables.

4.4.2. Methodology

Cross-section regression is inappropriate in estimating equation (4.1) due to the following shortcomings:

First, in the dynamic framework the cross section estimator will be inconsistent and the Fixed Effects and the Random Effects will lead to biased and inconsistent estimates as the unobserved effect is correlated with the explanatory variables.

Secondly, cross section growth regression cannot take into account the problem of endogeneity of the explanatory variables. For instance, in the present model high GDP growth in the may encourage more investment in infrastructure giving rise to the possibility of endogeneity.

Therefore, the dynamic specification of the cross country growth equation is estimated using the system Generalized Method of Moments (GMM) developed by Arellano and Bond (1991) and Arellano and Bover (1995) as it is more suited to

[4]The infrastructure index (ISI) is constructed involving six infrastructural variables: air transport, freight (million tons per km); air transport, passengers carried (per 1000 population); telephone mainlines (per 1,000 people); irrigated land (% of cropland); domestic credit provided by banking sector (% of GDP) and electric power consumption (kWh per capita). First these variables are normalized, and then using PCA in econometric software SPSS factor loadings are obtained which are again used to calculate the factor weights required to construct the ISI.

estimate growth equations than the first-differenced GMM estimator. The estimation process takes first difference of the regression equation which removes the unobserved country-specific time-invariant effects so that there is no omitted variable bias. Thus, the following equation is estimated:

$$Y_{ct} - Y_{c\,t-k} = \alpha_1 (Y_{c\,t-k} - Y_{c\,t-2k}) + \alpha_2(X_{ct} - X_{c\,t-k}) + (u_{ct} - u_{c\,t-K}) \quad (4.2)$$

To deal with the inconsistency problem arising from the endogeneity of the explanatory variables lagged values of these explanatory variables are used as instruments. The consistency of the GMM estimator depends on whether the lagged values of the dependent and the other explanatory variables are valid instruments. To address this issue we consider the Sargan test of over-identifying restrictions, which tests the overall validity of the instruments used in the estimation process. We also test whether the error term is second-order serially correlated.

Further, the role of diversification and composition of exports on output growth is estimated in a two-stage estimation procedure. In the first stage the impact of exports on output is estimated controlling for the impacts of lagged output and investment; in the second stage, the impact of the diversification and the composition indices on the export-induced growth component are estimated after controlling for infrastructure development of countries. The idea here is that the impact of these dimensions of export basket of a country on its output growth is at best an indirect one. Thus, it seems more reasonable to estimate the impact of the diversification and the composition of exports on the export-induced growth component, rather than on the overall output growth.

Thus, in the first stage the following equation is estimated:

$$Y_{ct} = \beta_0 + \beta_1 Y_{ct-k} + \beta_2 XP_{ct} + \beta_3 I_{ct} + \eta_c + u_{ct} \quad (4.3)$$

where XP_{ct} is the natural logarithm of exports of goods and services in country *c* at time *t* and I_{ct} is the natural logarithm of investment in country *c* at time *t*.

In the second stage, the estimated coefficient of exports ($\hat{\beta}_2$) obtained from the first stage estimation is multiplied with log of GDP. The term, $Y^*\hat{\beta}_2$, can be interpreted as the trade-induced growth component, that is, the effect of exports on income, controlling for the effects of lagged income and investment. This new variable, denoted as

$Y^*\hat{\beta}_2$, is regressed on its own lagged value, infrastructure stock index (ISI)[5], export specialization index (CCI), the squared export concentration (CCI^2) to account for non-linearity and measure of export composition (COMPOSITION). Two alternative measures of this "COMPOSITION" variable has been considered here: first, HTX as percentage of manufacturing exports; second, HTX interacted with the variables representing the manufacturing exports with respect to the world average manufacturing exports and the growth of manufacturing exports of a country with respect to the world average growth rate. Thus, the following cross-country equation is estimated:

$$Y^*\beta_{2ct} = \delta_0 + \delta_1 Y^*\hat{\beta}_{2ct-k} + \delta_2 ISIct + \delta_3 CCI_{ct} + \delta_3 CCI^2_{ct} + \delta_3 COMPOSITION_{ct} + \eta_c + u_{ct} \quad (4.4)$$

Both equations (4.3) and (4.4) are estimated using the system-GMM estimation method developed by Arellano and Bover (1995) as in equation (4.1) described earlier.

4.4.3. Data Sources

The data on cross country GDP (constant 2000 US$), exports (constant 2000 US$), gross capital formation (constant 2000 US$), the infrastructural variables and manufacturing exports as percentage of merchandise exports are obtained from the World Bank's World Development Indicators (WDI CD Rom 2007, World Bank). The measures of the diversification and the composition of exports, CCI and HTX, of the individual countries of the sample with respect to the world market has been calculated using World Bank data (World Integrated Trade Solution or WITS data) at the SITC-1 four digit classification level from 1965 to 2005.

However, data on some variables including infrastructure and the diversification and the composition of exports were not available for all the eighty eight countries in the sample from 1965. As a result, some countries were eliminated reducing the sample size from eighty eight to sixty five and time span from 1975-2005.

[5] Infrastructure is included in the second-stage of the model as infrastructure facilitates exports and consequently makes the export-growth relationship stronger. Infrastructure can also be taken as a proxy for domestic growth policy that might influence the export-growth relationship.

Table 4.2 in the Appendix presents the classification of country in four sub-samples: 23 countries have positive relationship throughout whereas it is negative for 4 countries; again, for 15 countries the export-GDP growth relationship changed from positive to negative vis-à-vis for 23 countries it's the other way round.

4.5. Estimation Results

Table 4.3 in the Appendix reports the GMM dynamic panel estimation results for the sample as a whole and **Table 4.4** shows the results of the positive relation group. In most of the cases two period lag of the dependent variable and all the predetermined variables have been used as instruments as suggested by the Akaike Information Criterion (AIC) for determining the optimum lag length. In all the estimations, the Sargan tests give p-values implying the validity of the instruments. Also the p-values for AR (2) test indicate that the instruments are not second order serially correlated.

The positively significant high values of coefficients of lagged income show the persistence of growth. For the positive relation group one period lag of the dependent variable captures the dynamics of growth whereas for the pooled sample there seems to be a longer path dependency since a higher lag length of the dependent variable makes the error terms uncorrelated. Both exports and investment have the predicted positive and significant impact on growth in all the cases.

The importance of export diversification can be seen from the significance of the squared term of CCI as well as the linear term in the first column of **Tables 4.3 and 4.4**. In all the specifications the linear term has negative impact on income implying that export concentration adversely affects GDP. However, the squared term's impact on income is positive implying non-linearity. This means that export diversification has positive impact on income up to a certain level of export concentration beyond which, the trend is reversed so that export specialization leads to growth.

Further, we also examine whether largeness of countries in terms of their participation in world trade matters for the export-growth relationship and for the export growth-diversification relationship. It is found that the favourable effect of export diversification on growth is stronger when exports of a country are greater than the world average. This is evident from the significance of the interaction term of export concentration with a

variable measuring a country's export volume relative to the world average exports with negative sign (see the second column of **Tables 4.3 and 4.4**). Thus the results do not confirm to the finding of Agosin (2007) that the effect of diversification is stronger when a country's exports are growing rapidly.

