CHAPTER II
THEORETICAL BACKGROUND AND
REVIEW OF LITERATURE

2.1. The Foundations of the Gravity Model

The gravity model for trade is analogous to Newton’s gravity law in mechanics. The gravitation a pull between two physical bodies (in Newton’s) is proportional to the product of each body’s mass (in kilograms) divided by the square of the distance between their respective centers of gravity (in meters).

\[ F = U \frac{M_1 M_2}{D^2} \]

The analogy for trade is as follows: the trade flow between two countries is proportional to the product of each country’s ‘economic mass’, generally measured by GDP, each to the power of quantities to be determined, divided by the distance between the countries ‘respective’ economic centers of gravity.’ Generally their capitals raised to the power of another quantity to be determined.

To derive the theoretical foundations of the gravity model, Bergstrand’s (1985) used the world trade equilibrium system. That is, the total exports by all countries exporting the goods in the world should equal the total imports by all countries importing the goods in the world. This equilibrium was to be equally true for both total trade of all commodities and trade for any specific commodity. Then, Bergstrand developed the gravity model by looking into the behavior of the exporters and the importers. He assumed that both exporters (supply side) and importers (demand side) are to benefit maximizing economic agents. On the export side, suppliers maximize their profits subject to the constraints of Constant-Elasticity-of-Transformation (CET) in the use of immobile resources. On the import side of the world incomes constraint.
Income comes only from the exports sold in the foreign market since the outputs of all countries are assumed to be sold only in the foreign market. This system produces N (N-1) bilateral export supply equations and N (N-1) bilateral import demand equations for each point in time. N is the number of countries trading the goods (the sum of N countries’ trade makes the world total trade). N-1 is the number of trade partners (that is, a particular country i do not trade with it). By equating the supply equations and demand equations, in equilibrium, the gravity model was derived. In using the Bergstrand’s (1985) model, we need to assume that all exports by the exporting courtiers in the study have to be imported by all the importing countries in the study within the same data set to be able to satisfy the equilibrium requirement. In the country specific gravity model, it is difficulty to satisfy such equilibrium requirement. We can use Gould’s (1996) approach as an example to illustrate this point. Gould extended Bergstrand’s (1985) model and applied it to the study on the US trade with its trading partners. The problem with this approach is, while the total US exports, its trade partners also import goods from countries other than the US, that is, the total US’s exports do not equal to the total imports of its trade partners. Then, the world trade equilibrium fundamental in Bergstrand’s (1985) model is not satisfied when it is applied to the country specific study.

We can now see that the world trade equilibrium foundation of Bergstrand’s theory for the gravity model is restricted to use in the full version of gravity equation, and the foundation collapses in the case of the country specific gravity model. The direct application of Bergstrand’s model to provide theoretical support for country specific case (as in Gould’s (1996) study) will not be appropriate. An alternative theory is needed for the country specific gravity model.

Linnemann (1966) justified the theoretical foundation of the gravity model by using a Walrasian general equilibrium system. He argued that the
gravity model is a reduced form of a four-equation partial equilibrium model of export supply and import demand (see also Bergstrand, 1985).

Bergstrand (1985 and 1989) provided a theoretical foundation for bilateral trade in differentiated products. He derived a “generalized” gravity equation including price index variable from partial equilibrium, which is the general equilibrium model plus small market assumption and the assumptions of identical utility and production function across countries. According to economic theory, some of factors that directly affect the volume of trade are: income, population, transaction cost and the presence/absence of trading agreements. In the case of income, where countries enjoy a relatively high level of income, theory purports that these countries tend to trade more. Theory also purports that where transaction cost are held in check and if there is the existence at a Regional Trade Agreements (RTAs) the potentiality of exporting goods and service is seen as being more likely than in the scenario of high transport costs and the presence of higher external tariff barriers due to the non-existence of a RTA of the combination of economic variables (income, population, distance etc). The variable that have been listed as being essential to the composition of the gravity model provide unique insight into the trade potentialities existing between two nations. An important determinant of potential trade restriction (or ‘Friction to trade’) is distance variable in the gravity model, the reason being that the higher the restrictions to trade the less two nations will be inclined to trade with another opting for alternatives where restrictions are less (usually a neighboring country closer in proximity). Restrictions to trade lead to heightened transaction costs and minimization of transaction costs is often one of the goals of trading nations. In addition to the fundamental variables discussed, auxiliary variable such as language, commonality, common colonial heritage, border contiguity and common currency are added to the gravity model in an attempt to further refine the gravity model, offering deeper insight and a heightened explanation of the
variance exhibited in bilateral trade flows. Income and transaction costs impact on the flow of trade can also be explained within the framework of the partial equilibrium model.

Feenstra et al. (1998) further derived a gravity equation from a reciprocal-dumping model of trade with homogeneous goods. It showed another kind of product differentiation model coming from factor endowment differences. Deardorff (1998) completed the theoretical foundation of the gravity model by showing that the gravity equation is consistent with Heckscher-Ohlin trade model in homogeneous goods with perfect competition. Evenett and Keller (2002) also emphasized that gravity prediction constitutes the most important result regarding the volume of international trade.

Due to the aforementioned development of theoretical foundation, it is generally accepted that a number of trade models are responsible for the empirical success of the gravity equation. While the Heckscher-Ohlin theory would account for the success of the gravity equation in explaining bilateral trade flows among countries with large factor proportion differences and high shares of inter-industry, the differentiated product model would serve well in explaining the bilateral trade flows among countries with high shares of intra-industry trade in increasing returns with monopolistic competition (Frankel 1997; Deardorff 1988; Evenett and Keller 2002).

Hummel and Levinsohn (1995) conducted a kind of model identifying empirical test with a set of Non-OECD countries where monopolistic competition was not so plausible. To their surprise, they proved that the gravity equation is also efficient in explaining the trade flows among developing countries where inter-industry trade is dominant with scarce monopolistic competition. Their findings questioned the uniqueness of the product differentiation model in explaining the success of the gravity equation and
proved that a variety of other models, including the Heckscher-Ohlin model, can serve as alternatives. Feenstra et al., (2001) showed that while gravity equations could be derived for both differentiated and homogeneous goods, the different theories underlying the equation lead to measurably different estimation in key parameter values. Evenett and Keller (2002) tackled the model identification problems by trying empirically to separate between Heckscher-Ohlin theory and the increasing returns trade theory as driving forces behind the success of the gravity equation. They argued that little production is perfectly specialized due to factor endowment differences and that as long as the production is not perfectly specialized across countries, both of the Heckscher–Ohlin model and differentiated products model are likely to account for the empirical success of the gravity equation. As a result, estimation of parameters of the gravity analyses is critically dependent upon the model identification.

2.1.1. Theoretical Underpinnings of the Gravity Model

Even though the Gravity Model had a highly acclaimed explanatory ability, its predictive capabilities were severely hampered by its “perceived” lack of a robust theoretical foundation (Bergstrand, 1985). This lack of a strong theoretical foundation has been addressed by Anderson (1979). Using the properties of expenditure systems while maintain homothetic preferences across regions, Anderson provides a theoretical explanation for the gravity equation as applied to trade in commodities. Anderson proposes that by the gravity equation constraining the pure expenditures system by highlighting the share of national income spent on traded goods, a stable unidentified reduced form function of income and population is obtained. Anderson also proposed that the equation’s multiplicative form is explained. Distance in the model has a substantive and meaningful interpretation, and structural irregularities across regions are handled forthrightly by holding them identical. Anderson alludes to the possible presence of bias in this method but subsequently dismisses it as the
gains to the model’s estimation efficiency outweigh any additional bias. Anderson develops several gravity models in his paper, with the Pure-Expenditure-System Model being the first. Anderson states that it is the simplest gravity type model, it stems from a Cobb-Douglas expenditure system that has been rearranged. In it he specified that the monetary amount of goods from country i and country j ($M_{ij}$) is equal to the product of Income ($Y_iY_j$) divided by the $\Sigma Y_j$. From there, Anderson develops his Trade-Share-Expenditure System Model where expenditure share is allowed to vary across regions (unlike before). To allow for this intra-regional variation, an additional variable, i, is introduced representing the share of country i’s production demanded in country j and then specifying an additional variable, j, that accounts for j’s total expenditure, thus arriving at demand for i’s tradable good in country j as being represented by the equation, $M_{ij}=ijY_j$.

