Foreign Trade Pattern of Nepal: Gravity Model Approach[#]

Laxmi Prasad Prasai[*]

Abstract

This study examines the overall trade pattern and flow of trade of Nepal by using pooled ordinary least square (OLS) along with one-year lag gross domestic product (GDP). It has also attempted to find the structural shift in the economy after economic liberalization in Nepal. In this study, gravity model is applied with comprehensive panel dataset for 29 years time period covering Nepal's 94 trading partners. The results appear robust to specification, time period and trade determinants. Following a convention in this field, this study separates exports and imports instead of using total trade turnover. The empirical results are found consistent with the fundamental of gravity model as the study reveals positive coefficients for economic size and negative coefficients for distance. No significant structural break is found in the determinants of trade after economic liberalization. The results from simulation while comparing actual trade with predicted trade show that Nepal's trade is not distorted by political decisions such as economical sanctions imposed by other countries. The results also suggest that trade with India in comparison to China is quite substantial. The results suggest that Nepal needs trade diversification in general and trade agreement with China in particular to reap the benefits from the trade.

Key Words: Gravity Model, Panel Data, Bilateral Trade, Export, Import, Trade Pattern, Distortion

JEL Classification: F14, F19, O10, O53

[#] The earlier version of this paper is available at www.nrb.org.np under NRB Working Paper series, NRB-WP-21, 2014.

[*] *Deputy Manager, Nepalgunj Office, Nepal Rastra Bank. Email: lpprasai@nrb.org.np*

I. INTRODUCTION

Nepal has Bilateral Trade Agreements with Bangladesh, India, Pakistan and Sri-Lanka. Majority of Free Trade Agreements (FTAs) of Nepal with trading partner countries are related with the merchandise trade rather than trade in services, investment and labor mobility. SAARC member countries are more inclined towards bilateral free trade agreements (FTAs) to get easy access to the neighboring countries. Due to lack of common consensus to implement multilateral trade agreement, bilateral trade agreements are becoming more popular in SAARC member countries.

More than sixty percent of Nepal's trade is concentrated with India, and the remaining with the rest of the world. Therefore, it is important to identify separately the major goods traded with India and those with the rest of the world. Nepal's exports to India are mainly concentrated on textiles (8 percent), zinc sheet (7 percent), thread (6 percent), and polyester yarn (6 percent). The characteristics of these products are typical of less developed countries that have a comparative advantage in the export of labor-intensive goods. We can deduce from this that Nepal benefits little from exporting less value added products (not final products) to India. Petroleum products constitute twenty-six percent of the total imports from India, followed by vehicles, machinery and M.S. Billet.

Nepal is known to have a comparative advantage in products like handmade woolen carpets, Pashmina products, readymade garments (RMG), leather and leather products, handicrafts, and gold and silver jewelry and in the tourism, hydro-electricity, and agro-processing industries. However, sandwiched between two large manufacturing powerhouses, India and China, Nepal faces huge disadvantages relating to economy of scales. Nepal's comparative advantage in the production of goods is very slight, owing to its inadequate infrastructure and the appropriate technology required for their production.

Table 1 shows that Organisation for Economic Co-operation and Development (OECD) countries were the major export and import partners during the 1980s, accounting for 38 percent of the total value of exports and 25 percent of the total value of imports. A remarkable change in trading partner countries was found in the 2000s. During this decade, a single country, India, accounted for about 60 percent of the value of both Nepal's exports and imports, becoming the leading trading partner country. Exports to ASEAN countries became less significant. The proportion of imports from China increased gradually in the last three decades. The USA accounted for around 20 percent of total export value during the same three decades with some fluctuations. The value of trade with non-OECD EU and SAARC countries was less than five percent of the total exports during the periods studied.

Table 1: Ratio of Major Regions/Countries in Terms of Nepal's Export and Import

Countries	1980s (in Percent)		1990s (in Percent)		2000s (in Percent)	
	Export	Import	Export	Import	Export	Import
India	28.02	24.01	16.15	22.39	59.04	58.06
ASEAN	4.89	13.10	0.63	19.76	0.60	11.16
OECD (except Japan & USA)	38.10	25.20	49.91	17.91	18.03	10.69
China	2.42	6.59	0.51	7.42	0.39	9.63
Others	0.45	2.70	1.58	16.63	0.63	5.13
Japan	1.17	19.60	0.69	8.11	1.26	1.94
Middle East	0.01	0.02	0.03	4.82	0.32	1.55
USA	21.20	6.35	28.28	1.42	17.17	1.33
SAARC	3.75	2.31	2.22	1.46	2.56	0.49
EU (Non-OECD)	0.00	0.12	0.00	0.08	0.01	0.01
Total	100	100	100	100	100	100

Source: Direction of Trade (DOTS) Database (IMF)

Table shown in Appendix 4 shows that India has been the leading import and export trading country for the last three decades based on the average import and export values, except for exports in the 1990s. In this decade, Germany was the top exporting destination for Nepal. Ranking second as export and import trading countries were Germany and Japan in the 1980s, USA and Singapore in the 1990s, and USA and China in the 2000s. China was included in the top five trading partners in terms of imports during the last three decades. On the contrary, China was in top seventeenth ranking during the 1990s and 2000s. China was a less important country for Nepal's exports, although it is a major bordering country.

Nepal initiated its economic liberalization program in the mid-1980s; this included deregulation of the financial sector, trade liberalization, current account convertibility, abolition of major trade restrictions, several privatization programs and policies, revision of the trade treaty with India, financial reform programs, and downsizing of the role of government. Accordingly, Nepal made bilateral agreements with 18 countries. Likewise, on April 23, 2004, the country joined the World Trade Organization (WTO) as the 147th member1.