In contrast, the impact of export composition, captured through high technology exports as a percentage of manufacturing exports (denoted as HTX), is found to be significant only in the all country group, not in the positive relation group. The positive sign of the coefficient implies that the larger is the share of high technology exports in total manufacturing exports, higher will be economic growth. However, in the positive relation group the export composition has significant impact when the manufacturing exports of a country is greater than the world average manufacturing exports or it grows faster than the world average growth rate as is evident from columns 4 and 5 of **Table 4.4**. Further, the interaction term of the growth rate of high-technology exports with Dm1 is positively significant emphasizing the importance of rate of growth of high-technology exports rather than its level.

The alternative specification presented in equations (4.3) and (4.4) yields improved estimates of the variables as shown in **Tables 4.5 – 4.7.** In all the specifications the regressions pass the Sargan specification test implying instrument validity and also there is no evidence of second order serial correlation. In the first stage all the explanatory variables – lagged income, exports, investment – are significant in all the estimations as presented in **Table 4.5**. In the second stage estimation results based on equation (4.4) presented in **Tables 4.6 and 4.7**, the dependent variable ($Y^*\hat{\beta}_2$) can be interpreted as the trade-induced growth component controlling for the other determinants of growth like lagged growth, exports, investment, and infrastructure. The coefficients of the lagged dependent variable are high and significant in all the cases. Infrastructure is also positively significant. The significance of the squared export concentration confirms non-linearity of export diversification and growth relationship in this alternative specification as well. It can be seen that this two-stage method gives better estimate of the diversification and the composition of exports. For instance, export composition, as measured by HTX, has positive significant impact on growth

when it is included in the non-linear specification of export concentration which was not significant in the earlier specification. The impact of export composition gets even stronger for those countries which have developed manufacturing base – both in terms of manufacturing exports (as percent of merchandise exports) with respect to world average manufacturing exports and growth rate of manufacturing exports with respect to world average growth rate. Growth rate of high-technology exports is also found to have significant impact on economic growth as indicated by the significance of the interaction term of growth rate of high-technology exports with D_{m1}.

The critical values of CCI at which the point of minimum income occurs have been calculated using the coefficients obtained from the estimation results for the pooled sample as well as for the positive relation group and are reported in **Table 4.8** in the Appendix. It is evident that the critical levels of export concentration differ from one group of countries to others. Comparison of the critical levels across country groups reveals that specialization is associated with growth only at very high values of commodity concentration (79.37) for the group where export-GDP growth relationship changed from being negative to positive[6]. This particular group consists of many fast growing Asian countries like India, Indonesia, and Sri Lanka which have diversified their export structure over time. Thus, for this group export diversification drives growth till a very high level of export concentration. In contrast, for the positive relation group the turning point is reached much earlier. Thus, the force of specialization dominates over diversification much earlier, and hence, the value of CCI* is lower. This positive relation group includes developed economies like the US, Australia, Germany and ten Latin American countries. The developed countries are generally predicted to specialize (Imbs and Wacziarg, 2003) whereas the Latin American countries have concentrated export structure.

4.6. Conclusion

The empirical investigation suggests that economic growth not only depends on higher trade, but export diversification or specialization and

[6] The result for this country group is not reported here. See Aditya (2013), Aditya and Acharyya (2013) for detail analysis on the negative to positive relation group and for derivation of the critical levels of the commodity concentration index (CCI*) using first and second order conditions of optimization.

the nature of export composition are the keys to growth across countries. The export basket should not only be sufficiently diversified but it should contain high value addition products to experience more sustained growth effect of openness. However, the level of exports too matters. This is because the impact of export diversification is stronger when exports of a country are greater than world average exports. The impact of export composition also gets stronger for those countries whose level of manufacturing exports is greater than the world average or is growing at a faster rate. Further, the study establishes a critical level of export concentration beyond which increasing export specialization leads to higher growth. Below this critical level, diversification of exports matters for GDP growth. Thus, countries trying to augment growth through exports need to emphasize upon on what they export. Regarding whether they should encourage diversification or specialization depends, however, on their current level of diversification. Thus, we can conclude that on the whole, the trade-growth relationship is much more nuanced in this exercise.

APPENDIX

A.4.1. Country Classification

Table 4.1: R^2 Values for Different Country Groups

Country Group	1965-84	1985-2005
All Country	0.17	0.42
Positive Relation	0.65	0.7
Negative Relation	0.4	0.36

Table 4.2: List of Countries

Positive Relation in both the Periods	Negative to Positive Relation
Cameroon	Algeria
Congo, Rep.	Austria
Costa Rica	Bangladesh
Cote d'Ivoire	Belgium*
Denmark	Canada
Gabon	Chile
Greece	Colombia
Guatemala	Egypt, Arab Rep.
Hong Kong, China	Finland
Ireland	France
Japan	Iceland
Lesotho*	India
Luxembourg*	Indonesia
Malawi*	Italy
Malaysia	Mali*
New Zealand	Morocco
Norway	Netherlands
Philippines	Pakistan
Rwanda*	Portugal
South Africa	Spain
Swaziland*	Sri Lanka
Sweden	Syrian Arab Republic

Switzerland	Togo
Thailand	Zambia
Trinidad and Tobago	Zimbabwe
Uganda*	
United Kingdom	
Uruguay	
Negative Relation in both the Periods	**Positive to Negative Relation**
Benin	Argentina
Burkina Faso*	Australia
Honduras	Bolivia
Iran, Islamic Rep.	Brazil
Kenya	Dominican Republic
Nigeria*	Ecuador
	El Salvador
	Gambia*
	Germany
	Hungary
	Mexico
	Nicaragua
	Paraguay
	Peru
	Senegal*
	Tunisia
	United States

* These countries are not included in the final estimation due to unavailability of data on various aspects.

A.4.1.1. Detection of Outliers

Figure 4.7: Box Plot of Growth Rate of GDP

Positive Outliers: Botswana, China
Negative Outliers: Congo Demo Republic

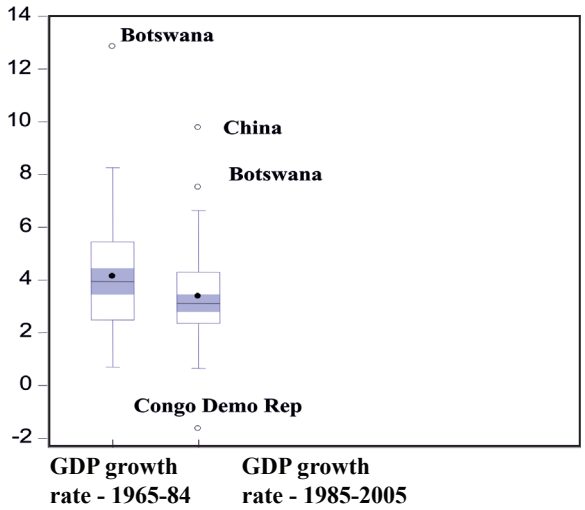
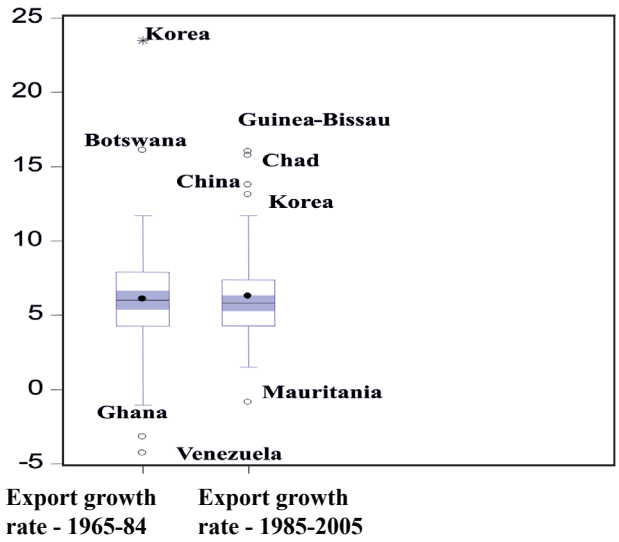