In similar fashion, Bergstrand address critics of the gravity model’s perceived lack of a strong theoretical foundation in asserting that the gravity model was in fact a reduced from derived form a four equation partial equilibrium model of export supply and import demand. Prices had been omitted from the original framework and critics argued that approach (price omission) was loose and did not explain the model’s multiplicative form. Bergstrand addressed these concerns directly and in systematic fashion by presenting the necessary assumptions in generating a gravity equation that was similar to the general equilibrium format. Bergstrand generated a utility function of CES (Constant Elasticity of Substitution) form from which he was able to derive consumer demand. Bergstrand also developed a supply function, assuming all firms were profit maximizing, and finally he set the two equations (demand and supply) equal to each other representing market equilibrium. This was not the final form of the gravity model due to the omission of exporter and importer incomes. This omission of incomes was addressed by deriving the incomes exogenously using additional assumptions. The additional
assumptions employed were: 1) Trade flow from i to j was small relative to other markets. 2) Identical utility and production functions across countries (ensuring constancy across country pairings); 3) Perfect substitution of products; 4) Perfect arbitrage of commodities; 5) Zero tariffs; and 6) Zero transport costs. Bergstrand noted that the inclusion of incomes into the model obtained the generally recognized gravity model format and posited that the variables of price and exchange rate had significant effects on trade flows.

Later, Bergstrand (1989) attempts, by using the framework of the General Equilibrium Model of World Trade (two differentiated product industries with each product utilizing two factors of production), to show how the Gravity Model fits into the Heckscher-Ohlin model of inter-industry trade and the Helpman-Krugman-Markusen models of intra-industry trade. Bergstrand expands the framework of the Gravity Equation to include factor endowment variables in the spirit of the Heckscher-Ohlin Model and test variables after that of Linder. He provides an “explicit theoretical foundation for exporter and importer incomes and per capita incomes consistent with traditional (and newer) trade theories”. Bergstrand, (1989) to accomplish this defines consumer demand as a CES utility function, makes the assertion that the firm in i is profit maximizing, and that each firm in the two industries posited produce a differentiated product that can be characterized as being Chamberlain Monopolistic Competition by nature by using two factors of production, namely, Capital (K) and Labor(L). Bergstrand then states firms distribute their output after a Constant Elasticity of Transformation function. Bergstrand then further expands on the Gravity Equation in a Multi-Industry world stating that when you proceed with more than two factors and more than two industries, the Gravity Equation could not be used in inferring relative factor intensities of industries Bergstrand reiterates that his goal was to shed further light on developing a Gravity Equation that was consistent with the theories of inter and intra-industry trade. He further states using a two-industry,
two-factor, N-country Heckscher-Ohlin-Chamberlin-Linder model, one could interpret exporter and per-capita income as national output in terms of units of capital and the country’s capital-labor endowment ratio. Bergstrand also proposed that between 40%-80% of the variation across countries was explained by the generalized gravity equation in one-digit SITC trade flows. He stated that importer per capita income coefficients suggested that manufactures tended to be luxuries and that raw materials tended to be necessities for everyday life (such as fuels and chemicals).

The perceived disparities between the gravity equation and the Heckscher–Ohlin (H-O) Model of trade have also been addressed by Deardorff (1998). Some have argued that the success of the gravity equation was proof against the H-O model while Deardorff argues that at some of the equilibrium in the H-O model yields interpretations that are consistent with that of the gravity equation. There are two keys to the results being sought by Deardorff, that there are two different types of H-O equilibrium, the first equilibrium being with frictionless trade and the second equilibrium without frictionless trade.

In frictionless trade, there are not impediments to trade because trade in just as viable an economic alternative as domestic production of a particular commodity. Deardorff asserts then that a change of mind must happen in the logic of thought as to trade because now, with no impediments, by ‘demanders’ indifference to equally priced sources of supply, this allows the entry of foreign suppliers into an otherwise domestic supplier’s market. Just as demanders are indifferent to equally priced sources of supply, so suppliers are indifferent to whom they sell. Deardorff argue that in the absence of trade impediments, trade flows are not bound to be small and because of the indifference of both suppliers and demanders trade flows become larger, falling more into a configuration akin to that of the gravity-equation (accounting for identical,
Deardorff proceeds to state the case where there is trade in the presence of trade impediments. The H-O model, where there are impediments to trade, must then have Factor Price Equalization (FPE). Because, if two countries had FPE and the presence of a trade impediment, trade would simply not be conducted between the two countries, rather country i would consume its own production rather than paying the country j’s price (same as their own) plus an additional trade impediment premium from country j. Deardorff says that in the presence of trade barriers, while not explicitly being the case, one nation specializes in the manufacture of a good and is it’s (the good’s) lowest cost producer. With this assumption in hand, Deardorff proceeds to study bilateral trade flows in the H-O model and asserts that they are the same as in models with differential products and hence the emergence of the gravity model once again.

The use of the gravity model for explaining spatial interaction and flows of all kinds appeared in the late 19th century. It has been successful in explaining human flows from one centre to another such as immigration flaws, shopper flows to shopping entries, patient flows to hospitals commuting traffics, and so on (for example, see Karemera, Oguledo, Davis, 2000; Zipf, 1946) the model assumed that there is a hidden force to draw the flow. The force is formed by the attraction of the two centers. The attraction of the two centers can be attributed to their sizes.

Stewart (1947) used the gravity model to study the distribution and equilibrium of population.

Hua and Porell (1979), Kau and Sirmans (1979) and Oguledo and Macphee (1994) identified some other applications of the gravity model which analyzed the flows of buyer to shopping centers, patient flows to hospitals,
recreation traffic, commuting, immigration communication, household relocation, regional planning, transportation and tourism.

Linnemann (1966) extends this model by introducing additional variables such as population size, which denotes the “share of domestic demand in total national product.” He attempts to explain the international trade flows in the theoretical bases of the gravity equations in terms of the ‘quasi-walrasian’ equilibrium systems which “determines total foreign supply and total foreign demand of a country.”

Anderson (1979) introduces significant theoretical improvements to the gravity model (in terms of Constant Elasticity of Substitution (CES) preferences and distinguishes goods by country of origin. First, Anderson shows that the gravity model could be derived from the pure expenditure system model by assuming that “products are differentiated by place of origin.”

According to Anderson, the differentiation of products indicates that in the production process “each country is completely specialized in the production of its own good.” He also states that the gravity model should be fully consistent with the generalized trade-share expenditure system model and notes that “trade shares should increase with income per capita and decrease with size (population).” He concludes that it is appropriate to use and refine the gravity model. Bergstrand (1985) propose a manifest the official foundation of bilateral trade for the gravity model which can be derived from assumptions of monopolistic competition and product differentiation in addition, Bergstrand (1989) applies the micro-economic foundation for the gravity equation to the factors endowment variables and also includes exporter and importer income and per capita incomes are exogenous variables with the assumption of perfect substitutability of products across countries. He emphasizes the importance of per capita incomes in bilateral trade flows pointing out that exporter and
importer per capita income has largely been ignored. Even though Anderson (1979), Bergstrand (1985) and Helpman and Kruman (1985) estimated bilateral trade flows in term of exporter and importer income.

