

CHAPTER II

CONCEPTUAL FRAMEWORK & LITERATURE REVIEW



2.1. Conceptual Framework

2.1.1. Gravity Model Overview

The gravity model has long been the workhorse for empirical studies in international trade (Eichengreen & Irwin, 1997). International trade economists have been using gravity equations even before they have theoretical basis for the specifications. Given its successes, it becomes one of the standard tools for applied international economists and for policymakers and has been applied to wide-ranging questions such as the formation of the free trade areas, trade creation/trade diversion, assessment of trade policy measures etc. Though the gravity equation will not explain which of the products any two countries will trade with each other, but provide good estimate of how much trade should be between any two pair of countries. Because of its appeal as an empirical strategy its application has become enormously popular. “Empirically they have performed well and are therefore well suited for policy analysis”, (Harris and Matyas, 1998).

The simple gravity equation explains a great deal about the data on bilateral trade flows. The origin of the gravity model is generally attributed to Tinbergen who argued that bilateral trade flows between countries could be modeled by appealing to the Newtonian law of gravity. The gravity model was first applied to the analysis of international trade flows by Tinbergen (1962) and Poyhonen (1963). These were the first econometric studies of trade flows based on the gravity equation and these early literature offered a range of intuitive explanations for the relationship, but none of these relied on standard trade model. Thus there was no formal representation of the role of technology, factor endowments, demand differences or any of the underlying structural differences we associate with the determinants of trade. Although it has been widely used because of its empirical success at predicting bilateral trade, initially the gravity model had lacked rigorous theoretical background, and was long criticized for being an ad hoc model.

It is certainly no longer true, that the gravity equation is without a theoretical basis since several of the same authors who noted its absence went on to provide one and its

recent revival has produced an extensive literature (Alan V. Deardorff, 1995). In 1966 Linnemann provided the first partial equilibrium rationalization and the first general equilibrium theoretical model leading to this relation is provided by Anderson (1979). Since then it has been shown that a gravity-type relation could be derived using different modeling frameworks. There are several theoretical models since 1980 to explain the success of the equation beginning with Anderson (1979), Bergstrand (1985, 1989), Helpman and Krugman(1985), Deardorff(1998), Anderson and Van Wincoop(2001) and Eaton and Kortum (2001). Feenstra, Markusen and Rose(2000).

2.1.2. Empirical Evidence of Theoretical Foundation for Gravity Model

Originally, Anderson (1979) derived a gravity model based on preferences that are homothetic and identical across all countries. Thus Anderson (1979) presented a theoretical justification for the gravity model based on CES preferences and goods that are differentiated by country of origin (the Armington assumption).

Accordance with the statement of Vancauteren(2003?), the author had shown that when consumers have both identical homothetic preferences, a sufficient condition for obtaining a gravity equation is perfect product specialization in the sense that each commodity is produced in one country. Also states that under the assumption that all goods are traded, national income is then the total value of traded goods and Armington preferences ensures that bigger countries, which have more traded goods, trade more.

The study further shows that like Anderson, Bergstrand (1985) derived reduced form of gravity equation for bilateral trade flows from a general equilibrium model and demonstrated that a gravity model can be derived from simple assumptions including perfect substitutability of goods across countries and expands the gravity equation with price indices from the existence of nationally differentiated products. This theoretical foundation was further extended (1989, 1990) with incorporation of factor endowment variables from the Heckscher – Ohlin model and accounts for taste preferences. Bergstrand elaborated on the theoretical propositions that intra-trade industry is promoted by supply (Heckscher-Ohlin model) and demand considerations (Linder hypothesis of tastes). From his analytical framework, it is suggested that a gravity model can be understood from theories of perfect competitive Heckscher-Ohlin models applied to inter-industry and monopolistic competition that assumes intra- industry trade.

Further many studies have stated that Helpman – Krugman (1985, 1987) in the monopolistic competition model predicts that intra industry trade may exist within a group of ‘industrialized countries’ as long as complete specialization occurs in production. In addition, they concluded that trade volumes should be related both to the size of the importing country (reflecting demand) and to the exporting country (reflecting the number of varieties produced). He used an absolute value of differences in GDP per capita as a proxy for differences in factor endowments. For a sample of 14 OECD countries, Helpman found that the larger the shares of bilateral intra-industry trade the more similar were the countries’ per capita income. He concluded that empirical evidence supports the theory. They also has shown that the gravity equation can be derived from both the traditional and the new theory of international trade and derived gravity equations from trade models based on product differentiation and increasing returns to scale.