Figure 4.8: Box Plot of Growth Rate of Exports

Positive Outliers: Korea, Botswana, Guinea-Bissau, Chad, China
Negative Outliers: Ghana, Venezuela, Mauritania



A.4.2. Estimation Results

Table 4.3: All Country Group

Explanatory Variable	(1)	(2)	(3)	(4)	(5)	(6)
Y(-1)	0.9 (0.00)***	0.8 (0.00)***	0.86 (0.00)***	0.85 (0.00)***	0.86 (0.00)***	0.8 (0.00)***
Y(-2)	0.16 (0.00)***	0.18 (0.00)***	0.04 (0.00)***	0.13 (0.00)***	0.86 (0.00)***	0.11 (0.00)***
Y(-3)	0.12 (0.00)***	0.1 (0.00)***		0.1 (0.00)***	0.86 (0.00)***	0.07 (0.00)***
XP	0.001 (0.00)***	0.002 (0.00)***	0.001 (0.00)***	0.004 (0.00)***	0.03 (0.00)***	0.004 (0.04)**
I	0.08 (0.00)***	0.1 (0.00)***	0.07 (0.00)***	0.08 (0.00)***	0.08 (0.00)***	0.08 (0.00)***
CCI	-0.003 (0.00)***		-0.002 (0.004)***	-0.003 (0.00)***	-0.003 (0.00)***	-0.004 (0.00)***
CCI^2	3.00 E-05 (0.00)***		2.85E-05 (0.04)**	3.00 E-05 (0.01)**	1.69E-05 (0.05)*	4.00E-05 (0.08)*
$CCI*D_x$		-0.005 (0.01)**				
HTX			9.00 E-05 (0.002)***			
D_{m1}*HTX				0.0001 (0.001)***		
D_{m2}*HTX					0.0002 (0.004)***	
D_{m1}* HTX Growth Rate						0.0001 (0.00) ***
Sargan test	0.55	0.55	0.54	0.5	0.52	0.48
AR(2)	0.84	0.20	0.14	0.86	0.12	0.93

Note: 1. p values in parentheses;

2. * denotes significant at 10%, ** denotes significant at 5%, *** denotes significant at 1%; all estimations;

3. Sargan refers to the p-value of the Sargan test for the validity of instruments, where the null hypothesis is of zero correlation between the instruments and the errors;

4. AR (2) refers to the p-value of second order serial correlation test, where the null hypothesis is absence of second order serial correlation;

5. Estimation is done in econometric software Stata.

Dependent variable: Y = log of GDP (constant 2000 US$)

Explanatory variables: XP = log of exports of goods and services (constant 2000 US$)

I = log of investment as proxied by gross capital formation (constant 2000 US$)

CCI = commodity concentration index

HTX = high-technology exports as percentage of manufacturing exports

D_x = { 1 if exports of a country are greater than world average exports
0 otherwise

D_{m1} = { 1 if manufacturing exports (as percentage of merchandise exports) of a country are greater than world average manufacturing exports (as percentage of merchandise exports)
0 otherwise

D_{m2} = { 1 if growth rate of manufacturing exports is greater than world average growth rate
0 otherwise

Table 4.4: Positive Relation Group

Explanatory Variable	(1)	(2)	(3)	(4)	(5)	(6)
Y(-1)	0.67 (0.00)***	0.78 (0.00)***	0.6 (0.00)***	0.55 (0.00)***	0.68 (0.00)***	0.7 (0.00)***
XP	0.14 (0.00)***	0.05 (0.00)***	0.2 (0.00)***	0.13 (0.00)***	0.12 (0.00)***	0.11 (0.00)***
I	0.11 (0.00)***	0.1 (0.00)***	0.08 (0.00)***	0.12 (0.00)***	0.1 (0.00)***	0.1 (0.00)***
CCI	-0.005 (0.00)***		-0.01 (0.00)***	-0.001 (0.01)**	-0.003 (0.003)***	-0.006 (0.001)***
CCI^2	5.49E-05 (0.00)***		9.78E-05 (0.001)***	2.89 E-0 (0.00)***	3.41 E-05 (0.002)***	7.91 E-05 (0.00)***
CCI* D_x		-0.001 (0.0001)***				
HTX			-0.0008 (0.1)			
D_{m1}*HTX				0.0002 (0.08)*		
D_{m2}*HTX					0.0002 (0.00)***	
D_{m1}* HTX Growth Rate						0.0008 (0.00)***
Sargan test	0.15	0.1	0.1	0.15	0.14	0.13
AR(2)	0.11	0.66	0.80	0.26	0.8	0.22

A.4.3. Results of Two-Stage Estimation

Table 4.5: First Stage Results

Explanatory Variable	All Country Group	Positive Relation Group
Y(-1)	0.8 (0.00)***	0.7 (0.00)***
Y(-2)	0.17 (0.00)***	
Y(-3)	0.13 (0.00)***	
XP	0.06 (0.00)***	0.13 (0.00)***
I	0.1 (0.00)***	0.08 (0.00)***
Sargan test	0.56	0.11
AR(2)	0.2	0.84

Table 4.6: Second Stage Results: All Country Group

Explanatory Variable	(1)	(2)	(3)	(4)
Y*$\hat{\beta}_2$ (-1)	0.9 (0.00)***	0.88 (0.00)***	0.9 (0.00)***	0.92 (0.00)***
Y*$\hat{\beta}_2$ (-2)	0.3 (0.00)***	0.27 (0.00)***	0.28 (0.00)***	0.33 (0.00)***
ISI	0.002 (0.004)***	0.002 (0.00)***	0.001 (0.00)***	0.0007 (0.004)***
CCI	-0.0001 (0.00)***	-0.0001 (0.00)***	-0.0001 (0.00)**	-0.0001 (0.00)***
CCI^2	9.37E-07 (0.00)***	1.19E-06 (0.00)***	9.65E-07 (0.00)***	1.22E-06 (0.00)***
HTX	3.00 E-05 (0.00)***			
D_{m1}*HTX		9.29E-06 (0.006)***		
D_{m2}*HTX			4.73E-06 (0.00)***	
D_{m1}* HTX Growth Rate				2.93E-06 (0.00)***
Sargan test	0.58	0.58	0.53	0.52
AR(2)	0.44	0.45	0.52	0.42

Note: Dependent variable: Log of GDP (constant 2000 US$) multiplied by the estimated coefficient of exports reported in Table 4.5.