Krueger (1999) uses the gravity equation to assess the impacts of preferential arrangements on international trade flows between the US, Canada and Mexico under NAFTA.


2.1.2. Theoretical Underpinnings of the Import demand function

In the literature, the investigations of the determinants of important demand are basically directed toward assessing the effects of government politics on import demand. Elastically approach has used to investigate the effectiveness factors on import demand. In this section, the study will provide a non-exhausting list of the leading studies in the economics literature. In addition to this, some recent studies regarding the Iranian case of imports will be reviewed.

From an econometric point of view, the elasticity approach is based on estimating the import demand function. In most studies, import volumes are regressed on effective exchange rates, relative import price and domestic real
income. Goldstein and Khan (1974) provides a survey of studies on income and price affects in foreign trade, with an excellent discussion of the specification and econometric issues in trade modeling, as well as a summary of various estimates of price and income elasticity and related policy issues. The study will first discuss a small About Theoretical this Model.

Khan [1974] has investigated for the period 1951-1969 employing annual data for individual countries using the following model specification:

\[
\log M^d_n = a_0 + a_1 \log(PM_i / PD_1) + a_2 \log Y_{it} + A_t + u_t
\]

Where, \(M^d_n\) is the quantity of imports of country I, \(PM_i\) is the unit value of import in country i, \(PD_1\) is the domestic price level of country i, \(Y_{it}\) is the real GNP of country i and \(U_t\) is an error term associated with each observation. Since each variable is defined in logarithmic terms, the estimated coefficients are the elasticity of imports with respect to the corresponding variables. Having estimate this function using OLS, Khan (1974) reported that the prices did play an important role in the determination of imports of developing countries and Marshall-Lerner Condition is satisfied

Warner and Kreinin (1983) have also employed a similar model, but their approach is different from Khan (1974) in two respects: Firstly, there are two distinct investigation periods, the periods of fixed and flexible exchange rate regimes, to analyze the behavior of the model in the two periods. Secondly, Warner and Kreinin (1983) estimated the import demand function as Khan (1974) estimated the import demand function as Khan (1974) did, but they also repeated the estimation after excluding the petroleum products. Quarterly data for the periods 1957:1-1970:4 (fixed exchange rate period) and 1972:1-1980:4 (floating exchange rate period) separately have been employed to estimate the model. Import demand function in Warner and Kreinin (1983) for the 1957:1-1970:4 periods is given by:
\[
\begin{align*}
\ln M &= c + a_1 \ln Y + a_2 \ln (PM / PD) + u_t \quad (2) \\
\ln M &= c + b_1 \ln Y + b_2 \ln PD + b_3 \ln PM + u_t \quad (3)
\end{align*}
\]

Import demand function for the 1972:1-1980:4 periods:

\[
\begin{align*}
\ln M &= c + a_1 \ln Y + a_2 \ln (PM / PD) + u_t \quad (4) \\
\ln M &= c + b_1 \ln Y + b_2 \ln PD + b_3 \ln PM + u_t \quad (5) \\
\ln M &= c + c_1 \ln Y + c_2 \ln PD + c_3 \ln PM^{FC} + c_4 \ln E + u_t \quad (6)
\end{align*}
\]

Where, \(PM^{FC}\) is the Import price in foreign currencies, \(M\) is the volume of imports on a per capita basis, \(Y\) is the real GNP on a per capita basis, \(PD\) is domestic prices, \(PM/PD\) denoted the relative prices and \(E\) stands for the exchange rate. As all the variables are expressed in logarithms, the parameters of this model are again interpreted as the elasticity of the dependent variable with respect to the independent variables. Exchange rate was included in the model only for the floating exchange rates period and it was calculated as an import-weighted effective exchange rate.

Bahmani-Oskooee(1985) used quarterly data for 1973-1980 periods and provided the estimates of aggregate import demand function for seven developing countries. They also provided estimates of price and exchange rate response patterns by introducing a distributed lag structure on the relative prices and on effective exchange rate, applying the Almon procedure. Since the dynamics of the determination of the trade flows are involved, Bahmani-Oskooee (1998) presented a more realistic setup. The equation used in this study is:

\[
\ln M^d_1 = a + b \ln Y_1 + c \ln (PM / PD)_1 + h \ln E_1 + u_1 \quad (7)
\]

### 2.2. Related Literature and the Commodity Specific Gravity Model

The gravity model plays a role in evaluating bilateral trade flows not only for aggregated commodity trade, but also for disaggregated commodity
trade between pairs of countries. However, there have been only a few studies
that apply the gravity model to a single commodity

Koo, Karemera, and Taylor (1994) adopt the traditional gravity model of
aggregate trade flows into the single product of world meat trade flows using a
panel data framework. They argue that “the gravity model for a single
agricultural commodity can be parameterized more effectively by using time
series and cross-section data rather than cross-section data alone.” They also
indicated that this pooled time-series and cross-section data greatly “improves
the efficiency of the results and permits the use of information available over
several years for each pair of trading countries”. Finally they conclude that the
modified gravity form can be applied to single commodity trade flows and that
the model provides an adequate statistical description of the meat trade flows
while retaining the conventional gravity model attributes.

For the international trade in forest products, Kangas (2001) applied the
gravity model to the round wood trade. This approach used the gravity model
for a single commodity of forest product to study the development of trading
patterns for round wood between the EU and Central and Eastern European
Access Candidates (CEEC) in the 1990s. This model included exporter and
importer’s income and per capita GDP, distance, and preferential trade areas as
the main determinants affect European bilateral trade in round wood.

Jordaan and Eita (2008) investigate export and economic growth in
Namibia. This study indicates that export is the key to economic growth in
Namibia, and country can expand its limited domestic market by exporting to
the international markets.

Antonucchi and manzacchi (2006) estimated a dynamic panel fixed
effect gravity model using GMM (generalized method of moments) . They
followed a tab-step procedure.
First they estimated a standard FEM (Fixed effects model) regression then a cross section regression with country specific individual effects as a function of time-invariant variables (i.e. distance and dummies)

Boughanmi (2008) is the particular paper on the trade potential of GCC (Gulf Cooperation Council) countries with a panel fixed effect gravity model. The study to investigate the import flows of the GCC countries with 69 partners over the period 1990 and 2004, and found that the name variables and the dummy variable for the GCC countries are positive and significant supporting a high volume of intra-trade, but the EU and the dummies are negative and significant, which indicates a low level of integration.

Vollrth et.al (2006) adopt a gravity approach when they analyze trade in Processed and staple agric-food products among a wide cross-section of 69 countries biennially from 1996 to 2002. Among others, they find that difference in per capita income effect trade in manufactured food but not trade in commodity foods, that is consistent with the HO theory of international trade-the Land/labour ratio is an important determinate of trade in food products and that the EU, NAFTA and mercocur have all increased in intera-bloc trade in food products beyond that which would have taken place in the counter fractural.

Mcpherson et.al (2001) support the Lender hypothesis for five of the six east African developing countries, namely, Ethiopia, Kenya, Rwanda, sudan and Uganda. However, there is no significant relationship between trade intensity and similarity of per capita income levels between Tanzania and its trading partners they capture both time-series and cross-section elements of the trade relationship by employing a panel data set from 1984, to 1992. This finding implies that these countries trade more intensively with other who has similar per capita income levels, as predicted by Linder.
Achay (2006) investigated the determinants of trade flows between various countries of the world. He applied the gravity model on a sample of 146 countries for the five-year sub-periods between 1970 and 2000. His model included such determinants of trade as GDP, distance, and regional integration agreement. His findings showed that all estimated coefficients were statistically significant and their signs were in conformity with expectations the adjustment quality of the model as measured by determination coefficient (adjusted $R^2$) was quite high standing at 71%. He found that GDP, GDP per capita, common frontier, common official language, common currency or common colonial past have a positive impact on the volume of bilateral trade. On the other hand. The geographical distance factor had a negative effect on the volume of trade.