Deardorff (1998) also derives the gravity model from two extreme cases of the classical framework of the Heckscher -Ohlin (H-O) perspective. Deardorff proves that if trade is impeded and each good is produced by only one country, the H-O framework will result in the same bilateral trade pattern as the model with differentiated products. Deardorff (1995) in his study “determinants of bilateral trade: does gravity work in a neoclassical world”, also concluded that even a simple gravity equation can be derived from standard trade theories.

Thorough overview of trade theories explaining the success of the gravity equation for exploring trade flows of international trade pattern is given by Evenett and Keller (1998) and showed that the gravity model could be derived from Ricardian framework. Based on various approaches to theoretical foundations Evenett and Keller (1998, p. 1) of gravity equations, summarize three types of trade models, which differ in the way product specialization is obtained in equilibrium. (Rahman, 2003 and Pass, 2000):

- Technology differences across countries in the Ricardian model,
- Variations in terms of countries' differing factor endowments in the Heckscher-Ohlin (H-O) model,
- Increasing returns at the firm level in the increasing returns to scale (IRS) models.

Evenett and Keller showed that there is strong evidence that the volume of trade is determined by the extent of product specialization and proved that the standard gravity equation can be obtained from the H-O with both perfect and imperfect product specialization. They concluded that models with imperfect product specialization explained even better the variations in the volume of trade than the models with perfect product specialization, thus it is better to explain the success of Gravity model.

2.1.3. Success of Gravity Model & Trade Theories

Even though the gravity model initially suffered from a weak theoretical foundation, it has recently become extremely popular in the empirical trade literature. Now there are number of reasons for gravity model popularity, first the modern theories of trade based on differentiated products provide an improved theoretical foundation for the gravity equation and gravity model has proved quite successful in estimating bilateral trade flows. Further there has been a new interest among economists in the subject of geography and trade (c.f. Frankel, 1997) and also increased interest in empirically testing the trade effects of regional trading arrangements.

Classical gravity theory states that the attraction force a_{ij} between two entities i and j is proportional to their respective masses m_i and m_j and inversely proportional to the squared distance d_{ij}^2 between these entities. Therefore, this law can be formalised as; (Pass 2000).

$$a_{ij} = \gamma m_i m_j d_{ij}^{-2} \quad \gamma \text{ is a constant proportionality factor.}$$

At the core, the gravity model predicts that bilateral trade should increase with GDP and decrease with distance. Trade theories based upon imperfect competition and the Hecksher –Ohlin model justify the inclusion of the core variables income and distance. The study has stated that the derivation of a proportionate relationship between trade flows and country size as given by Helpman do not include a role for distance. There are several reasons for the inclusion of distance as an explanatory variable. Distance is a proxy for transportation costs; indicator of the time elapsed during shipment; greater geographical distance is correlated with larger cultural distance. The existing studies estimating gravity equations have consistently found a very large negative effect for distance, much higher than could be attributed to transport costs only.

All theories acknowledge the restraining effect of transportation costs on trade. Production of the same good in two or more countries in the presence of transport costs is inconsistent with factor price equalization. Quoting Davis and Weinstein, 1996, Pass 2000 writes that moreover as emphasized by recent economic geography literature different trade models might behave differently in presence of transport cost and differences in demand across countries. So distance between a pair of countries naturally determines the volume of trade between them.

There are also theoretical reasons to include additional variables. Most studies include additional variables to control for differences in geographic factors, historical ties and at times economic factors like the overall trade policy and exchange rate risk. One category of trade flow restrictions is made up of man-made impediments. These barriers or disincentives are created and maintained by governments or their agencies as well as by groups of private individuals or firms. Tariffs, quotas, subsidies, export taxes, exchange controls, and different marketing restrictions are means by which governments or their agencies can create trade barriers. Thus numerous adjustments and additions have subsequently been made to the standard gravity model developed independently by Tinbergen (1962) and Poyhonen (1963). Regional dummies are used in gravity equations to isolate influence of regional agreements on trade flows which otherwise would have been soaked up in gravity variables.