Table 4.7: Second Stage Results: Positive Relation Group

Explanatory Variable	(1)	(2)	(3)	(4)
Y*$\hat{\beta}_2$ (-1)	0.88 (0.00)***	0.79 (0.00)***	0.88 (0.00)***	0.88 (0.00)***
ISI	0.01 (0.003)***	0.005 (0.05)*	0.007 (0.02)**	0.01 (0.001)***
CCI	-0.001 (0.00)***	-0.0006 (0.001)***	-0.0006 (0.00)***	-0.001 (0.00)***
CCI^2	7.60E-06 (0.002)***	7.56 E-06 (0.00)***	6.76 E-06 (0.00)***	7.65 E-06 (0.04)**
HTX	0.0001 (0.04)**			
D_{m1}*HTX		4.9 E-05 (0.03)**		
D_{m2}*HTX			2.25 E-05 (0.003)***	
D_{m1}* HTX Growth Rate				0.0001 (0.00)***
Sargan test	0.11	0.14	0.15	0.85
AR(2)	0.11	0.26	0.19	0.14

A.4.4. Table 4.8: Critical Values of Export Concentration

Country Group	Critical Values of CCI	
	(A) Estimate based on equation (4.3)	(B) Based on Two-Stage Estimation
All Country	50	53.36
Positive Relation	45.54	65.8

5. TRADE, GROWTH AND INSTITUTIONS

5.1. Introduction

There is a huge literature which concludes that impediments to trade lower growth. Some worth mentioning studies in this context are Dollar (1992), Edwards (1992), Sachs and Warner (1995), Frankel and Romer (1999), Dollar and Kraay (2003). Rodriguez and Rodrik (2000), however, were skeptical about such findings due to narrow measure of openness being used and other methodological deficiencies. The trade-growth association might not be robust once the effect of institution is controlled for, which was supported by Rodrik, Subramanian and Trebbi (2002) also. It may as well depend on human capital formation and research and development (R&D) which augment productivity and competitiveness of a country's exports. In that case the developing countries' inability to make enough investment either in human capital formation or in R&D should make the trade-growth relationship weaker there. This constitutes the third major concern addressed in the present study. More specifically, we examine the roles of institutions and productivity constraints in the context of export-led growth at cross country level. The study, however, differs from the existing literature by focusing on the institutions facilitating trade like multilateral and regional trading arrangements. The other important institution relevant here is the political regime of a country. There is a sizeable literature that suggests that institutions like political regime of countries have far reaching implications for their growth performances. As argued by Varshney (2002), moderate policies followed by the democracies stuck them in the middle of the growth spectrum, termed as "democratic middle" by Varshney (2002), whereas faster growth is associated with authoritarian regimes.

There is a long debate regarding the relative importance of institutions and openness as determinants of economic growth. Sachs and Warner (1995), Frankel and Romer (1999), Dollar (2002), Edwards (2002), Dollar and Kraay (2001) demonstrate that trade fosters economic convergence among

countries and regions. However, in a detailed review of some of the most influential studies Rodriguez and Rodrik (2000) found that the result on openness and growth are not robust controlling for other determinants of income, such as geography and rule of law. A second school of thought documents the importance of institution in the form of property rights protection and less distortionary policies for growth in the long run (Acemoglu, Johnson and Robinson, 2001; Rodrik, Subramanian and Trebbi, 2002). Rodrik et. al (2002) found that once the effect of institution is controlled for, the role of trade and geography becomes insignificant. Dollar and Kraay (2003), on the other hand, pointed out the relative importance of trade in the short run, whereas joint significance of both trade and institutions in the long run.

In light of these evidences, the present chapter extends the disaggregated level analysis of Chapter 4 by including different dimensions of institution. First are the country specific institutions like political regime. Second are the regional institutions like formation of regional trading arrangements and free trade areas (RTAs/FTAs) and global institutions like the formation of GATT/WTO which are essentially trade-related policy regime.

The study incorporates the impact of political regime with the objective to examine whether in trade-growth relationship political institution plays any role or not. The relationship between democracy and economic growth has generated lot of debate among the social scientists. In one view democracies are stuck in the middle (Varshney, 2002). Be it growth escalation or poverty eradication, democratic polities always fall in the middle. The democracies usually follow the direct methods of poverty eradication (like food-for-work programmes, land reforms) because of their greater political appeal. Though the indirect methods (for example, trade liberalization policies like exchange rate devaluation, tariff reduction) are more sustainable in the long run their impacts are less obvious in the short run. In contrast, it is easier for the autocracies to adopt indirect policies. Sachs and Warner (1995) elaborated this point with the examples of South Korea and Brazil, both of which experienced high growth but the former is trade-oriented since the late 1960s and the latter since 1991. South Korea, with an autocratic regime, could carry out trade liberalization more effectively than a democratic polity of Brazil.

However, the main focus of the present analysis is trade-related policy regime, such as formation of regional trading arrangements and free trade areas (RTAs/FTAs) and multilateral trading

institutions like GATT/WTO. The existing studies found varied evidence regarding the impact of WTO formation on trade. Rose (2004) found little evidence that formation of GATT/WTO has actually led to increased trade. Again, Subramanian and Wei (2003) established that this institution has positive significant impact on trade, though there is some asymmetry – say, between developed and developing countries, between sectors. For example, the industrialized countries experienced large increase in imports after joining GATT/WTO compared to the developing countries. Helpman et al. (2008) also found strong and significant effect of WTO membership on bilateral trading relationship.

The present chapter contributes to the growing literature on the importance of trade and institutions on growth. The study is, at the same time, different from the existing literature in the following ways:

First, while investigating the relationship between trade, growth and institutions we adopt different measures of institution. In particular, we are concerned with those types of institution that matter for the trade-growth relation. For example, within country or country-specific institution, like political regime of a country. The study is, hence, an attempt to establish a link between two apparently disjoint issues — the trade-growth and democracy-growth literature.

Second, institution has also been captured in terms of trade-related policy regime. There can be regional factors like formation of regional trading arrangements and free trade areas (RTAs/FTAs) and universal factors like formation of GATT/WTO.

Third, instead of focusing on the volume of trade, we have focused on some disaggregated aspects of trade like the emerging pattern and composition of export baskets of the countries as in Chapter 4.

Fourth, these issues have been investigated for separate country groups classified on the basis of their export-growth relation and a two-stage method of estimation as discussed in Chapter 4.

Fifth, the chapter also includes a comparative study of the differences in growth performances of Asia and Latin America, in particular, the roles of trade and institutions in explaining the differential growth experiences of the two regions.

5.2. Model specification, Methodology and Data Sources

This section describes the model specification, the variables included, methodology and data sources.

5.2.1. Model Specification and Methodology

The two-stage estimation method with a dynamic framework as discussed in Chapter 4 has been adopted here also. Once again in the first stage the set of explanatory variables include the lagged dependent variable, exports, investment. Only change is that new control variables like the impact of political regime change and the productivity effect have been added.

For the present purpose it is more interesting to capture the political regime change of a country over time, if any. For this reason we have defined a variable D_p such that the variable takes unit value if Polity IV score is greater than or equal to 6 and it is zero otherwise. A priori, the trade-growth relationship is expected to be stronger in authoritarian regime than in democracy.