Filippini (2003) used a gravity equation model to analyze trade flows between East Asian industrializing countries (including China) and some developed countries in order to show the surprising trade performance of East Asian countries. He found that all signs of coefficients were consistent with model assumptions. He also found high propensity of Asian countries (including China but excluding Japan), to exchange high-tech manufactured products with Japan and USA. Another interesting result was that among the East Asian economies, China plays a very important role as an exporter and as importer too in recent years.

Martinez-zarzogo (2003) applied the gravity model to annual bilateral exports between 19 countries. His results indicated exporter and importer incomes. As, expected, had positive influence in bilateral trade flows. Exporter population had a large and positive impact on exporter. Regarding transport infrastructure, he found that exporter infrastructure fosters that bigger countries import more than small countries.
Brulhart and Kelly (1999) also applied a gravity model to estimate Ireland’s potential trade patterns with five Central and Eastern European Countries (CEEC) to assess the impact of their possible accession to the EU. They found that “Irish export volumes are close to their normal level, but that Irish imports from the CEECs were still less than half of their normal size in 1994.”

The modified single commodity gravity model has adopted the methods indicated in the literature. According to Linnemann (1966) and Bergstrand (1985, 1989), a gravity model is a reduced form equation of a partial equilibrium in import demand and export supply. The general equilibrium model for world trade can be derived from utility and profit maximizing behavior. Koo, Karemera, and Taylor (1994) suggested that:

“The demand equation for the specific commodity can be derived from maximizing the constant elasticity of the substitution (CES) utility function subject to income constraint. The supply equation is derived from the firm’s profit maximization procedure in exporting countries with resource inputs allocated according to the constant elasticity of transformation (CET) during the production process”.

The single commodity gravity model under market equilibrium conditions of demand and supply can be derived as follows. The GDP of an exporting country can be translated as its production capacity, whereas the GDP of an importing country means its purchasing power. In the end, it is anticipated that the GDPs of pairs of exporting and importing countries will be positively related to the trade flows between them.

In this context, short-hand representation of supply and demand forces of gravity model can be accomplished in international trade. If country $i$ is the
origin of exports, then Yi represents the potential of the exporting country to supply a product, while Yj represents the potential of the importing country’s demand for that product. In this study, the typical gravity model for aggregate goods is re-specified to analyze trade flows of a single commodity, wood product. Furthermore, this study will demonstrate how the Hausman specification test the Breusch and Pagan’s Lagrange multiplier test are used to choose between competing models in this case, the one and two way applications of fixed effect and random effect models.

Common currency is a binary variable which is using if i and j use the same currency a time t. it thus take a value if j don’t use dollar of trade and 1 if i use dollar in trade with other country.

Countries sharing a common currency (dollar here) are expected to trade more, thus “common currency” has a positive sign.

Flam and Nordstrom (2003) Found that the introduction of the Euro has increased Euro-zone trade by an average of 15 per cent between 1998 and 2003 and that trade between Euro-zone counties increased twice as much as between Euro and non – Euro countries. They propose trade costs and tariffs reduction as the must likely reasons. However, they use unilateral trade rather than bilateral trade their model, which, they admit, may lead to greater inaccuracies in their estimates.

Micoo et.al (2003) to measured the potential impact of the currency union effects on trade using a panel data of 22 countries for a ten-years period ending in 2002. They found that the effect of the introduction of the Euro on bilateral trade between Euro-zone countries ranges between 8 and 16% increase when compared to trade among non-Euro-zero countries.
Harrigan, (1993) derives a gravity equation based on a monopolistic competition model and progress for 1983 cross-country trade flows on trade barriers and profusion. The data on bilateral trade flows between 13 OECD countries is applied to twenty eight 3 digit industries the data on trade barriers come from a comprehensive inventory of NTBs from the united Nations commission on trade and development (UNCTAD). Those data consist of indicator various of about 20 different types of NTBs.

Harrigan (1993) estimates the share of bilateral import weighted by the GNP of the importing country on the three broad categories of NTBs. The partner’s country production in industry, Average tariffs and a freight factor.

The gravity model has also been applied for identifying the impact of regulatory policy barriers. In this subsection, we will review and evaluate the methodology and results of selected studies that have related trade flows to measures of non-tariff barriers (NTBs) using gravity-type equation of international trade. Based upon several types of NTBs (regulations, standards, technical barriers to trade), we may distinguish the mainstream literature into three categories:

(i) The studies of Harrigan (1993) and Head and Mayer (2000) use crude indicators of NTBs in investigating its trade impeding effect. The effect of regulations (technical barriers to trade) is implicitly incorporated in the data.

(ii) Moenius (1999) the hypothesis and country-specific standards act like barriers-to-trade while the bilateral harmonization of standards promote trade. These studies focus on the trade impact of voluntary standards rather than on TBTs (more generally due to data limitations): in particular, they investigate institutional standards that are produced by the coordinated efforts of standard setting bodies.
Harrigan (1993) derives a gravity equation based on a monopolistic competition model and regress, for 1983, cross-country trade flows on trade barriers and production. The data on bilateral trade flows between 13 OECD countries is applied to 28 3-digit industries. The data on trade barriers come from a comprehensive inventory of NTBs from the United Nations Commission on Trade and Development (UNCTAD). These data consist of indicator variables of about 20 different types of NTBs. To construct the NTBs variables, coverage ratios for each type of NTB were measured by the percentage of imports covered by one or more NTB. These various categories of NTBs were then aggregated into three broad categories of price, quantity, and threat measures (e.g., price monitoring).

Harrigan (1993) estimates the share of bilateral imports weighted by the GNP of the importing country on the three broad categories of NTBs, the partner’s country production in industry, average tariffs and a freight factor. The study found that only five industries have estimated price NTB effects that are negative while three effects are positive and the rest of the estimated effect were not significant. Quantity NTB effects were reliably negative while most of the estimated threat NTB effects are not statistically significant. The study conclude that a heterogeneity across industries exists and concluded that tariffs and transport costs were a more substantial barrier to trade in manufactures between developed countries than were non-tariff barriers.

When deriving a gravity model from a monopolistic competition framework, a series of (likely unrealistic) assumptions are being made. The study tests two restrictions: (i) homotheticity implying that the elasticity of imports with respect to production should be unity; and (ii) tariffs and transport costs should be the same in both directions between countries. These restrictions were rejected at most of the cases.
Head and Mayer (2000) apply a gravity approach to 3-digit NACE data for EU countries and assess whether there is any correlation between the estimated border effect and two indirect measures of EU non-tariff barriers (NTBs). The first measure is based on a 1980s survey of EU firms conducted by the European Commission. From this survey, the study constructs three variables representing the stringency of NTBs in terms of standards differences, public procurement, and customs formalities. The second set of indicators comes from Buigues et al. (1990) which classified European industries into three levels of barriers: low, moderate, and high.

Swann and Temple (1996) present an econometric analysis of the effect of standards on UK trade performance, using trade for eighty-three 3-digit SIC manufacturing codes over the period 1985-1991. Counts of the number of German and UK standards by industry were taken from the Perineum database.

A distinction was made between internationally equivalent standards where the national standard was found to be identical to an international standard and national standards where it was not. The count measures of standards assume that all standards have equal weights across industries and that different standards would impose identical economic effects.