Thus the basic idea behind the gravity model is the notion that bilateral trade flows between countries can be explained by three types of factors: 1) those that capture the potential of a country to export goods and services; 2) those that capture the propensity of a country to import good and services; and 3) other conditioning factors that enhance or inhibit bilateral trade.

Thus the gravity model not simply explain why countries trade in different products (which actually trade theories do), but show why some countries trade more extensively than other countries. However, trade theories, as a rule explains why countries may trade in different products but does not explain why some countries' trade links are stronger than others and why the level of trade between countries tends to increase or decrease over time. This is the limited applicability of trade theory in explaining the size of trade flows. While, trade theories have succeeded to exploit the

“Why” behind trading reasons, the empirical work, and especially the gravity model has been very successful in quantifying and explaining the size of the trade flows.

The gravity model of international trade has a remarkably consistent history of success as an empirical tool. The elasticities of trade with respect of both income and distance are consistently high, signed correctly and statistically significant in an equation that explains a reasonable proportion of the cross-country variation in trade. To quote “ it is to be noted however, that, in analyzing trade between country A and B, the gravity model makes no provision for third party effects i.e. the model does not take into account the conditions and opportunities that prevail between A and C and B and C”. Batra (2004).

Trade is assumed to occur when domestic production is not equivalent to domestic demand. Essentially, certain fields of production have an advantage in certain regions or countries, which result in specialization of production and a division of labor. In trade theory this specialization of production explains why trade occurs in terms of comparative advantage in production. The theory of comparative advantage formulated in the beginning of 19th century by David Ricardo is one of the oldest theories used for explaining international gains from trade. In the Ricardian framework trade takes place because of differences across countries in *technologies*. *Hecksher-Ohlin* theory says trade results from the fact that different countries have different *factor endowments*. In accordance with Mathur (1999), Dreze (1961) summarize that country size and scale economies are important determinants of trade (Pass 2000).

The production will be located in one country in the presence of economies of scale and these economies of scale induce the producers to differentiate their product. The larger the country in terms of its GDP the larger are the varieties of goods offered. The more similar are the countries in their GDP, the larger is the volume of this bilateral trade. In the presence of differentiated products produced with economies of scale, the volume of trade depends in an important way on country size in terms of its GDP (Pass, 2000.) This is the concept of new theories of international trade and it provides a better explanation of empirical facts of international trade in terms of their pattern, direction and rate of growth. As a result, the traditional theories are supplemented, if not replaced, by the new trade theories, in recent years, based on the assumption of product differentiation

and economies of scale as stated in the Rahman (2003). Assumption of similar technologies and factor endowments across countries are implicit in new trade theories.

The H-O and Ricardian theories of trade contradict with the trade in real world. In the H-O model the larger the differences in the factor endowments between two countries, the larger the trade. Therefore based on this ground we would expect little trade between west European countries since these countries have more similar factor endowments and a lot of 'North South' trade. However, in fact there is evidence of large intra-industry trade and North-North trade.

Thus empirical facts have proved that more similar the countries are in per capita income, larger is their bilateral trade. That is "absolute value of the difference" of per capita income in any two countries will have a negative effective on their bilateral trade. This is true of the *Helpman-Krugman* sort of theory, as it predicts that the volume of trade should increase with increasingly equal distribution of national income. In addition, the *Linder hypothesis* says that countries with similar levels of per capita income will have similar preferences and similar but differentiated products, and thus will trade more with each other. So the Linder hypothesis is viewed similar to the Krugman – Helpman theory in its prediction. This would explain the 'North-North' trade pattern.

Further Deardorff (1998) argues that certain relationship of gravity model can be viewed to Heckscher-Ohlin. In the statement of Rahman, (2003, quoted from Markusen, 1986 & Frankel 1997) since according to the H-O theory capital intensive goods are produced by capital rich countries and if high income consumers tend to consume larger budget shares of capital intensive goods, then it follows that: capital rich countries will trade more with other capital rich countries than with capital poor countries and capital poor countries will trade more with their own kind which follow same prediction as those of the Linder Hypothesis.