The export-GDP growth relationship may not work well if there are other constraints on economic growth. Apart from investment and infrastructure, another important constraint that may influence the export-growth relationship is the productivity constraint. Two types of productivity constraints have been considered: the availability of skilled labour or human capital (as proxied by years of schooling) and the R&D constraint (captured in terms of the Ginarte-Park index of patent protection). The importance of human capital, which has been proxied by years of schooling, is emphasized in the new growth theories from time to time. Intellectual Property Rights (IPR), on the other hand, arguably stimulates R& D, and hence growth. Theoretically, intellectual property protection can augment growth through productivity improvement by encouraging domestic innovation and technology diffusion. Helpman (1993) while analyzing the effect of tightening of IPR policies in the South on the growth rate and welfare in both North and South pointed out that stronger intellectual protection can attract greater inflows of high-technology goods, thereby enriching the stock of knowledge capital. Empirical studies, like studies by Coe and Helpman (1995), Blyde (2003) found evidences of technology diffusion to have significant impact on the productivity of the importing countries. Also stronger IPR attracts foreign direct investment which has important spillover effects on the domestic economy. In contrast, Falvey et al. (2006) argued that strong IPRs may adversely affect the developing countries which undertake little or no R&D and imitation is a significant source of technological development. Empirically, cross-country studies like studies by Ginarte and Park (1997) and Thompson and Rushing (1999) revealed that the effect of tightening

of IPRs on growth is positive and significant in the advanced countries whereas insignificant in the developing countries.

Along with these explanatory variables now we control for market access effect of WTO formation. Accession to the WTO may facilitate exports through market access effects, and thereby may contribute to growth. This aspect is captured by defining a dummy variable D_{WTO} such that it is one after a country becomes WTO member and zero otherwise.

5.2.2. Data Sources

As far as measurement of political institutions is concerned the latest version of Polity data series, Polity IV, has been used. The data on years of schooling is taken from Barro and Lee (2000) on 5-year interval for 1965-2005. The Ginarte-Park Index (Ginarte and Park, 2005) has been used to measure patent protection for the period 1970-2005, again on a 5-year interval. The index is an indicator of the strength of patent protection involving the following aspects: coverage (patentable inventions), membership in international treaties, duration of protection, enforcement mechanisms, and restrictions. Data sources for all other variables are same as mentioned in Chapter 4. Since data on human capital and R&D are available on 5-year interval basis, now estimation is done with data for all the variables averaged over five year periods from 1975-79, 1980-84, ..., 2000-2004.

5.3. Estimation Results

The GMM dynamic panel estimation results for the pooled sample and positive relation group are reported in Tables 5.1- 5.4 in the Appendix. In most of the cases two period lag of the dependent variable and all the predetermined variables have been used as instruments. In all the estimations the Sargan tests and the AR (2) tests are satisfied.

In the first stage the lagged dependent variables are positively significant for all the country groups implying persistence of growth. One period lag of the dependent variable captures path dependency. Exports and investment have the predicted positive significant impact on growth. Among the new control variables the political dummy variable is significant with negative sign implying the phenomenon of democratic middle (Varshney, 2002). The two measures of productivity, human capital as measured by the log of years of schooling and Ginarte-Park index of patent protection to measure IPR are also positively significant in all the estimation for separate country groups. In this model with average data time dummies are included

though they are not reported in the tables. In the first stage estimation with years of schooling (column 1 of **Tables 5.1 and 5.2**) time dummies are insignificant which implies that there is no time effect. However, when the years of schooling variable is replaced by the Ginarte-Park Index of IPR, then some of the time variables become significant. Thus, it can be concluded that years of schooling can explain more variation in GDP compared to IPR.

In the second stage log of GDP is multiplied with the estimated coefficient of exports obtained from the first stage estimation with schooling as the measure of productivity. In **Tables 5.3 and 5.4** the one period lag of the dependent variable is significant indicating persistence effect of the trade-induced growth component. Infrastructure index is also positively significant in all the specifications. The linear term of export concentration index is negatively significant whereas the squared term is positively significant in all the specifications implying that the relationship between export diversification and income is non-linear as found in Chapter 4 as well. However, export composition as measured by HTX alone is not always significant (for the positive relation group as evident in column 1 of **Table 5.4**). Rather, the effect of export composition becomes stronger when manufacturing exports as percentage of merchandise exports of a country is greater than the world average (as shown in column 2 of **Table 5.4**). Export composition is also significant when manufacturing exports grow at a faster rate than the world average growth rate as indicated by the significance of the coefficient of the interaction term D_{m2}* HTX shown in column 3. Growth rate of HTX too is important as shown in the last column of **Tables 5.3 and 5.4.**

WTO membership is found to have strong and significant effect on the trade-induced growth for the pooled sample as well as for the positive relation group which is in contrast to the study of Rose (2004).

The critical values of CCI at which the turnaround in the trade-induced growth component occurs have also been calculated for each set of estimations as in Chapter 4. It is found that for a particular country group, the CCI* values do not vary much from one specification to another; for example, it is 50 in all the alternate specifications for the all country group as reported in **Table 5.3.**

So the exercise reveals that institution as captured in terms of country specific effects like political regime and universal factors like accession to WTO play important role in the trade-growth relation for different country

groups. Not only that, diversification and composition of export baskets are important determinants of the trade-growth nexus even after controlling for the impacts of productivity constraints like human capital and R&D and different types of institutions like political regime and WTO accession. These results hold for the pooled sample as well as for the positive relation group. In that sense the present exercise provides a robustness check of the results obtained in Chapter 4.

5.4. Growth Experiences of Asia and Latin America[7]

The objective of this section is to examine whether trade and institutions can be plausible explanations of the differential growth experiences of Asia and Latin America. This is interesting as Latin America developed much earlier than Asia, in particular, East Asia. But its growth rate started slowing down since the 1980s with East Asia catching up faster and then surpassing Latin America by the turn of the twentieth century. Nonetheless, Elson (2006) pointed out that these two regions share similar geographical and physical properties in terms of endowments and natural resources, similar proportion of their regions being in the tropic and proximity of the regions to major markets for their trade. Thus we investigate the role of trade and institutions in explaining the differential growth experiences in the two regions. Similar two stage GMM dynamic panel estimation method, as used in Chapter 4 and in the previous section, for the period 1975-2005 reveals that there are some common determinants of economic growth like exports, investment, public debt and human capital in Asia and Latin America[8]. Trade policy instruments like the emerging pattern and the composition of export baskets in the two regions are quite similar. Both diversification and composition of exports in general are found to have significant impact on economic growth in the two regions. The relationship between export diversification and economic growth is non-linear in both the regions. However, it is also found that growth of high-technology exports itself does not explain output growth; its impact gets stronger when manufacturing exports grow faster than the world average.

This apart, the study identifies the aspects which are not uniform in the

[7] See Aditya and Acharyya (2012) for detail discussion on the comparative study.

[8] In this comparative study public debt is included to capture the effects of macroeconomic instability accounting for the divergent growth processes of the two regions (Obstfeld and Rogoff, 1996). Public debt crowds out private investment and retards growth (Diamond, 1965).

two continents. Diversification within the manufacturing sector is significant only in Asia. This means that for Latin America, while the composition of export basket as measured by manufacturing exports relative to agricultural exports is important, the diversity in manufacturing exports does not matter. Among the other determinants of economic growth, infrastructure development and institutional aspects like patent protection are significant only in Asia. This is quite expected as Latin American countries like Brazil, Mexico, and Peru have under-invested in infrastructure in the 1970s and 1980s (Rioja, 1997). The level of patent protection is also low in Latin America as compared to Asia. Blyde (2006) observed that the average Ginarte-Park index was the lowest for Latin America in 1985 and 1990 compared to other regions, though it improved in 1995 but was still weak.