Moenius (1999) advanced this approach by incorporating standards count data from Perinorm for 12 countries and 471 4-digit industries from the Standard International Trade Classification (SITC) into a gravity-based analysis of bilateral trade volumes over the period 1980-1995. The author also distinguishes between country-specific standards, measured by the number of documents specifying a technical requirement within a country, and bilateral shared standards, measured by the number of documents linked between two countries covering the same code. The number of links is then counted as the number of standards.
Moenius (1999) regress bilateral trade volumes on counts of shared standards and a set of dummy variables that control for country-pair effects (intended to capture for instance, income and distance) and yearly –time effects. He finds that one percent increase in the number of shared standards increases bilateral trade volumes by one-third of a percent. Using the same gravity specification, but addition a lagged dependent variable to control for first-order autoregressive errors, yield similar results. The study, then, concludes that shared standards can play a significant role in promoting trade.

In the food and agricultural sector, Otskuki et. al (2000) suggest that technical regulations in developed countries constitute a considerable obstacle to exports of developing countries. The study used the equation method to determine the effect of European harmonization of aflatoxin standards on African exports. They estimate the exports, between 1989-1998 of cereals and fruits from 9 African countries to the EU15: using both countries’ GDP’s, their bilateral distance, a dummy for colonial ties, fixed time-effects and exporting country-effects. Standards enter directly the equation and are measured as the maximum aflatoxin level imposed on imports of food products by the EU countries. This data is obtained from a FAO survey of mycotoxin standards and from an EU Directive.

The results show that new (and more stringent) EU standards are likely to be a major barrier to African exports of dried fruits and nuts: it implies that a 10 percent tightening of aflatoxin standards will reduce African exports by 14.3 percent for cereals and 3% for dried fruits.

Rahman & Shadat (2006) estimate the preference erosion for Bangladesh and other Asian LDC under different NAMA scenarios by comparing the change due to tariff reduction in duty paid in the US with the decline on the preference margin enjoyed in the EU. They found that
Bangladesh will lose between 24.3 million to 53 million US$, depending on the scenario simulated. Because they do not account for the preference utilization rates, their results may overstate Bangladesh losses.

Yang & Mlachila (2006) evaluate the effects on Bangladesh’s economy of ATC quotas phasing out. They point out that the productivity of the Bangladeshi apparel industry is low mostly because the government restricted foreign investment in the RMG sector to keep the large quota rents for domestic producers. By using Global Trade Analysis Project (GTAP) global general equilibrium model, they found that the reduction on Bangladeshi total exports amounts to 6.8% to 29.5% (depending on the substitution elasticity used in the simulations). Based on the evaluation of quota restrictiveness, export similarity across countries, and supply constraints, they found that Bangladesh might face significant pressures on its balance of payments, output and employment.

Cordoba & Vanzetti (2004) analyze the economic impact of proposals in the non agricultural market access negotiations in the WTO using a GTAP global general equilibrium model. The authors bound that losses from tariff revenue could have a strong negative impact on the government revenue in a number of countries. Still, changes in output may be moderate, suggesting small structural adjustment costs.

Lipholdt & Kowalski (2005) use the GTAP standard model and database to simulate trade liberalization scenarios that would entail preference erosion. While highlighting a number of cases of preference reliance, the study underscores the advantages of multilateral liberalization. Globally, and for a majority of developing regions, liberalization by preference-granting countries will result in positive welfare gains, notwithstanding the effects of preference
erosion. In a comparatively small number of cases though, the analysis points to a risk of net welfare losses.

Ernst, et. al (2005) uses a gravity model to estimate the implication of the end of the MFA on trade and employment. They develop a quota impact indicator that takes into account the expected change on quota restrictiveness. By including this variable, as well as tariffs, in a gravity model they found that only three countries, namely Pakistan, China and Hong Kong, would experiment a significant increase in total exports. Bangladeshi exports would decrease about 21 percent, representing a loss of about 220 thousand jobs.

Cheng and Wall (2003) with designating incongruous control in their Gravity model of Trade, they showed that in examine effects of integration; incongruous between countries must be considered while using the gravity model. In a way that whenever mentioned incongruous has been considered consequently, its results are very different from results which has been obtained from standard methods. Therefore, to avoid these differences they have used panel data for 22 countries as exporter and 116 countries as importer during 1991-1995. Their objective was to estimate gravity model with using Partial Least Squares which led to over-estimate of trade in countries with low level of trade, and consequently underestimate of trade in countries with high level of trade.

Martiz, Nowaak and Saman (2000) by extending gravity model examined the practical application of this model in trade flows of Mercosur and European Union. They studied determinant factors of trade flows between European Union and Mercosur member countries. Thus they used gravity trade model between these two blocks and also trade potential arising from agreements made between these two blocks during 1996-1998. So that they used Panel data analysis and concluded that export potential of Mercosur block in 1996 was much more than its real export, but for previous years different results were obtained.
Howard and Wall (1999) estimated gravity model with a set of panel data of export and import of United States during 1994-1996 for 85 countries. He tried to apply gravity model to estimate supportive expenditures. In this study he used a new method which could compute effects of general equilibrium by using less information. Furthermore, he used a form of special gravity model which was used for heterogeneous pair of trade. And this model was very standard. His method is used for policy index of trade which has different kind of supports. Even it can be used, in some measuring problems such as: executive obstacles, collecting data, corruption and so on. Furthermore, protectionism in the rest of world showed that exports of United State of America in 1996, was 26 percent less than of the other points of the world.

In order to assess the role of Japan in the East Asian currency regime, this study provides estimates of trade-creating effects and accompanying welfare gains of various single currency arrangements in the region, focusing on Japan, China, the United States, and the seven East Asian economies: Hong Kong S.A.R., Singapore, Korea, Indonesia, Malaysia, Thailand and the Philippines. He estimated a micro-founded gravity equation that emerges from a general equilibrium trade model, adopting the theoretical approach of Anderson and Van Wincoop (2001). An advantage of this framework is that once parameters are estimated, one can use the general equilibrium model to conduct comparative statistics exercises. In particular, the model allows for counterfactual experiments such as asking what the effects on trade and welfare are of a hypothetical currency union.

Comparative statistics exercises of the general equilibrium model suggest that currency unions with China tend to generate higher average welfare gains for East Asian countries than currency unions with Japan or the United States. In comparing the effects of including Japan or the United States
in currency unions, the analysis shows that welfare gains will be larger for currency unions that include Japan rather than the United States. This result is consistent with the earlier findings of Shirono (2008) who reports that currency unions with Japan tend to generate larger welfare gains for East Asian economics than currency unions with the United States.

However, in comparing the role of Japan and China, the analysis suggests that currency unions with China in general tend to yield larger welfare gains than currency unions with Japan, both in bilateral and multilateral setups. This result is also robust to sub-regional grouping as well as extending membership to other regional trade partners such as Australia and New Zealand. Moreover, the analysis also suggests that China’s participation in a regional currency union can potentially have a larger impact on the United States, a non-member third country, than Japan’s participation even though the magnitude of such effects is quite small. The evidence thus seems to indicate that China may play a more significant role in regional currency arrangements if China’s relative importance in regional trade continues to rise.

Ghosh and Yamarik (2004) tried to test the robustness of the regional agreement effect by using cross-section data. They concluded that its effect may be over- or underestimated owing to the potential endogeneity of this variable. These findings were confirmed by Baier and Bergstrand (2007), who pointed out that the regional agreement variable is not exogenous and the estimation of a gravity model using cross-section data for investigating the quantitative effect of this variable on trade flows can be biased because of unobservable heterogeneity or/and omitted variables. The bias resulting from not considering this variable as endogenous is an important issue; it can be the consequence of omitted variables that can be correlated with the regional agreement variable. Panel data (fixed effects) methods were shown to be suitable to take endogeneity into account.
Kohpaiboon (2003) highlights the effect of trade policy regimes in conditioning the impact of foreign direct investment (FDI) on growth in host country in Thailand. It is found that the impact of FDI on growth will be greater if the host country implements an export oriented policy comparing to an import substitution policy. Romalis (2005) suggests that trade liberalization carried out by large trading partners leads to trade expansion in other countries inducing by providing the greater market access. This claim was supported by an empirical analysis using tariff barriers of the USA as an instrument of developing countries' openness.