Despite Nepal's economic reforms and active involvement in global trade, few studies have examined its trade pattern. One of the objective of this study is to identify the pattern and flow of trade Nepal experiences with its major trading partners using a comprehensive dataset and a well-proven gravity model. Besides, this paper also seeks to inquire the changes in the trade pattern before and after liberalization of Nepal. It also observes whether there are any distortions in the trade pattern with trading partners. The

[1] These countries included Bangladesh (1976), Bhutan (2011), Bulgaria (1980), China (1981), Czech Republic (1982), Egypt (1975), India, Democratic People's Republic of Korea (1970), Republic of Korea (1971), Mongolia (1992), Pakistan (1982), Poland (1992), Romania (1984), Sri Lanka (1979), UK (1965), USA (1947), Russia (1970), and Yugoslavia (1965).

study uses the trade data of Nepal with its 94 trading partner countries during the last 29 years. It uses the econometric model and is based on the explanatory variables which are economic size, distances and some controlling variables. The study is structured as to include the review of literature in the second part, methodology in the third part and followed by empirical results and conclusion in the fourth and fifth part respectively.

II. REVIEW OF LITERATURE

Tinbergen (1962) specified the estimates of the determinants of trade flows in econometric model. The intuition behind this type of econometric model is that trade between two countries resembles the gravitational interaction between two objects; the force of attraction is determined by their relative masses and the distance separating them.

Anderson (1979) showed how the gravity model fits into an optimizing framework by assuming separable social utility functions with respect to traded and non-traded goods. According to his paper, the gravity model is based on constant elasticity substitution (CES) preferences and goods that are differentiated by the region of origin.

Bergstrand (1985) applied the gravity model to the study of international trade. In this paper, the author states that the gravity equation is empirically successful for the explanation of trade flows but maintains that the theoretical foundation is weak in respect of projecting the potentiality of the model. Bergstrand (1989) studied the consistency of the gravity equation with contemporary theories of inter-industry and intra-industry trade. This paper was an extension of the microeconomic foundations spelt out in his earlier paper of 1985 in that the gravity equation incorporated factor endowment differences and non-homothetic preferences.

Montenegro and Soto (1997) also used simulation techniques from their estimated results based on the gravity model to study the distortions in Cuban trade. The paper discusses the Cuban trade structure and identifies the effects of liberalization on the development of trade. The deviation they found between the predicted and actual values from simulation was a consequence of non-economic factors. Import quotas caused significantly lower actual import volumes in Cuba from USA than predicted one. Similar interpretations of the results of simulation are also adopted here to study trade distortion in Nepal.

Sohn (2005) examined the extent to which the gravity model can be employed to study South Korea's bilateral trade flows and thereby applied in the formulation of trade policy. The author found the gravity model to be the best tool for the explanation of South Korea's bilateral trade flows as a single country case.[2] The coefficient on the trade

2 In Sohn's paper, the product of GDP is used as one of the independent variables to serve as an alternative to the economic size of two trading partner countries. Here, economic size refers to the production capacity for exports and the market size for imports.

variable showed that Korea's trade flows depend on comparative advantage, income differences, and stages of development rather than on economies of scale, as proposed in Heckscher-Ohlin[3] model on the study of international trade pattern.

The author of the present paper also employs the fundamentals of the gravity model by using the product of Nepal's GDP and its trading partners and the simulation techniques applied by Sohn (2005). In this respect, Sohn's paper forms the basis on which research on Nepal's international trade was conducted.

Sharma & Bhandari (2005) studied the effects of foreign trade on Nepal's economic development. They identify export growth, capital stock, labor force, average propensity to save (APS), relative price index (RPI), and ratio of government development expenditure to GDP (Gross Domestic Product) as factors that can affect international trade.

Wang, Wei, and Liu (2010) studied the causes of trade flows between 19 OECD countries from 1980 to 1998 by using the augmented gravity equation. Their results demonstrate that geographical distance, domestic technology (R&D) stock, inward FDI and total inward FDI stock, level of GDP and factor endowment are the major factors affecting trade flows.

Singh and Khanal (2010) studied Indo-Nepal trading patterns after 1990. They found that the rising proportion of exports to and imports from India in Nepal's total trade has increased its dependency on this neighboring country for trade. The paper does not suggest any possible solutions based on the empirical findings as to how to reduce trade dependency on India.

Oh and Tumurbaatar (2011) studied the international trade patterns of Mongolia. They state that the log-linear structure of regression equation based on the gravity model produces not only a comparison of traded goods and trading partners but also the determinants of trade. This paper also examines the influence of Mongolia's geographical location on the country's trading patterns. The results show that Mongolia's exports are distorted by its geographical location. However, its imports and overall trading patterns have not been distorted.

Basyal (2011) examined how the full implementation of a liberal trade agreement can contribute to the growth of the exporting sector and its significance for the economy of Nepal. The paper recommends that measures to reduce the inflation rate in Nepal could considerably improve trade competitiveness. The recommendations made on how to improve trade are vague and are not supported by empirical results.

---

3 Eli Filip Heckscher is the pioneer to explain the model on the patterns of international trade. Hecksher and his students Bertil Ohlin had jointly developed the Heckscher-Ohlin model at the Stockholm School of Economics.

Thapa (2012) has used gravity model to estimate the trade potentiality of Nepal using only 19 trading partner countries for 2009. In the paper, trade potentiality is simply calculated with the help of the ratio of predicted trade to actual trade. Similarly, Acharya (2013) has used the gravity model to identify the determinants of international trade of Nepal. In the paper, the author used country specific fixed effect which revels that time invariant factors are significant as one of the determinants of the trade. In two papers Acharya (2013) and Thapa (2013), they also used the gravity model to discuss the determinants of trade. This paper is different from those two papers in respect of using comprehensive data sets (29 years data), all trading partner countries (94 countries) of Nepal, division of data into two sets to observe structural breaks (before and after liberalization), simulation of results (Actual Vs Predicted) and use of other most important variables such as Linder (to observe whether trade is based on comparative advantage or product differentiation), Per Capita GDP, WTO and Landlocked in the model.