Again, trading institutions like regional integration and WTO membership have asymmetric effects on Asia and Latin America. The gains from greater market access after WTO formation has been higher for Latin America than for Asia. Regional integration is captured by defining two dummy variables $D_{MERCOSUR}$ and D_{AFTA} for Latin America and Asia, respectively, which are unity if a country is becomes a member of MERCOSUR/AFTA after the formation of MERCOSUR/ASEAN. The estimation results show that whereas MERCOSUR had created trade for its member countries than it diverted trade, in case of ASEAN, diversion of trade from non-member countries may perhaps have outweighed trade creation.

Further, the critical levels of CCI derived from the estimation results are found to be higher for Asia than for Latin America. Thus, relatively speaking, export diversification seems to be more important for growth in the Asian region. For Latin America, conversely, specialization matters. Note that this is consistent with the general observation that Asian exports are much more diversified than Latin American exports.

5.5. Conclusion

The present chapter has examined the role of institutions in the trade-growth relation. Institution has been interpreted in different layers such as country-specific institution, like political regime of a country, regional factors like formation of regional trading arrangements and free trade areas (RTAs/FTAs) and universal factors like formation of GATT/WTO. The GMM dynamic panel results for a sample of sixty five countries for the period 1975-2005 reveals that both trade

and institution matter for growth during that period. It is found that autocratic regimes are associated with faster growth as argued by Varshney (2002). WTO formation has also strengthened the trade-growth association. Even after controlling for the impacts of productivity constraints like human capital and R&D and different types of institutions like political regime and WTO accession, diversification and composition of export baskets remain important determinants of growth. Moreover, the relationship between export diversification and economic growth is non-linear as found in some recent studies by Imbs and Wacziarg (2003) and Hesse (2008) and in Chapter 4. Also the impact of export composition gets stronger when manufacturing export base of a country is greater than world average or is growing at a faster rate. Growth rate of high technology exports matter for growth. These results hold for the pooled sample as well as for the positive relation group. In that sense the present exercise can be considered as a robustness check of the results obtained in Chapter 4. The estimation results are further used to calculate the critical levels of CCI which vary from one country group to another, but in a way similar to the evidence of Chapter 4.

The comparative study of regional growth experiences of Asia and Latin America for the period 1975-2005 identifies the major determinants of economic growth in the two regions which has important implications for policy formulation. The estimation results suggest that the common determinants of growth in the two regions are exports, investment, public debt, human capital and diversification and composition of exports. On the other hand, the differentiating factors on the diverging growth experiences of Asia and Latin America are infrastructure, regional integration and institutional aspects like patent protection, and WTO. Diversification within the manufacturing sector is important for Asia only.

APPENDIX

A.5.1. Estimation Results

Table 5.1: First Stage - All Country Group

Explanatory Variable	(1)	(2)
Y(-1)	**0.3** **(0.00)*** **	**0.03** **(0.002) *** **
XP	**0.15** **(0.005)*** **	**0.14** **(0.00)*** **
I	**0.23** **(0.00)*** **	**0.16** **(0.00)*** **
D_{POLITY}	**-0.045** **(0.05)***	**-0.05** **(0.04)****
Log (Years of Schooling)	**0.26** **(0.00)*** **	
IPR (Ginarte Park Index)		**0.02** **(0.001)*** **
Sargan test	**0.12**	**0.63**
AR(2)	**0.93**	**0.49**

Note: 1. p values in parentheses;

2. * denotes significant at 10%, ** denotes significant at 5%, *** denotes significant at 1%; all estimations;

3. All notations are same as defined in Chapter 4.

$D_{POLITY} = \begin{cases} 1 \text{ if Polity IV score is} \geq 6 \\ 0 \text{ Otherwise} \end{cases}$

Table 5.2: First Stage - Positive Relation Group

Explanatory Variable	(1)	(2)
Y(-1)	0.48 (0.00)***	0.6 (0.00)***
XP	0.26 (0.00)***	0.3 (0.02)**
I	0.2 (0.00)***	0.14 (0.00)***
D_{POLITY}	-0.07 (0.6)	-0.096 (0.2)
Log (Years of Schooling)	0.14 (0.4)	
IPR (Ginarte Park Index)		0.0016 (0.9)
Sargan test	0.73	0.55
AR(2)	0.37	0.75

Table 5.3: Second Stage - All Country Group

Explanatory Variable	(1)	(2)	(3)	(4)
Y* $\hat{\beta}_2$ (-1)	0.63 (0.00)***	0.54 (0.00)***	0.9 (0.00)***	0.82 (0.00)***
ISI	0.15 (0.00)***	0.15 (0.00)***	0.2 (0.00)***	0.2 (0.00)***
CCI	-0.005 (0.00)***	-0.003 (0.008) ***	-0.004 (0.00) ***	-0.003 (0.00)***
CCI^2	0.00005 (0.00)***	0.00003 (0.003)***	0.00004 (0.00)***	0.00003 (0.00)***
D_{WTO}	0.95 (0.00)***	0.72 (0.00)***	0.4 (0.00)***	0.63 (0.00)***
HTX	0.012 (0.00)***			
D_{m1}*HTX		0.015 (0.00)***		
D_{m2}*HTX			-0.002 (0.6)	
D_{m1}*HTX Growth Rate				0.0045 (0.00)***
Sargan test	0.32	0.47	0.38	0.31
AR(2)	0.46	0.16	0.21	0.28
CCI*	50	50	50	50

Note: 1. Dependent variable: Log of GDP (constant 2000 US$) multiplied by the estimated coefficient of exports obtained from first stage estimation with years of schooling.

2. CCI* denotes critical level of CCI.

$$D_{WTO} = \begin{cases} 1 \text{ after a country becomes WTO member} \\ 0 \text{ otherwise} \end{cases}$$

Table 5.4: Second Stage - Positive Relation Group

Explanatory Variable	(1)	(2)	(3)	(4)
$Y^*\hat{\beta}_2$ (-1)	0.57 (0.00)***	0.6 (0.00)***	0.42 (0.008)***	0.62 (0.00)***
ISI	0.2 (0.001)***	0.33 (0.00)***	0.11 (0.03)***	0.16 (0.0001)***
D_{WTO}	0.08 (0.001)***	0.11 (0.04)***	0.13 (0.00)***	0.15 (0.00)***
CCI	-0.007 (0.00)***	-0.002 (0.02)**	-0.01 (0.00)***	-0.009 (0.00)***
CCI^2	0.0001 (0.00)***	0.000035 (0.002)***	0.00015 (0.00)***	0.0001 (0.00)***
HTX	0.0001 (0.6)			
D_{m1}*HTX		0.0004 (0.001)***		
D_{m2}*HTX			0.0004 (0.002)***	
D_{m1}*HTX Growth Rate				0.00014 (0.07)*
Sargan test	0.99	0.68	0.52	0.99
AR(2)	0.16	0.11	0.75	0.12
CCI*	35	28.57	33.33	45

Note: 1. p values in parentheses;

2. * denotes significant at 10%, ** denotes significant at 5%, *** denotes significant at 1%; all estimations;

6. SUMMARY OF RESULTS AND POLICY IMPLICATIONS

6.1. Summary of Results

The developing countries in general suffer from high commodity concentration, dependence on primary products and poor quality of exports. Recent empirical evidences suggest that increased variety and improved quality of exports are two important dimensions behind the fast growth of some of the developing countries like China, India during the 1980s and 1990s. If trade liberalization increases variety and improves quality of export basket, the association between trade liberalization, export promotion and growth will be stronger. The existing literature is not sufficient to explore the link between trade liberalization and export promotion through diversification and composition of exports. In this context the present study has attempted to shed some light on the link between trade liberalization, export diversity and quality, on one hand, and between export diversification, composition and output growth of the countries, on the other. These aspects have been analyzed both theoretically and empirically with the review of the relevant literature. The following is a brief summary of the main findings of the study followed by the policy implications that emerge from the study and the future scope of research.