Rodrik (1996), Dehejia and Samy (2004, 2009) based on large sample and more rigorous statistical analysis, and a variety of indicators for labor standards, which found no (or very weak) evidence that low labor standards have an impact on trade performance. These studies consider both developed and developing countries and conclude that natural determinants of comparative advantage in the form of factor endowments are important factors in explaining trade patterns, as opposed to labor standards.

Rodrik (1996) and dehejia and Samy (2004, 2009) studies, based on cross-section data, are more compelling since these authors use a variety of better indicators for labor standards, in addition to ILO conventions ratified. Rodriguez and Samy (2003) use time series data and examine the effects of labor standards on US export performance. They obtain very weak evidence that low standards help boost export competitiveness.

Dehejia and Samy (2008) in a recent study have examined the relationship between labor standards and trade performance for EU-15 countries based on a Heckscher-Ohlin framework and using panel data for the period 1980-2001. They find some evidence for the conventional wisdom when exports of the EU to the rest of the world are considered but labor standards
exert less of an influence than the traditional determinants of comparative advantage. When intra-EU exports are considered, the evidence for the conventional wisdom is rather weak and the authors even find evidence going in the other direction, which they explain through productivity effects. Dehejia and Samy (2008) also investigate whether there has been a race to the bottom of standards over that time period and again their results are not conclusive: some standards have converged while others have diverged.

However, while this study also considers how immigration impacts exports and imports at the provincial level, it differs from previous research in that it also examines the timing of immigrants’ impact on trade as well as the associated policy implications.

When new immigrants arrive, they bring with them an array of social, business and political contacts from their home country, as well as preferences for consumer products. This set of contacts and preferences is often revealed in the linkages the immigrants make with their home country after arriving. Thus, while immigrants will enter the labor force and contribute to economic prosperity, they will also affect the trade flows between their new and old countries. This relationship has been found in previous studies such as Rauch (2001) and Rauch and Trindade (2002).

Wagner et. al (2002) and Head and Ries (1998), which considered the population of immigrants from country i (an immigrant’s home country) residing in province/region j or country j (Canada). Gould (1994) considered the length of stay of immigrants in the U.S. by including the average stay of the immigrant stock as well as its squared value (to identify potential non-linearities). In Gould’s study, both immigrant stay and squared immigrant stay variables indicated that immigrant-link effects increase at a decreasing rate over time for import flows and that exports increase only after several years.
More importantly, Gould found that overall, the length-of-stay effects were small and of low statistical significance. This study adds to the previous literature by including lagged Canadian provincial immigration wave data to determine whether or not, as hypothesized immigration is positively related to imports from, and exports to immigrants’ home countries.

Chan (2005), empirical results show that the gravity model is very effective in explaining Korea’s bilateral trade flows and that the gravity model is well applicable to a single country case. The coefficient on the trade structure variable identifies that the Korea’s trade pattern follows a Heckscher-Ohlin type. Thus Korea’s trade flows depend more on the factors such as comparative advantage and different development stages than economies of scale or product varieties. The trade flows will mainly depend on inter-industry trade, and on vertical intra-industry trade, but to a lesser degree.

APEC variable shows significant positive effect on Korea’s trade volume, meaning that there exists a large intra-APEC trade flows which may come primarily from private market activities. According to thesis empirics, APEC evolves as a natural trading bloc.

The gravity estimations of 23 disaggregated sectors depict that the distance variables are systematically related to the APEC variable in explaining the Korea’s bilateral trade. Responding to the suggestion that empirical work in understanding the trade volume should work with disaggregated data they statistically tested how well the gravity equation fits at an industrial level. Disaggregating total trade flows into 23 sectors, then application of gravity equation shows a promising empirical result.

Successful empirics of identifying the bilateral trade flows of Korea, study purposed some trade policy suggestions. For instance, the selection of a
desirable free-trading partner by the country of a large unrealized trade potential; the conjecture of the potential trade volume between South and North Korea.

Shon, Chan-Hyun (2001) attempted to analyze Korea’s trade patterns empirically, based on “the Gravity model”, one of the most efficient models in explaining international trade volume. This study also seeks to identify the determinant factors of Korea’s bilateral trade flows and effective ways to expand these flows.

According to the results of this study, Korea’s bilateral trade patterns follow the basic gravity model, implying that bilateral trade flows will increase in proportion to the trading partner’s GDP and decrease in proportion to the distance involved. Therefore, in order to expand bilateral trade flows, it appears to be more desirable for Korea to promote bilateral trade with countries in close proximity and having large economies. Per capita GDP, in contrast, turned out to be an insignificant factor in determining Korea’s bilateral trade flows. This implies that Korea’s trade patterns follow a GDP pattern, concentrating on the production and export of quantity-based products and depending on overall market size, rather than a per capita GDP pattern centering on the export of quality-based high value added products which are sensitive to the levels of income.

They also analyzed the possible impact of complementary trade structures on Korea’s bilateral trade flows and found that Korea’s bilateral trade flows increase in proportion to the trade complementarity’s. Accordingly, it seems that Korea’s trade patterns are based on inter-industry trade rather than in intra-industry and Korea’s bilateral flows are accepted to increase more when its trading partner possesses a complementary structure rather than a competitive one. The reason why Korea trades more actively with remote
countries, such as the U.S., than it does with those in close proximity, such as China and Japan can be attributed to Korea’s relatively higher degree of trade complementarity’s with the U.S.

Finally they estimated the effect of a regional trading arrangement on Korea’s bilateral trade flows and it turned out to be a facilitating factor for increasing bilateral trade flows. The positive effects of a regional trading arrangement appear in various forms. One of which is the shortening of economic distance. With the formation of a regional trading arrangement, such as an FTA, the physical distance will be replaced by a reduced form of economic distance, thereby expanding trade indirectly. The second positive effect of a regional trading arrangement is the trade creation effect, which takes plan to overcoming the existing trade structures. In Korea’s case, where inter-industry trade is more dominant, trade complementarity’s acts as a crucial factor in determining bilateral trade flows. However, with the formation of an FTA, bilateral trade flows are expected to increase regardless of the trade structure, whether it is complementary or competitive.

Mustafizur et. al (2006) was developed augmented gravity model to identify trade creation and trade diversion effects originating from SAPTA and other nine RTAs. Panel data approach with country pair specific fixed effects and year specific fixed effects was followed. Two-stage estimation method was pursued to capture the time dimension and cross section specification of the data.

Coefficients of all the common gravity variables (i.e., GDP, Population, Distance, Common Border, Common Language, Real Exchange Rate and Import-GDP ratio and bilateral dummy variable) bear expected sign, and are statistically significant. Export flows between trading partners are significantly explained by the size of the economy (both exporter and importer), distance
between countries, commonality of language and common border. There is approximately proportional relationship between bilateral export flows and size of the economy (either exporter or importer) indicting that potential high economic growth of south Asian counties (particularly for India, Bangladesh and Sri Lanka) may boost their trade flows. Interestingly, openness of importing country is associated with a significant surge in bilateral exports. This indicates that it is highly possible that reduction in tariff barriers within the SAFTA region may raise intra-regional trade in the region. However, impact of devaluation of domestic currency on bilateral export flows was found to be low. This indicates that a devaluation of domestic currency may not be an effective tool to increase exports of a country.