In this paper we have taken GDP and also GDP per capita. The reason for taking GDP per capita as separate independent variable is that it indicates the level of development and developed countries would have better infrastructures which would facilitate trade by reducing the transportation cost. Also consumers demand more exotic foreign varieties that are considered superior goods as the country develops. Further

development may be achieved through innovation or invention of new products that are then demanded by other countries as exports.

2.2. Literature Review

Literature review is undertaken to understand the theoretical application and to shed some light on the existing studies of the researchers. Much of the existing empirical literature on countries overall propensity to trade has focused on the geographical determinants of trade. However, in particular there are no existing literatures on empirical analysis of the determinants of trade flow of Bhutan that can serve as a basis for this study. But, there are number of studies carried out on the trade flow and trade potential with application of gravity model approach for many small open economies in transition like Albania and Estonia, have been successful in determining trade flow and trade potential.

Bhutan and Albania share some similarities, like strong trade dependence on the performance of two economies and a very narrow export base dominated almost by two groups of commodities and displays a very wide diverse import structure. Further, the application of model has also been successful in analyzing determinants of trade flow and trade potential of countries like India and Bangladesh within the sub-region. Thus based on these papers and many other related studies, this thesis provides an initial exploration in to the use of gravity models to analyze the bilateral trade flow of Bhutan and hope to shed some light on the actual trade pattern characteristic and trade potential of Bhutan.

Numerous studies have shown that gravity typed model is one of the most appropriate ways to model international trade flows (Baldwin 1994, Eichengreen and Irwin 1998, Feenstra 1998). Since the beginning of the 1990's gravity models were widely used for estimating trade relations between Eastern and Western European countries, especially for predicting and modeling trade relations between European Union, Central and Eastern European countries and Baltic countries.

Given the numerous gravity model specifications, each with a partial listing of variables that are significantly correlated with bilateral trade, researchers are uncertain as to the confidence they should place in the results of any one study. The choice of which variables to include and which to omit is of utmost importance since misspecification either lowers the precision of the estimates, or worse, biases the estimates. As beyond the

core variables of GDP and distance, there is little consensus on which variables to include and which to omit. The study carried out by Yamarik and Ghosh (2004) provides researchers with a suitable starting point in which to examine *new* potential determinants of international trade. They examined the robustness of variables used in the gravity model literature and out of the 47 variables investigated, found 20 variables measuring level of development, trade policy, linguistic and colonial ties, geographic factors, relative population density, common currency, and various regional agreements or common membership etc. are robustly linked with trade.

The most recently developed gravity model, by UNCTAD-WTO Trade Centre is ITC's econometric gravity model. Trade Sim (2003, second version), has been developed specially for analyzing the trade potential of developing countries and economies in transition. The additional variables like language diversity, literacy rates, FDI stock and telecommunication infrastructure have also been introduced in this updated version. The model in general has been useful in analyzing the bilateral trade flows of developing countries with their trading partners and especially for the countries with limited trade relations in the past.

As already stated, in its most basic form the gravity equation in international studies relates trade volume between partner countries to their size, as measured by domestic output, and the distance between them. Such analysis explicitly includes transport costs typically approximated by the distance between countries as a primary determinant of the level of bilateral trade. Thus gravity theory has primarily been centered on in the fields where a distance plays a significant role. There are a number of theories, attempting to explain the huge effect of distance on trade. For example, McCallum (1995) estimates that the effect of the log of distance on the log of imports is -1.42, which implies that two countries 500 miles apart will trade more than 2.67 times as much as two countries 1000 miles apart.

Like wise several researchers like Paas (2000), Sandberg, Taylor & Seale(2002), Byers, Talan B. & Lesser(1998), Xhepa and Agolli (2002), Batra (2004) and Rahman (2003) in their studies provide an evidence of significant influence of distance on trade flow. That is the larger the distance between the trading partners, the smaller the trade flows and also found that relations with countries where GDP is higher had positive impact of trade partners on trade flows. These studies have used penal data estimation

techniques and have taken into account different additional variables (i.e. augmented gravity model) along with basic gravity variables.