III. METHODOLOGY

3.1 Model Specifications

In order to investigate the pattern of Nepal's international trade with its trading partner countries, this paper uses both the basic[4] and augmented gravity models. In the basic, standardized gravity model which considers trade as dependent variable GDP and distance as independent variables is used. Based on the model, some other determinant variables of trade are included in the augmented model. The formulation of the gravity model was traced back to the Newton's gravity law which reveals the attraction force between two objects. The gravity model reveals that the volume of trade between countries can be estimated as an increasing function of two countries' economic size and decreasing function of the geographic distance between them.

The basic gravity equation is initially used following the Frankel (1997) and Sohn's (2005) studies. They used the product of GDP and the product of Per Capita Gross Domestic Product (PCGDP) as explanatory variables in their model. In this paper, white's robust standard errors are employed. Next, in order to incorporate other relevant variables that have a significant impact on trade patterns, this study incorporates an augmented model, which is as follows.

---

[4] The basic gravity model is

$$\ln X_{ijt} or \ln M_{ijt} = \beta_0 + \beta_1 \ln(GDP_{it} * GDP_{jt}) + \beta_2 \ln(PCGDP_{it} * PCGDP_{jt}) + \beta_3 \ln DIST_{ijt} + \varepsilon_{ijt}$$

$$\ln X_{ijt} or \ln M_{ijt} = \beta_0 + \beta_1 \ln(GDP_{it} * GDP_{jt}) + \beta_2 \ln(PCGDP_{it} * PCGDP_{jt}) + \beta_3 \ln DIST_{ijt} + \beta_4 \ln LINDER_{ijt} + \beta_5 LOCKED_j + \beta_6 SAARC_{jt} + \beta_7 WTO_{jt} + \varepsilon_{ijt}$$

X_{ijt}* M_{ijt}	Bilateral export or import between Nepal (i) and its trading partner (countries j) in year t
t	1981, 1982, 1983, ……..2009
GDP_{it}*GDP_{jt}	Product of GDP of Nepal and its trading partner countries in year t (MGDP)
$PCGDP_{it}$*$PCGDP_{jt}$	Product of Per Capita GDP of Nepal and its trading partner countries in year t (MPCGDP)
$DIST_{ij}$	Distance between Nepal (i) and its partner countries (j)
$LINDER_{ijt}$	Absolute difference of per capita GDP between Nepal and its trading partner countries in year t
LOCKED	Locked=1 if trading partner countries (j) are Landlocked, otherwise Locked= 0
$SAARC_{jt}$	SAARC=1 if trading partner countries (j) are the member of SAARC in year t, otherwise SAARC= 0
WTO_{jt}	WTO=1 if trading partner countries (j) are the member of WTO in year t, otherwise WTO = 0
ε_{ijt}	Residuals

The product of GDP represents economic size in terms of production capacity and market size. When a country's economy expands, it also creates a large domestic market for imported goods from other countries. Therefore, the sign of β_1 coefficient for the product of GDP is expected to be positive ($\beta_1>0$). This paper employs one year lagged variable in both basic and augmented gravity equations in order to avoid the endogeneity problem.

GDP per capita evaluates the purchasing power or the income level of a country. Since the per capita GDP of Nepal is static, the country's trade flows depend on the income level of its trading partners. There is no expected sign for this coefficient. Bergstrand (1989) suggested that the exporting country's per capita GDP should have a positive coefficient when the composition of trade flows involve capital-intensive products and negative when composition of trade flows involve labor-intensive products. On the other hand, the importing country's per capita GDP should have a positive coefficient when composition of trade flows consist of luxury goods and vice versa when composition of trade flows consist of necessity goods.

Geographical distance represents a barrier to trade. Long distance between two countries causes in higher transportation costs, delay delivery times, and hinder market accessibility. The negative coefficient of this variable would suggest that Nepal trade

more with its neighboring countries. The sign of β_2 coefficient for the product distance is expected to be negative ($\beta_3<0$).

Linder (1961) calculates the absolute difference between the per capita GDP of Nepal and that of its trading partners. According to Linder, the sign of this coefficient is expected to be positive when the trade between countries is determined by comparative advantages. In such circumstances, countries trade more if their economies differ. On the other hand, Linder claims the sign of this coefficient is expected to be negative when trade is determined by product differentiation. In those circumstances, countries trade more if their economies are similar.

Landlocked countries trade less with other countries owing to high transportation costs. Therefore, the sign of this coefficient is expected to be negative ($\beta_5<0$). Last, but not least, as a member of SAARC or WTO, Nepal is expected to trade more with other member states. In this regard, the expected sign for these coefficients is positive ($\beta_6>0$ and $\beta_7>0$). In this paper, Linder, landlocked, WTO, and SAARC are incorporated into the basic gravity equation to make the model augmented. As prescribed by this model, general hypothesis of this paper is that Nepal trades more with those countries having large economic size, short distance and less economic barriers.

3.2 Data Description and Analysis Procedure

This paper analyses a comprehensive panel dataset for 29 years (1981 to 2009) covering Nepal's 94 trading partners. To analyze the panel data, the paper considers the pooled OLS. Many studies use pooled Ordinary Least Square: OLS (Refer Egger (2002), Sohn (2005), Frankel (1997)). Pooled OLS techniques hold certain factors constant in order to ascertain the effect of another factor.