Martinez et.al (2003) Thesis result show that exporter and importer incomes, as expected, have a positive influence on bilateral trade flows. Income elasticity’s are close to unity as predicted by the theory. Exporter population has a large and negative effect in exports showing a positive absorption effect, whereas importer population has a large and positive effect on exports, indicating that bigger countries import more than small countries.

They investigated the role that infrastructure variables, income differences and exchange rates play as explaining bilateral trade flows in a panel data framework. This framework, which allowed for trading-pair heterogeneity, was shown to be statistically superior to the standard model. Then findings support the hypothesis of the importance of these variables since they are all statistically significant and present the expected sign, apart from the importer infrastructure variable that is not significant. Results concerning infrastructure might have some important implications for economic policy. Viewing infrastructure as an international public good rises the question of how the cost of infrastructure should be shared between trading partners. For Mercosur-EU trade it seems that only exporter infrastructure fosters trade,
therefore investing to improve the trading-partner infrastructure appears not to have spill-over benefits for the investor.

When testing intra-bloc trade effects, both preferential dummy variables present a positive sign and are statistically significant, suggesting that belonging to one of the two preferential arrangements fosters trade. However, since this study was not considering the difference between trade creation and trade diversion (Endoh, 2000), these results have to be taken with caution.

Simwaka (2006), apply a gravity model of Malawi’s trade with her major trading partners using the panel data estimation technique.

Preliminary results indicate that the fixed effects model is preferred to the random effects gravity model. Malawi’s trade is positively determined by the size of the economies (GDP of the importing country) and similar membership to regional economic body. On the other hand, transportation cost is found to have a negative influence on Malawi’s trade. This implies Malawi can do better if the country trades more with its neighbors. Similarly, exchange rate volatility depresses bilateral trade. Likewise, exchange rate volatility depresses Malawi’s bilateral trade whereas regional economic groupings have has insignificant effect on the flow of bilateral trade.

Eita et.al (2007). Employed the gravity model in Namibian exports covering the period 1998 to 2006 in order to investigate the factors that determine export flows between Namibia and its 38 main trading partners. The model was estimated in order to determine whether there is unexploited export potential among Namibia’s main trading partners. The results showed that an increase in importer’s GDP and Namibian GDP is associated with an increase in Namibian exports. Importer’s GDP per capita has a negative impact on export, while Namibia’s GDP per capita does not have significant impact on
exports. The real exchange rate also does not have an impact on Namibian exports.

As per the theoretical expectations, distance is associated with a decrease in exports. The farther the country is from Namibia, the lower the export. Membership of SADC, EU and sharing a border with Namibia causes an increase in exports. This suggests that regional trade agreements be promoted in order to encourage exports.

The estimated model was solved to determine whether there is potential export that is not exploited. Determining export potential is important especially when the market is not known. The results indicate that among others, Australia, Belgium, Kenya, Mauritius, Netherlands, Portugal, South Africa, Switzerland and the United Kingdom have unexploited export potential is fully exploited. This will accelerate economic growth and helps in generating the much-needed employment.

Bougheas et. al (1999) showed that transport costs are a function not only of distance but also of public infrastructure. They augmented the gravity model by introducing additional infrastructure. The augmented the gravity model by introducing additional infrastructure variables (stock of public capital and length of motorway network). Their model predicts a positive relationship between the level of infrastructure and volume of trade. This is supported using data from European countries.

2.3. Related literature of the demand import function

For the purposes of this study, the empirical literature on import demand function can divided into two main strands; international work and studied directed specifically at the Iran economy.
In the international literature, the behavior of import demand functions has been analyzed in many different studies for several decades. Among an impressive array of empirical studies, the most important studies include Houthakker and Magee (1969), Khan (1974), Murray and Ginman (1976) and Khan and Ross (1977), all of which have studied the empirical relationships between imports, import prices and other related variables. For instance, Murray and Ginman (1975) estimated the traditional aggregate import demand for the U.S. covering the period 1950 to 1964 and found that income elasticity ranged from 0.96 to 1.94, but that import price elasticity ranged from 0.71 to 1.05. Carone et al (1996) tested the American demand for imports using quarterly data 1970 to 1992 and the Co integration and error correction approaches. They found a statistically significant long run relationship between the import demand function and real income and relative prices.

Bahmani-Oskooee et. al (1998) examined the import demand functions of 30 countries through the aggregate model by using the Johansen-Juselius (JJ) Co integration tests (Johansen 1988; and Johansen et al, 1990). Annual data is used and the sample period of each individual country is mostly 1960-1992. Fourteen countries are found to contain one Co integrating vector and 12 of them are found to contain two co integrating vectors. NI most cases, the price elasticity’s and income elasticity’s are high. However, this study does not perform the error-correction model (ECM) estimation.

Dutta et. al (2001) used the aggregate import demand function to investigate the behavior of India during the period 1971-1995. Johansen (1988 and 1991) and, JJ (Johansen et al 1990, 1992 and 1994) co integration tests are employed to obtain the relevant co integrating vectors. NI addition, the respective ECM is estimated by the general-to-specific procedure. One co integrating vector is detected and then incorporated in the ECM. The aggregate import volume is rather price inelastic with coefficient estimate being -0.47.
The value of income elasticity of demand for imports of two year lag is greater than unity at 1.48, implying that the import demand changes more than proportionately to the changes in real GDP. Moreover, the estimated coefficient of the one-year lagged error-correction term (ECT) is -0.12, which is of correct sign for adjustment in the short run while disequilibrium occurs in the long run. All these key estimated coefficients are statistically significant at 5% level.

Kotan et. al (1999) apply two econometric methodologies to perform the estimations of Turkey’s import demand function during the period 1987-1999. The first estimation uses the Engle-Granger two-step Co integration procedure, which shows that in the long run, income level, nominal currency depreciation rate, inflation rate and international reserves significantly affect imports, in the short run, however, inflation and international reserves lose their significant impacts on imports. The second methodology estimates the import demand by using the Bernake-Sims structural Vector Auto regression (VAR) method. It indicates that anticipated and unanticipated changes in the real currency depreciation rate and unanticipated changes in the income growth have significant effects on import demand growth.

Mohammad et. al (2000) examine the long run relationship between Malaysian real imports and the underlying components of final demand expenditure – namely real final consumption expenditure, investment expenditure and exports – and relative prices during 1970-1998 via Johansen multivariate cointegration analysis (Johansen 1988; and Johansen et al 1990). An ECM is estimated to evaluate the short run responses of imports to its determinants. Only one cointegrating vector is found and it implies that the partial elasticities of import demand with respect to consumption expenditure, investment expenditure and exports are 0.72, 0.78 and 0.385 respectively. The import price is fairly inelastic (at -0.69). In estimating the ECM, the speed of adjustment implied by the one-period lagged ECT is -0.637, which is quite fast.
The specification of the ECM dropped out the effect of final consumption expenditure as its effect is statistically insignificant to imports.

Mohammad et.al (2001) examine the long-run relationship between imports and expenditure components of five ASEAN countries (Malaysia, Indonesia, the Philippines, Singapore and Thailand) through Johansen multivariate co-integration analysis (Johansen 1988; Johansen et al, 1991). Annual data for the period 1968-1998 are used for the countries (except Singapore, with a shorter period 1974-1998). The disaggregate model, in which the final demand expenditure is split up into three major components is used. The results reveal that import demand is co-integrated with its determinants for all five countries.