The difference between study by Rahman(2003) and Batra(2004) is that, Rahman has taken into account macro economic factors like country openness, exchange rate etc. whereas Batra has taken into account natural factors like common language, colonial links, landlocked etc. Similarly Xhepa and Agolli (2002) have augmented gravity model with exchange rate as well as common border and regionalism dummy variables. And rest other studies stated above have augmented gravity model with the natural factors influence of historical, colonial ties and regionalism on the trade flow and have found a large and significantly positive effect on bilateral trade.

Pass (2000) have employed export and import gravity model approach to explore the international trade pattern of Estonia using basic gravity variables; GDP and distance augmented with number of dummies of regionalism. He concluded that country with small, open and comparatively successful transitional economy look for regional niche to penetrate into world market and found Estonia has an excellent potential to develop trade relations within the Baltic Sea region countries. To quote, Estonia's situation is certainly not unique, and conclusions presented in this paper could be applied to analysis of international trade pattern in other economies in transition.

Similarly Sandberg, Taylor & Seale (2002), Byers, Talan B. & Lesser (1998) have also done similar studies using export gravity model taking in to account basic variables like GDP, distance and population augmented with historical relationship and colonial ties. They found that the parameter estimated for exporting and importing country GDP are statistically positive, however estimate of GDP is larger for the importing country than the exporting country. Also found exporting countries' population generally positive and statistically significant and those of the importing country's population negative. Further found that past colonial ties and membership in CARICOM has a positive and significant effect on bilateral trade level. With similar specification of gravity model, Pravorne, Sjorohoda, Strods and Tkachevs (2003) estimated gravity models for Baltic Sea States' international trade and obtained similar results as above.

Xhepa and Agolli (2002) have used export and import function taking into account the basic gravity model variables augmented with lag of export and import and

similarity variables in term of economies of masses (GDP), nominal exchange rate and dummies. Everything is taken in nominal terms applying the assumption that trade usually happens at international prices, therefore GDP in constant prices or PPP has no bearing on trade levels especially in short terms. Found that imports as well as exports were strongly related to import performance of a year ahead, as this relationship was very important in both significance level and magnitude. Also linkage of economic mass with import level is statistically significant and this fact is consistent with all empirical results.

The gravity model constructed by Frankel (1993), Sharma and Chua(2000) and Hassan (2000,2001) has been reconstructed by Rahman (2003), to analyze Bangladesh's trade with its major trading partners using the panel data estimation technique. According to the Rahman model bilateral trade flows from the countries of origin to their trading partners depend not only on the basic gravity variables that is size of the economy (GNP) of these countries and the distance between exporting and importing country and a set of dummies but also on other macro economic factors like openness, exchange rate etc. The results show that Bangladesh trade is positively determined by the size of the economies, per capita GNP differential of the countries involved and openness of the trading countries. The major determinants of Bangladesh exports were found to be the exchange rate and openness of the Bangladesh economy. On the other hand exchange rate was found to have no effect on the Bangladesh's imports rather imports are determined by the inflation rates, per capita income differential and openness of the countries involved in trade. Transportation cost is found a significant factor influencing Bangladesh's trade negatively and concluded that Bangladesh could do better by trading more with its neighboring countries. This is the key literature used in our study.

The estimation of trade potential in this paper primarily followed (Pootrakool, Chaianant, Dejtrakul & Punnarach, 2003), where the coefficients obtained from gravity model estimation and the actual data on the GDP and distance between the two countries and other variables were used to obtain the predicted level of trade, to determine the trade potential and compared with actual trade. The difference between the predicted level and the actual level of trade is viewed as the "potential trade". Positive indicates that there is more room for trade between the particular pair of countries. On the other hand, negative potentials do not necessarily indicate too much export to a particular destination, but be viewed as a "high performing pair", a desirable quality that both countries should try to

maintain. They estimated the potential for additional trade between any pair of the countries both in and out of the sample with the intuition that countries that are closer will trade much more with each other and trade also depend on the income level of both countries as measured by GDP indicating greater production capacities and greater product varieties to trade with other countries. They concluded that Thailand export performs very well with the United States, Hong Kong and Singapore and there is more room to increase its exports to China, Taiwan, Japan and India.