The data relating to bilateral trade flows (exports with f.o.b. and imports with c.i.f. values) were taken from the Direction of Trade (DOT) Statistics of the International Monetary Fund (IMF) and measured in US dollar millions at current prices. The World Development Indicator database was another source of data relating to GDP and per capita GDP (both in US dollar millions at current prices).

The data relating to distance were taken from the website http://www.searates.com/reference/portdistance to calculate shipping distances and from the website http://www.distancefromto.net for air distance, by following a specific procedure that makes distance calculations more precise. Detail process of distance calculation is shown in Appendix 2.

IV. EMPIRICAL RESULTS

This study mainly deals with two different sets of regressions. The first set deals with the entire dataset, which incorporates two models (basic and augmented) for exports and two for imports. In the second, the dataset is divided into two time periods (before and after liberalization) to determine the impact of economic liberalization on Nepal's trading patterns. To say the conclusion first, the regression results basically follow the predictions of the gravity model in its basic and augmented model, and structural breaks in two time periods are weak. This study also compares the actual trade volumes with the predicted ones to determine whether Nepal's trade is distorted for political or economic reasons.

4.1 Overall Regression Results for Exports and Imports

The pooled OLS results on Nepal's exports and import are presented in Table 3. The positive sign of the coefficient of one-year-lagged GDP is consistent with the prediction of the gravity model. The negative coefficient of per capita GDP, which is consistent with Bergstrand's (1989) interpretation, shows that Nepal's exports are mainly composed of labor-intensive products and most of its imports are necessity goods for consumption. In the augmented model, the coefficient for Linder is significant and positive. According to Linder's hypothesis, the positive sign of the coefficient shows that Nepal's trade with its trading partner countries is made up of heterogeneous goods with different economies as per the Hecksher-Ohlin type of comparative advantages (Montenegro and Soto (1997)).

Table 2: Overall Results

Explanatory Variables	**Basic**		**Augmented**	
	Log(Export)	**Log(Import)**	**Log(Export)**	**Log(Import)**
Log (Product of GDP-lag)	0.539 (0.07)***	0.230 (0.11)**	0.546 (0.08)***	0.267 (0.10)***
Log(Product of Per Capita GDP)	0.105 (0.09)	0.268 (0.13)**	-0.158 (0.16)	-0.263 (0.17)
Log (Linder)			0.325 (0.17)*	0.614 (0.13)***
Log(Distance)	-0.843 (0.42)**	-1.835 (0.36)***	-1.043 (0.44)**	-1.891 (0.34)***
Landlocked			-1.298 (0.95)	-1.932 (0.63)***
SAARC			0.29 (0.40)	1.345 (0.31)***
WTO			0.045 (0.03)*	0.0745 (0.04)**
Constant	-7.766 (4.71)*	15.17 (5.12)***	-5.153 (4.88)	16.39 (4.81)***
Observations	1,215	1,317	1,212	1,315
Number of countries	94	85	94	84
Overall R^2	0.5141	0.273	0.4972	0.3409

Note: *, **, and *** show significance at the 10%, 5%, and 1% level respectively
Robust standard errors are given in parenthesis

The results indicate that the coefficient of distance and the dummies have the expected signs. Both distance and the landlocked dummy are more sensitive to imports than to exports. This shows that Nepal trades less with geographically distant countries and with

landlocked countries. The coefficient for SAARC shows a positive and significant relationship only for imports, implying that Nepal imports more from SAARC countries, whereas WTO is significant for both imports and exports.

4.2 Regression Results Before and After Liberalization

In this second series of regressions, all the data is divided into two groups based on time periods. Liberalization policies were initiated in the mid-1980s, and complete liberalization policies[5] were implemented in 1990 when democracy was adopted in Nepal. To determine whether this political change in 1990 brought structural changes that affected Nepal's trade patterns, the data has been divided into two parts, before liberalization (1981 to 1990) and after liberalization (1991 to 2009), and the results are presented in Table 4.

Table 3: Results Before and After Liberalization

Explanatory Variables	**Export**		**Import**	
	(1981-1990)	**(1991-2009)**	**(1981-1990)**	**(1991-2009)**
Log (Product of GDP-lag)	0.557 (0.09)***	0.764 (0.11)***	-0.022 (0.07)	0.730 (0.12)***
Log(Product of PCGDP)	0.881 (0.81)	-0.490 (0.19)**	1.641 (0.46)***	-1.019 (0.19)***
Log (Linder)	-0.242 (0.84)	0.474 (0.18)***	-0.327 (0.52)	0.764 (0.14)***
Log(Distance)	-1.578 (0.46)***	-0.635 (0.52)	-2.170 (0.62)***	-2.071 (0.45)***
Landlocked	-0.206 (0.63)	-1.081 (0.98)	-1.817 (1.20)	-1.661 (0.69)**
SAARC	-0.079 (0.55)	1.991 (1.45)	0.737 (0.33)**	-0.656 (0.90)
WTO	0 (0.00)	0.0061(0.03)	0 (0.00)	0.0549(0.04)
Constant	-9.472 (7.50)	-15.89 (5.97)***	14.79 (7.10)**	5.642 (6.49)
Observations	285	927	332	983
Number of countries	50	94	50	84
Overall R^2	0.4915	0.5333	0.3281	0.4118

Note: *, **, and *** show significance at the 10%, 5%, and 1% level respectively
Robust standard errors are given in parenthesis.