Export diversification is defined in two senses in the literature: inter-industry or across sectors and intra-industry or within sector. In contrast, we define export diversification in both the senses to examine the possibility of any trade-off between these two types of diversification. This trade-off has not been addressed in the existing theoretical literature. Thus, we begin our analysis by examining how trade liberalization affects export diversification and composition through the development of new product varieties and improvement of quality in Chapters 2 and 3 theoretically. Such an analysis is worthwhile from

the perspective of growth implications of liberal trade policies, since recent empirical findings suggest that diversification and composition of export basket of countries are crucial determinants of stronger export-growth relationship.

For this purpose in Chapter 2 we introduce a homogeneous import competing CRS good produced under perfect competition in the one sector model of Krugman (1979) with a horizontally differentiated IRS good produced under monopolistic competition. The benchmark model considers a small open economy with fixed coefficient production technology in the traditional sector and constant elasticity of demand. It emerges that tariff reduction can lead to greater diversification in terms of increased variety in the modern IRS sector depending on the relative factor intensity of the two sectors.

The small open economy model is then extended to consider two-region world economy so that the terms of trade is determined endogenously. Now we consider diversification in two layers: first, the country which exports the homogeneous good along with a differentiated good has a more diversified export basket in the inter-industry sense, and second, the other country's export basket is more diversified in the intra-industry sense. When the two sectors of an economy draw resources from the same pool, expanded size of the import competing sector means smaller number of variety.

In another extension of the benchmark model discussed in Section 2.3.1, we bring a vertically-differentiated export good following Acharyya and Jones (2001) in Section 2.4 to address whether trade liberalization by a small open economy can increase variety as well as improve quality. It is shown that a tariff reduction unambiguously raises the quality of the vertically differentiated export good, whereas it increases the number of varieties if the horizontally differentiated export good is relatively more labour intensive than the import competing homogeneous good.

We further examine the impact of trade liberalization policy for diversification of exports in a more general sense – diversification of exports of many goods and many varieties of the same good. The benchmark analytical framework of two country world economy model described in Section 2.3.2 of Chapter 2 is extended in Chapter 3 by considering

a continuum of perfectly competitive traded good following Dornbusch, Fisher and Samuelson (1977). In a synthesis of DFS (1977) and Krugman (1979) model we examine whether there exists any trade-off between diversification of export basket in terms of larger set of homogeneous goods and wider set of varieties of the differentiated good. Moreover, the higher indexed continuum goods being more labour intensive, we can interpret them as higher quality good. Thus this trade-off, if exists, can be re-interpreted as between quality and variety of exports.

In this set up we see that tariff reductions may have asymmetric effect on the diversity of export basket of countries. In case of unilateral tariff reduction by the home country, it is highly likely that the export basket of the foreign country will be more diversified whereas the export basket of the home country may not. For bilateral tariff reductions (which is very much relevant in the present era of globalization and trade liberalization), on the other hand, the country in whose favour the ratio of national wages moves is more likely to have a diversified export basket. This means that both countries may not achieve export diversification across as well as within industries and consequently may have different export-led growth experiences.

Chapter 4 reconciles various theoretical arguments regarding export diversification and specialization and nature of export composition. The empirical investigation suggests that economic growth not only depends on higher trade, but export diversification or specialization and nature of export composition are the keys to growth across countries. The export basket should not only be sufficiently diversified but it should contain high value addition products to experience more sustained growth effect of openness.

However, the *volume* of exports cannot be ignored altogether even when what is being exported matters. This is because the impact of export diversification is stronger when exports of a country are greater than world average exports. The impact of export composition also gets stronger for those countries whose level of manufacturing exports is greater than the world average or is growing at a faster rate. These results hold even if the dataset is classified based on the export-economic growth relationship.

Moreover, the relationship between export diversification and economic growth is found to be non-linear which is supportive of the existing literature (Imbs and Wacziarg, 2003; Hesse, 2008). The non-linearity implies that there is a critical level of export concentration below which diversification leads to GDP growth and beyond that level increasing export specialization matters for achieving higher growth. Thus, countries trying to augment growth through exports need to emphasize upon on what they export. Regarding whether they should encourage diversification or specialization depends, however, on their current level of diversification.

The two-stage estimation produces even stronger results and reconfirms the importance of the diversification and the composition of exports in the growth processes of the countries. The significance of infrastructure in the second stage of estimation implies that infrastructure facilitates exports and consequently can be instrumental in making the export-led growth effect stronger.

Chapter 5 examines the role of productivity constraints and institutions in the trade-growth relationship. Productivity constraints, captured in terms of human capital (measured by years of schooling) and patent protection (IPR) as a proxy for R&D, are found to play important role in the trade-growth nexus. Among the two measures of productivity, human capital can explain more variation in GDP compared to IPR across country groups.

Institution has been interpreted in different layers such as country-specific institution, like political regime of a country. We find that faster growth is associated with authoritarian regimes than democratic polities. This finding once again supports the existing literature that it is easier for the autocracies to carry out the indirect methods of poverty alleviation, which are more sustainable in the long run like trade liberalization, more effectively than democracies (Sachs and Warner, 1995), and ensures the existence of democratic middle as termed by Varshney (2002).

However, the main concern here is trade related institutions such as formation of GATT/WTO which is found to have positive significant impact on the trade-growth association. The estimation results reveal that even after controlling for the impacts of productivity constraints and different

types of institutions like political regime and WTO accession, diversification and composition of export baskets remain important determinants of growth. In that sense the exercise checks the robustness of the results obtained in Chapter 4.

In addition, a comparative study of regional growth experiences of Asia and Latin America is carried out which reveals that there are some common determinants of economic growth in the two regions such as exports, investment, public debt and human capital. Trade policy instruments like the emerging pattern and composition of export baskets in the two regions are quite similar. The study also identifies the aspects which are not uniform in the two continents. Diversification within the manufacturing sector is significant only in Asia. Among other determinants of economic growth, infrastructure development and institutional aspects like patent protection are significant for Asia only. On the other hand, trading institutions like regional integration and WTO membership have asymmetric effects on Asia and Latin America. The gains from greater market access after WTO formation has been higher for Latin America than for Asia. As far as regional integration is concerned MERCOSUR had created trade for Latin America whereas for our sample of Asian counties AFTA had diverted trade away from efficient non-member countries.

6.2. Policy Implications

There are some far reaching policy implications of the results obtained in the present study, as summarized in Section 6.1. From the theoretical exercises emerge the following specific trade policy implications:

1. Unilateral tariff reductions by the importing countries can promote their export growth through increased variety and improved quality of their export baskets. Thus, tariff reductions appear as export promotion policies.

2. Tariff reductions have significant impacts on diversification of the export basket both within and across sectors for large countries that can influence the world prices of goods they trade. This means, to the extent to which output growth rates are augmented by diversification of a country's export basket, *trade liberalization or tariff reduction policies may promote output growth.*

3. The liberal trade policies that India is pursuing since the mid

1990s have the potential to make Indian exports more sophisticated in terms of increased varieties as well as improved qualities of export goods, both of which are important preconditions of export-led growth in the present era of globalization.