On the other hand studies have used ratio of trade potential (P) as predicted by the model and actual trade (A), i.e. (P/A) is then used to analyze the future direction of trade flow. If the value of P/A exceeds one the implication is in terms of potential expansion of trade with the respective country. Batra (2004) has determined trade potential of India with the regional grouping using augmented gravity model for the year 2000 and concluded that magnitude of India's trade potential is maximum in the Asia-Pacific region followed by Western Europe and North America.

Xhepa and Agolli also determined Albania's foreign trade potential by employing export and import function of gravity model separately since they display different behavioral patterns, estimation based on 2001 data and concluded that FTA will potentially induce more trade creation while the presence of "overtrade" with neighboring countries may also lead to some trade diversion, both forces may contribute to enlarging the geography of foreign trade. Similarly, Pravorne, Sjorohoda, Strods and Tkachevs (2003) analyzed Baltic trade flow predicting exports and imports in 2001 using data for year 2000. They found that Baltic States are still overtraded in exports with CIS and Baltic Sea region countries indicating that historical ties still matter for Latvia, Lithuania and Estonia and found potential for their exports to many non-Baltic States. They calculated the ratios between actual and predicted trade flows (A/P) and if the ratio between actual and predicted values for exports (imports) exceeds 1 then the correspondent country is overtraded in exports (imports) with the corresponding "third" country (region) and if it is less than 1 then it is under traded.

All these studies have found that export with neighbor countries are on "overtrade" situation, showing that cultural closeness, language, large human interaction as immigration are very important indicators of trade patterns, besides other economic incentives and showed significant influence of distance on trade.

Several studies have also analyzed the trade enhancing impact of preferential trading arrangement. These studies predict the additional bilateral trade that would be a consequence of the economic integration of a set of economies. So to analyze the effects of regionalism, investigators typically add dummy variables for participation in regional arrangements. Both the cross section and panel data approach has been used by these studies. Viner (1950) recognized that the trade induced by free trade area or customs union was of two types: trade creation and trade diversion. According to empirical analysis of Whalley (1998), the benefits from this form of market of assurance may in fact be quite large, particularly in case of a small country. Regional trade arrangements include the traditional welfare gains from preferential tariff reductions, the market-power benefits of forming a larger unit for tariff setting and bargaining, and strategic benefits from integrating markets and committing to preferential arrangement.

Gravity Analysis of South Asian Free Trade by Hirantha (2003), using data from 1996 to 2002 have shown that there is a significant trade creation effect under SAPTA and found no evidence of trade diversion effect with the rest of the world. This supports the proposition that further regional integration may bring about substantial benefits to SAARC region and South Asian Free Trade Area is most likely to promote intra-regional trade through further dismantling of tariff and other non-tariff barriers to trade among members.

Further Carrillo and Li (2002) analyse the importance of preferential trade agreements in enhancing intra-industrial trade in Latin American countries by applying the gravity model of bilateral trade flows. They also found that trade agreements have had an impact on the dynamism of intra-regional trade and on the surge of intra-industrial trade, although relatively low compared with other important variables. In particular, their impact has been only on some specific product classifications, not all of them. Indeed, have shown that after accounting for size and distance effects, the Andean Community preferential trade agreements had a statistically significant effect on the aggregate differentiated and reference products category.

Anderson and Marcouiller (2002) derive a structural model in which trade between countries is subject to predation. They provide evidence that improvements in contract enforcement and institutions have a substantial positive effect on trade, but not on the estimated distance elasticity of imports. Also Jansen and Nordas (2004) have

analyzed the degree of domestic institutions affect trade flows and found that the quality of institutions has a positive and significant impact on a country's level of openness however, domestic tariffs have no statistically significant impact on their own, but do affect total trade flows when combined with good institutions.

In reviewing the empirical studies it was revealed that researchers have augmented basic gravity model by variables that either increase or reduce trade through their impact on transaction costs or the overall institutional environment (e.g. trade policy proxies, binary variables for participation in regionally trading agreements, for sharing a common commercial language, for sharing a common border, and for common colonial heritage). Thus it is common to augment gravity model with additional variables of macro economic factors and natural factors. The variables are incorporated based on the trade pattern of each country and variables that best suit the bilateral trade flow of the country.