It transpires that those two time periods do not provide significant differences except in some cases. For example, per capita GDP, Linder, and SAARC have opposite signs in the two periods. It can be inferred from Bergstrand's (1989) findings—that Nepal imported

[5] Included amongst the liberalization policies and programs were the Structural Adjustment Program (SAP) in 1987, Enhanced Structural Adjustment Program (ESAP) in 1992, complete deregulation of interest rates in 1989, and implementation of the Privatization Act 1994.

luxury goods in the 1980s and necessity goods thereafter—that per capita GDP was positive during the earlier periods and negative during the later periods.
The Linder variable was insignificant for both exports and imports in the first period, but after liberalization, it became significant with opposite signs both for exports and imports. This shows that, after liberalization, Nepal began to trade with different economies based on comparative advantages. For exports, the coefficient for distance becomes insignificant after liberalization. However, for imports, this coefficient becomes less sensitive after liberalization. This demonstrates that after liberalization, Nepal imported from more geographically remote countries. The landlocked dummy becomes significant only after liberalization.

4.3 Simulation: Predicted Vs. Actual

Several studies[6] have used this simulation technique to investigate trade distortion. By comparing the predicted with the actual volumes, we can see whether a country's trade is distorted. Montenegro and Soto (1997) used similar simulation techniques to find that Cuba's trade distortions caused by the economic sanctions imposed by USA. Thant (2011) also found trade distortions in Myanmar.

This section presents the predicted trade volumes of Nepal's exports and imports with its trading partners, as shown in Table 5. The results in Table 5 are derived from the results in the first two columns of Table 3 which is based on basic gravity model.

Table 4: Simulation of Nepal's Export and Import with Different Regions

Countries/Groups	Actual Export (%)	Estimated Export (%)	Actual Import (%)	Estimated Import (%)
India	60.57 (1)	21.08 (3)	59.35 (1)	66.46 (1)
China	0.75 (8)	24.76 (1)	17.12 (2)	18.75 (2)
OECD(except US and Japan)	18.75 (2)	22.67 (2)	8.50 (3)	3.91 (3)
ASEAN	1.03 (7)	5.62 (7)	7.46 (4)	2.76 (5)
Others including EU(Non OECD)	1.37 (6)	8.70 (4)	2.85 (5)	1.69 (6)
Japan	1.63 (5)	5.87 (6)	1.94 (6)	1.39 (7)
United States	8.52 (3)	6.83 (5)	1.29 (7)	0.88 (8)
Middle East	0.72 (9)	1.91 (9)	1.01 (8)	0.48 (9)
SAARC	6.67 (4)	2.57 (8)	0.48 (9)	3.67 (4)
Total	100.00	100.00	100.00	100.00

Source: Author's Calculation

Note: i) European Union (EU) was disregarded because many of EU members overlap with OECD members.
ii) Estimated results are based on the basic model for simplicity reason.
iii) Log values are transferred into actual values and then into percentage for better comparison.

[6] Egger (2002) has explained in his paper that the gravity model is effective for simulation analysis. Sohn (2005) uses this method to analyze South Korea's trade pattern. In Sohn's paper, it is shown that the difference between actual and predicted trade volume can be understood as an "unexhausted" trade potential.

From Table 5, it is very clear that actual exports to China are far below the predicted exports (33 times lower). On the contrary, actual exports to India exceed the predicted exports. There are several reasons for lower export volumes to China and higher export volumes to India. First, Nepal is closer to India than to China with respect to culture, language and other aspects. Second, Nepal has no open border with China as with India. Moreover, the majority of the border shared with China falls in hilly and Himalayan regions. There are railway links between Nepal and China, and transportation by air makes trade with China very expensive. Nepal should therefore, focus more on trading policies that would facilitate trade with this country.

Nepal's actual imports from SAARC countries are lower than the predicted values. Similarly, Nepal's actual exports to ASEAN countries and Japan also fall short of predicted values. On the other hand, Nepal's actual exports to the USA and SAARC countries exceed their predicted values. The volume of Nepal's trade (both exports and imports) with OECD countries is quite significant.

From these results, the following could be deduced. First, Nepal's trades more actively with OECD (developed countries), which implies that its trade is based on inter industry and comparative advantages. Nepal exports labor intensive goods to developed countries and imports necessity goods from other countries. Similar results can be observed from the positive sign of the coefficient of Linder and the negative sign for per capita GDP. Second, Nepal's trade is not distorted by any political sanctions, because there are no unexpected lower volumes of exports or imports, as evidenced in Cuba and Myanmar's trade distortions with USA. Third, Nepal's trade is more concentrated and highly dependent on India, and Nepal should diversify its exports to other countries such as China, Japan, and the ASEAN countries.

V. CONCLUSION

This paper is based on an empirical examination of Nepal's pattern of international trade. The study uses the basic and augmented forms of the gravity model for the period from 1981 to 2009. The empirical results are basically consistent with the predictions of the gravity model, and the coefficients for most of the variables are as expected, with some exceptions, such as a positive sign for per capita GDP in the basic model but a negative sign in the augmented model for both for imports and exports. The lag of the product of GDP, which is the proxy for the economic size of the trading partner countries, was found to positively affect bilateral trade with Nepal. The negative sign of per capita GDP in the augmented model shows that Nepal exports labor-intensive goods and imports necessity goods. The positive and significant coefficient of Linder shows that Nepal's trade is determined by comparative advantages with different economies. Therefore, inter industry trade is common and goods are imported to and exported from developed countries. Nepal's imports from SAARC countries are significant but their export is not significant. Moreover, no evidence was found to indicate that Nepal benefits from the

WTO for its exports and imports. The distance coefficient shows that Nepal's imports are concentrated with its nearer trading partners.

The results obtained for both the before and after liberalization periods concur with the basic predictions of the gravity model with some deviation between the two periods. The positive sign of the coefficient for per capita GDP during the period before liberalization implies that Nepal used to import luxury goods, whereas the negative sign of the coefficient during the period after liberalization implies that Nepal imports necessity goods for consumption. Moreover, the difference in the trade with similar countries for differentiated products before liberalization and with different economies based on comparative advantages shows some of the structural deviation, which can be observed from the negative sign for Linder before liberalization and positive sign after liberalization in Nepalese economy.