4. In the context of bilateral or multilateral trade liberalization, which is particularly relevant for formation of regional trade blocs and multilateral negotiations at the WTO level, *trading nations may have different tariff-reduction induced export-led growth experience* since export basket of countries may not be diversified symmetrically.

5. For India, it means that entering into regional or bilateral trade agreements might be favourable for its growth objective.

Further, the results obtained from the cross-country empirical investigation conducted in the present study have the following implications for the export-led growth hypothesis:

1. *What* a country exports, rather than *how much* does it export, is the important factor for ensuring higher output growth rates. That is, it is not just important to export more, but it is important to diversify the export basket and improve quality of its export goods. The export basket should not only be sufficiently diversified but it should contain high value addition products to experience more sustained growth effect of openness.

2. The *volume* of exports may still matter as it strengthens the impact of export composition. In particular, export diversification has a stronger impact for those countries whose level of manufacturing exports is greater than the world average or is growing at a faster rate.

3. Whereas diversification of export basket from a very concentrated one is needed to step up growth, as our study reveals, whether countries should adopt policies to promote diversification or not depends on their current level of diversification itself. For fast growing developing countries like India, Indonesia, and Sri Lanka, export diversification appears to be more important in sustaining their high growth momentum. On the

contrary, developed economies like USA, Australia and Germany gain from specialization. Again, export diversification seems to be more important for growth in the Asian region as compared to Latin America for which specialization matters.

4. Productivity constraints play an important role in the trade-growth nexus. However, human capital explains more variation in GDP compared to patent protection or IPR across country groups. That means to foster economic growth, countries should adopt policies for human capital formation, such as investing more in higher education and skill formation.

5. Public investment in infrastructure development is important since improved infrastructure does facilitate exports and consequently can be instrumental in making the export-led growth effect stronger. This is particularly important for the Asian countries, and, therefore, for India.

6. Faster output growth can also be achieved through accession to WTO and regional trade agreements provided both ensure larger market access for exporters. Though the gains from greater market access after WTO formation has been found to be higher for Latin American countries than for Asian countries, this does not undermine the potential effects of larger market access for Indian exporters (through WTO accession and regional trade agreements) to step up India's growth. In fact, trade creation effect being dominating over trade diversion effect that a non-member country may face makes regional trade agreements all the more important.

6.3. Future Scope of Research

The relationship between trade, export diversity and variety, and growth is a complex one with many dimensions, not all of which one can hope to address in one study. Thus, despite our best efforts and our knowledge improving substantially and significantly through the above analyses, a lot more issues remains unanswered. The issues outlined below constitute the future scope of research.

First, referring back to the theoretical analysis of Chapter 2, in the two country world economy model, instead

of assuming the trade pattern ex ante we can begin with the autarchic equilibrium and study how the pattern of trade itself depends on the factor endowment of countries. Second, and perhaps the more vital one, is to endogenize tariff rates as in case of the theory of optimal tariff. This enables us to study a trade-off, if at all, between, social welfare and growth that a diversified export basket may mean.

The analysis of Chapter 3 can be extended to several directions. First, as robustness check, it may be worthwhile to consider non-uniform tariffs rates. Second, in the demand side also we can bring in the dimension of higher quality in the sense that a larger fraction of expenditure is spent on higher quality goods.

In the empirical investigation a relevant issue that has been left unexplored here is the geographical diversification of exports or diversification of export destinations. Further, recent study by Arora and Vamvakidis (2005) has shown that trading partner may also matter for a country's economic growth. Hence the empirical investigation can be extended to take into account partner country characteristics.

Though the present study could not address these issues but the basic structure and the results can be used for future research.

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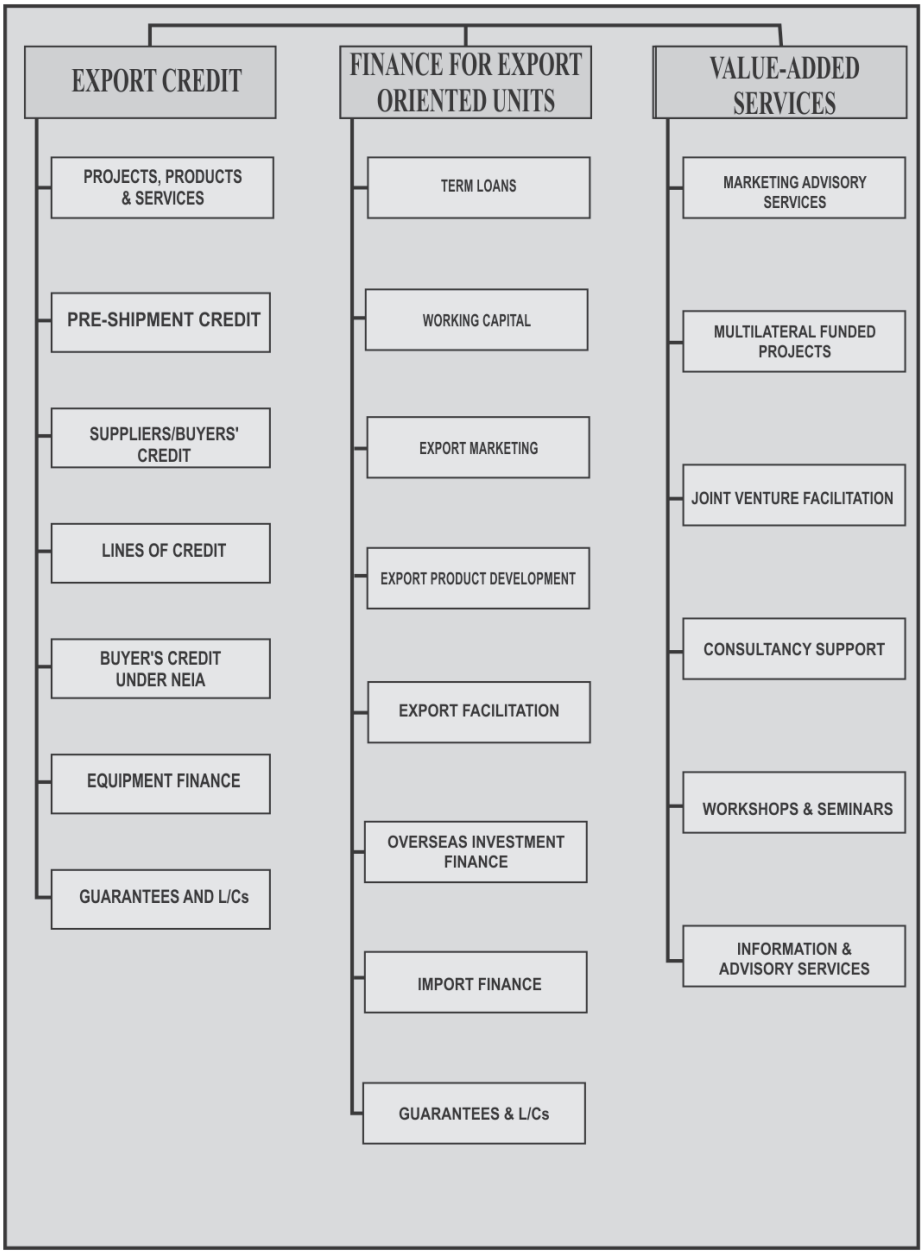

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