Senhadji (1998) derived structural import demand equation, which was composed of relative price of imports and an activity variable (defined as GDP minus exports) and applies it to 77 countries. The sample period of most countries is 1960-1993. Moreover, the model predicts a unique Co integrating vector for the relevant variables and is estimated both by ordinary least squares (OLS) and by the Phillips-Hansen fully modified (FM) estimator. Only 66 countries with the right signs for the price and income elasticity’s are reported, and the average price elasticity is close to zero in the short run but slightly higher than one in the long run. The short run income elasticity’s are on average less than 0.5, while the long-run income elasticity’s are close to 1.5

The studies on estimates of import-demand elasticity’s at disaggregate level have appeared intermittently since Armington (1969). Stone (1979) estimated price elasticity of disaggregated import and export demand for the U.S., the European Economic Community and Japan. Shiells, Stern and Deardorff (1986) estimated import-demand elasticity’s with annual data from 1962 to 1978 for 163 disaggregated sectors and obtained statistically significant
elasticity’s for 122 sectors. Shiells et.al (1986) employed the log-linear specification to estimate elasticity’s. Reinert and Roland-Holst (1992) and Shiells and Reinert (1993) also used the same method to estimate Armington elasticity’s for disaggregated mining and manufacturing sectors in U.S. The import-demand elasticity’s estimated by Shiells et.al have been widely used in the literature of political economy and trade models.

Employing the Gravity Model, Sayyid Komeil Taibi and Karim Azerbaijani (1998) studied the trade potentials between Iran and Ukraine. The results of their study indicated that economic integration in the form of mutual trade cooperation between Iran and Ukraine are not justifiable.

Taibi and Moalemi (1994) investigated the significance of regional cooperation and global economy regulation, as the experience of ASEAN (Association of Southeast Asian Nations) and trade integration in the union of Southeastern Asian nations. The results obtained indicated that the trade integration of ASEAN countries has greatly helped the trade among them increase where exportation and import, too, have had a rising trend between them. Moreover, openness of the union to trade processes indicates that regionalism in Southeast Asia has given ASEAN a global economic destination to lead.

Marquez (1994) examined the behavior of U.S. imports using a simultaneous equations model and bilateral data and emphasized the weakness of constant-elasticity model. Blonigen and Wilson (1999) estimated Armington elasticity’s for U.S. industrial sectors using a varying coefficients model and found that the variations of elasticity among sectors are due to some home bias variables and the presence of foreign-owned affiliates.
Erkel-Rousse and Mirza (2002) tried to discover the reason of low price elasticity of import-demand and argued low values of elasticity’s might be due to misspecification. They obtained high estimates from 1 to 13 using several econometric methods with theoretically appropriate instruments. Thomakos and Ulubasoglu (2002) estimated disaggregated import-demand elasticity’s for Turkey and investigated the effects of trade regime change on import-demand elasticity’s. Gallaway, McDaniel and Rivera (2003) showed that average long-run estimates of Armington elasticity’s are two times larger than the short-run estimates.

Reinhart (1959) estimated structural import demand functions for 12 developing countries. A co-integration approach developed by Johansen (1988) and dynamic estimator devised by Stock and Watson (1988) were used. Reinhart (1995) found that the income elasticity for imports of his sample of developing nations is lower than those for developed countries.

Senhadji (1998) estimated structural import demand functions for 77 countries. Using co-integration and the fully modified ordinary least squares estimator (FMOLS), he found that average short-run price and income elasticity’s were -0.26 and 0.45 respectively, whereas the average long-run price and income elasticity are -1.08 and 1.45.

Mah (1999) examined the Melo-Vogt (1984) hypotheses concerning the relationship between import demand elasticity and trade liberalization on data for 1963-92 in Thailand. Melo and Vogt (1984) advanced two propositions. Firstly, if the degree of import liberalization increases, then the income elasticity of import demand will increase. Secondly, if economic development occurs, then the price elasticity of import demand will increase due to import substitution. Mah(1999) used the traditional import demand function, which relates the quantity of import demanded to domestic real income and relative
prices. He found that the income elasticity of import demand was relatively small and insignificant. The price elasticity of the import demand for Thailand was between 1.4 and 1.7, which was smaller than that for Venezuela (Melo and Vogt, 1984), but larger than that for Ireland (boylan and Cuddy, 1987). He also found that income elasticity increased after trade liberalization.

Aydin et.al (2004) developed a vector auto-regression to estimate import demand for the Turkish economy. They found long run income and price elasticity for imports were 1.99 and 0.402 respectively. They also established that the short-run income and price elasticity for exports are 0.366 and -0.509 respectively; significantly lower than the long run elasticity.

Santos-Paulino and Thirwall (2004) examined the impact of trade liberalization on exports, imports and the balance of payments for 22 developing countries. They tested the impact and significant of liberalization using different estimation techniques such as the fixed effects and generalized method of moments (GMM) for panel data analysis. They found that the impact of trade liberalization on import growth was greater than export growth. At the same time, they found income elasticity of import demand for imports and exports increased by equal amounts, but the price elasticity of demand for imports was greater than for exports. Thus, they concluded that the balance of trade deteriorated after trade liberalization.

Lopez (2005) examined the effects of trade liberalization on imports for the Mexican economy covering the period 1973-2000. An autoregressive distribute lag (ARDL) estimation technique was used to identify the long-run relationship between the dependent and independent variables. He found that the price and income elasticities of the demand and error correction coefficients were significant for import demand functions. He also found that trade liberalization positively affected import growth.
Harb (2005) estimated the elasticity’s of import demand functions for 40 advanced and developing countries. FMOLS (Fully Modified Ordinary Least Square) and DOLS (Dynamic Ordinary Least Square) estimates were used. He found that the income and price elasticities were 1.04 and -0.94 for FMOLS method whereas the income and price elasticities were 1.23 and -0.92 for DOLS method for developing countries. However, for developed countries these values were 0.75 and -0.42 respectively for the FMOLS method, whereas using the DOLS method they were 0.67 and -0.48 respectively.

Dutta and Ahmed (2000) examined a long run import demand function for Bangladesh using co integration and error correction approaches for the period 1974-1994. They employed two types of import demand functions for estimation: Real import prices and real GDP were used for the first model whereas in the second model, real import prices, real GDP, real imports and a dummy variable were used. The dummy variable was employed to show the effects of import liberalization policies. Dutta and Ahmed (2000) found only one co-integrating relationship among imports, price, GDP and real foreign exchange reserves. The sign of the coefficient of error correction was negative as expected, which was statistically significant for the first model indicating the validity of a long run equilibrium relationship among the variables. For the second model, real import price, real GDP, real import and the dummy variable were also significant. The estimated error correction was statistically significant at the 5 per cent level and had an expected negative sign, which indicates the validity of a long-run equilibrium relationship among the variables. The coefficients of the dummy variable were very low for both models, which suggested that liberalization policies were not fully effective.

Hussain (2004) estimated disaggregated and total import demand functions for the Bangladesh economy during the period 1973-2000 for import commodities. The Ordinary Least Square (OLS) technique was used for linear
and log-linear import demand equations. Income elasticity was found to be positive as expected for all commodities, except rice and wheat. Almost all of the income coefficients of relative price for rice and Soya bean oil were found to be negative even though they were not statistically significant.

Nguyen and Bhuiyan (1977) estimated elasticity for both export and import demand functions for four South-Asian countries (India, Pakistan, of Bangladesh and Sri Lanka) using the double-logarithmic form followed by Houthakker and Magee (1969). The income elasticity of import demand for food Bangladesh were found to be higher than the other countries.

Finally, Kabir (1988) estimated import and export demand functions for the Bangladesh economy during the period 1973-1983. He found out that the impact of the exchange rate was greater on export elasticity than on import elasticity.

2.4. Summary

To sum up, this chapter uses various gravity models used by researchers. The over all review of literature is brought out in chapter.