Results from the simulation shows that Nepal's trade is unduly low with China and highly concentrated with India. It reveals that Nepal should redirect its trading activities to China to reduce its excessive and risky trade dependence on India. For example, Nepal should negotiate a free trade agreement with China. Since China is a bordering country with economic growth exceeding 8 percent over the last several years, Nepal could acquire a large international market for its exports by improving trade relations and by constructing railway links with that country. The removal of tariffs on Nepalese goods entering the Chinese market could also boost Nepal's export.

*****

REFERENCES

Acharya, S. 2013. A Panel Data Analysis of Foreign Trade Determinants of Nepal: Gravity Model Approach. *NRB Economic Review*, vol. 25, 1-20.

Anderson, J.E. 1979. A Theoritical foundation for the gravity model. *American Economic Review,* 69(1), 106-16.

Basyal, T. R. 2011. Nepal's Economic Growth Rate in the Context of Absorption, Trade Imbalances and the Fixed Exchange Rate. *Banking Journal, 1(1)*, 1-13.

Bergstrand, J. H. 1985. The Gravity Equation in International Trade: Some Microeconomic Foundations and Empirical Evidence. *Review of Economics and Statistics*, Vol 67**,** 474–481.

Egger, P. 2002. An Econometric View on the Estimation of Gravity Models and the Calculation of Trade Potentials. *World Economy*, Vol. 25, 297–312.

Frankel, J. A. 1997. *Regional Trading Blocs in the World Economic System*. Washington, DC: Institute for International Economics.

Linder, S. 1961. *An Essay on Trade and Transformation.* New York: John Wiley.

Montenegro, C. E. and Soto, R. 1997) 'How distorted is Cuba's trade? Evidence and predictions from a gravity model'. *The Journal of International Trade & Economic Development*, 5(1), 45-68.

Oh, J. and Tumurbaatar, O. 2011. Mongolia's International Trade: The Impact of Its Geographical Location. *The Journal of Econometric Study of Northeast Asia*, 7(2), 69–82.

Sharma, O. and Bhandari, R. 2005. Foreign Trade and Its Effects on Nepalese Economic Development. *The Journal of Nepalese Business Studies*, Kathmandu.

Sohn, C. H. 2005. Does the Gravity Model Explain South Korea's Trade Flows?, *Japanese Economic Review*, 56(4), 417-30.

Singh, D. A. and Khanal, R. K. 2010. Pattern of Indo-Nepal Trade After 1990. *Socio-economic Voice.* Downloaded from http://www.indiastat.com/article/18/arjun/fulltext.pdf.

Thant, K. C. 2011. *Determinants of Myanmars Trade and the Effect of Economic Sanctions: A Gravity Approach*. MA Thesis, International University of Japan.

Thapa, S.B. 2013. Nepal's Trade Flows: Evidence from Gravity Model. *NRB Economic Review, vol. 24-2, 1-12.*

Tinbergen. J. 1962. *Shaping the World Economy: Suggestion for an International Economic Policy*. New York: The Twentieth Century Fund.

Wang, C., Wei Y., and Liu, X. 2010. Determinants of Bilateral Trade Flows in OECD Countries: Evidence from Gravity Panel Data Models. *World Economy*, 33(7), 894-915.

World Bank 2011. *World Development Indicators Database.* Washington D.C. Downloaded from the link http://data.worldbank.org/country/nepal).

APPENDICES

Appendix 1: Sample Trading Partner Countries (94 Countries)

A. OECD (except Japan & United States)

Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Korea, Luxembourg, México, Netherlands, New Zealand, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom.

B. EU (Non-OECD)

Bulgaria, Cyprus, Latvia, Lithuania, Malta, Romania

C. ASEAN

Brunei, Cambodia, Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam

D. **SAARC**

Bangladesh, Maldives, Pakistan, Sri Lanka

E. MIDDLE EAST (except Israel)

Bahrain, Iran, Jordan, Kuwait, Lebanon, Oman, Qatar, United Arab Emirates.

F. India G. China H. United States I. Japan

J. Others

Argentina, Azerbaijan, Belarus, Benin, Bolivia, Brazil, Burkina Faso, Cameroon, Colombia, Costa Rica, Croatia, Côte d'Ivoire, Ecuador, Egypt, Fiji, Ghana, Hong Kong, Macao, Macedonia, Madagascar, Mauritius, Morocco, Norway, Peru, Russia, Saudi Arabia, South Africa, Tanzania, Togo, Tunisia, Ukraine, Zambia, Zimbabwe.

Appendix 2: Procedure of Distance Calculation

Countries	Sea Distance (NM*)	Sea Distance (KM)	Calcutta to Kathmandu	Total Distance	Mode of Transport
Argentina	9076	16808.75	793.4	17602.15	(Sea +Rail+Road)
Australia	5807	10754.56	793.4	11547.96	(Sea +Rail+Road)
Austria				6242.7	(Air distance)
Azerbaijan				3576.9	(Air distance)
Bahrain	3058	5663.416	793.4	6456.816	(Sea +Rail+Road)
Bangladesh	346	640.792	793.4	1434.192	(Sea +Rail+Road)
Belarus				5308.6	(Air distance)
Belgium	7688	14238.18	793.4	15031.58	(Sea +Rail+Road)
Benin	8010	14834.52	793.4	15627.92	(Sea +Rail+Road)
Bolivia				16465.2	(Air distance)
Brazil	9652	17875.5	793.4	18668.9	(Sea +Rail+Road)
Brunei	2291	4242.932	793.4	5036.332	(Sea +Rail+Road)
Bulgaria	5357	9921.164	793.4	10714.56	(Sea +Rail+Road)
Burkina Faso				5566.5	(Air distance)
Cambodia	2334	4322.568	793.4	5115.968	(Sea +Rail+Road)
Cameroon	7867	14569.68	793.4	15363.08	(Sea +Rail+Road)
Canada	8963	16599.48	793.4	17392.88	(Sea +Rail+Road)
Chile	10456	19364.51	793.4	20157.91	(Sea +Rail+Road)
Hong Kong	3052	5652.304	793.4	6445.704	(Sea +Rail+Road)
Macao	3031	5613.412	793.4	6406.812	(Sea +Rail+Road)
China				2061.5	(Air distance)
Colombia	10400	19260.8	793.4	20054.2	(Sea +Rail+Road)
Costa Rica	11177	20699.8	793.4	21493.2	(Sea +Rail+Road)
Côte d'Ivoire	8113	15025.28	793.4	15818.68	(Sea +Rail+Road)
Croatia	5464	10119.33	793.4	10912.73	(Sea +Rail+Road)
Cyprus	4689	8684.028	793.4	9477.428	(Sea +Rail+Road)
Czech Republic				6150.8	(Air distance)
Denmark	8142	15078.98	793.4	15872.38	(Sea +Rail+Road)
Ecuador	11325	20973.9	793.4	21767.3	(Sea +Rail+Road)
Egypt	4579	8480.308	793.4	9273.708	(Sea +Rail+Road)
Estonia	8520	15779.04	793.4	16572.44	(Sea +Rail+Road)
Fiji	6172	11430.54	793.4	12223.94	(Sea +Rail+Road)
Finland	8640	16001.28	793.4	16794.68	(Sea +Rail+Road)
France	7330	13575.16	793.4	14368.56	(Sea +Rail+Road)
Germany	7943	14710.44	793.4	15503.84	(Sea +Rail+Road)
Ghana	8027	14866	793.4	15659.4	(Sea +Rail+Road)
Greece	5024	9304.448	793.4	10097.85	(Sea +Rail+Road)
Hungary				5873.9	(Air distance)
Iceland	8264	15304.93	793.4	16098.33	(Sea +Rail+Road)
India			793.4	793.4	(Sea +Rail+Road)
Indonesia	2114	3915.128	793.4	4708.528	(Sea +Rail+Road)

Countries	Sea Distance (NM*)	Sea Distance (KM)	Calcutta to Kathmandu	Total Distance	Mode of Transport
Iran	2785	5157.82	793.4	5951.22	(Sea +Rail+Road)
Ireland	7462	13819.62	793.4	14613.02	(Sea +Rail+Road)
Israel	4558	8441.416	793.4	9234.816	(Sea +Rail+Road)
Italy	5852	10837.9	793.4	11631.3	(Sea +Rail+Road)
Japan	4550	8426.6	793.4	9220	(Sea +Rail+Road)
Jordan	4281	7928.412	793.4	8721.812	(Sea +Rail+Road)
Korea	4144	7674.688	793.4	8468.088	(Sea +Rail+Road)
Kuwait	3243	6006.036	793.4	6799.436	(Sea +Rail+Road)
Latvia	8500	15742	793.4	16535.4	(Sea +Rail+Road)
Lebanon	4663	8635.876	793.4	9429.276	(Sea +Rail+Road)
Lithuania	8345	15454.94	793.4	16248.34	(Sea +Rail+Road)
Luxembourg				6815.5	(Air distance)
Macedonia				5747.5	(Air distance)
Madagascar	3483	6450.516	793.4	7243.916	(Sea +Rail+Road)
Malaysia	1293	2394.636	793.4	3188.036	(Sea +Rail+Road)
Maldives	1451	2687.252	793.4	3480.652	(Sea +Rail+Road)
Malta	5420	10037.84	793.4	10831.24	(Sea +Rail+Road)
Mauritius	3163	5857.876	793.4	6651.276	(Sea +Rail+Road)
Mexico	10714	19842.33	793.4	20635.73	(Sea +Rail+Road)
Morocco	6778	12552.86	793.4	13346.26	(Sea +Rail+Road)
Netherlands	7789	14425.23	793.4	15218.63	(Sea +Rail+Road)
New Zealand	6483	12006.52	793.4	12799.92	(Sea +Rail+Road)
Norway	8276	15327.15	793.4	16120.55	(Sea +Rail+Road)
Oman	2548	4718.896	793.4	5512.296	(Sea +Rail+Road)
Pakistan	2294	4248.488	793.4	5041.888	(Sea +Rail+Road)
Peru	11660	21594.32	793.4	22387.72	(Sea +Rail+Road)
Philippines	3004	5563.408	793.4	6356.808	(Sea +Rail+Road)
Poland	8285	15343.82	793.4	16137.22	(Sea +Rail+Road)
Portugal	6731	12465.81	793.4	13259.21	(Sea +Rail+Road)
Qatar	3019	5591.188	793.4	6384.588	(Sea +Rail+Road)
Romania	5429	10054.51	793.4	10847.91	(Sea +Rail+Road)
Russia	6851	12688.05	793.4	13481.45	(Sea +Rail+Road)
Saudi Arabia	3080	5704.16	793.4	6497.56	(Sea +Rail+Road)
Singapore	1634	3026.168	793.4	3819.568	(Sea +Rail+Road)
Slovak Republic				5851.3	(Air distance)
Slovenia	5725	10602.7	793.4	11396.1	(Sea +Rail+Road)
South Africa	4676	8659.952	793.4	9453.352	(Sea +Rail+Road)
Spain	6020	11149.04	793.4	11942.44	(Sea +Rail+Road)
Sri Lanka	1108	2052.016	793.4	2845.416	(Sea +Rail+Road)
Sweden	8153	15099.36	793.4	15892.76	(Sea +Rail+Road)
Switzerland				8307.6	(Air distance)
Tanzania	3566	6604.232	793.4	7397.632	(Sea +Rail+Road)
Thailand	2451	4539.252	793.4	5332.652	(Sea +Rail+Road)
Togo	8022	14856.74	793.4	15650.14	(Sea +Rail+Road)

Countries	Sea Distance (NM*)	Sea Distance (KM)	Calcutta to Kathmandu	Total Distance	Mode of Transport
Tunisia	5593	10358.24	793.4	11151.64	(Sea +Rail+Road)
Turkey	5231	9687.812	793.4	10481.21	(Sea +Rail+Road)
Ukraine	5826	10789.75	793.4	11583.15	(Sea +Rail+Road)
UAE	2910	5389.32	793.4	6182.72	(Sea +Rail+Road)
UK	7644	14156.69	793.4	14950.09	(Sea +Rail+Road)
US	9294	17212.49	793.4	18005.89	(Sea +Rail+Road)
Vietnam	2987	5531.924	793.4	6325.324	(Sea +Rail+Road)
Zambia				7618	(Air distance)
Zimbabwe				7924.6	(Air distance)

Note: NM* = Nautical Miles

Distance calculation procedure:

- Distances are from Kathmandu and Sea distances calculated from Calcutta port in India
- Distances are calculated to capital cities or major ports closest to Calcutta port available from the data sources.
- Distance between Calcutta port to Kathmandu is 793.4 km which is calculated as below
  From Calcutta port to Birgunj Dry port: Railway distance is 583.4 km
  From Birgunj to Kathmandu: Road distance is 210 km
- If sea distance is not clear especially in case of landlocked countries, simple Air distance is used from the data source

Data Sources:

Distances between sea ports: http://www.searates.com/reference/portdistance/

Distances between capital of countries: http://www.distancefromto.net/distance

Appendix 3: Descriptive Statistics

Variable	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
Countries	2726	47.5	27.13891	1	94
Year	2726	1995	8.368135	1981	2009
Log (Export)	1220	12.92786	2.796289	.436589	20.14875
Log (Import)	1323	14.52676	2.692295	3.946166	21.35323
Log (Total Trade)	1486	14.44283	2.971389	.436589	21.59599
Log (Product of GDP)	2587	46.83219	2.151119	39.16277	53.55424
Log(Product of PCGDP)	2582	13.69019	1.629934	9.816458	17.76028
Linder	2581	10289.3	13394.14	.82	117517.1
Landlocked	2726	.1276596	.3337716	0	1
SAARC	2726	.0458547	.2092083	0	1
WTO	2716	.4558174	.4981358	0	1
Distance	2726	10730.74	5261.055	793.4	22387.72
Log (Linder)	2581	8.119897	1.844224	-.1984509	11.67434
Log (One Year Lag Product of GDP)	2586	46.83262	2.15142	39.16277	53.55424
Log (Distance)	2726	9.127703	.6115442	6.676328	10.01627

Appendix 4: Ranking of Countries with Respect to Average Export and Import

1980s (Amount in Million USD)				1990s (Amount in Million USD)				2000s (Amount in Million USD)			
Export		Import		Export		Import		Export		Import	
India	35.04	India	77.98	Germany	126.67	India	199.32	India	428.51	India	1138.57
Germany	28.82	Japan	63.66	USA	100.36	Singapore	110.01	USA	124.62	China	188.89
USA	26.50	Singapore	24.35	India	57.31	Hong Kong	107.69	Germany	53.76	Singapore	93.34
UK	9.58	China	21.40	Switzerland	11.23	Japan	72.24	Bangladesh	16.60	Thailand	48.02
Switzerland	3.71	USA	20.62	UK	8.55	China	66.07	UK	16.29	Saudi Arabia	41.82
Malaysia	3.34	Korea	20.19	France	6.70	Thailand	49.75	France	11.59	Indonesia	39.14
China	3.03	Germany	16.25	Italy	5.38	New Zealand	33.44	Japan	9.16	Japan	38.05
Singapore	2.70	Thailand	16.15	Austria	5.22	UAE	25.34	Italy	8.15	Hong Kong	36.57
France	2.44	UK	10.08	Bangladesh	3.88	Germany	22.05	Canada	8.12	Malaysia	36.49
Sri Lanka	2.20	Hong Kong	8.36	Argentina	3.82	Argentina	20.94	Switzerland	5.28	Korea	33.05
Japan	1.46	France	7.97	Canada	2.95	UK	19.54	Belgium	4.80	Germany	28.88
Bangladesh	1.36	Bangladesh	6.48	Sri Lanka	2.89	Korea	19.06	Netherlands	3.56	UK	27.49
Pakistan	1.13	New Zealand	6.12	Japan	2.43	France	14.29	Turkey	3.52	USA	26.18
Austria	0.61	Netherlands	3.44	Spain	2.14	Saudi Arabia	12.66	Spain	3.14	Australia	21.38
Canada	0.49	Denmark	2.82	Netherlands	1.96	USA	12.63	Portugal	3.09	Switzerland	18.72
Netherlands	0.40	Finland	2.42	China	1.81	Switzerland	9.97	China	2.81	UAE	17.45
Hong Kong	0.37	Italy	2.28	Singapore	1.79	Bangladesh	9.42	Singapore	2.31	France	15.30
Spain	0.33	Switzerland	2.01	Sweden	1.48	Malaysia	8.16	Hong Kong	2.28	New Zealand	14.91
Italy	0.29	Australia	1.98	Belgium	1.33	Kuwait	7.52	Australia	1.97	Belgium	10.51
Poland	0.19	Malaysia	1.80	Pakistan	1.12	Qatar	6.59	UAE	1.95	Argentina	7.88

Source: DOTS Database (IMF)