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Foreign Trade of Nepal: Evidence from Gravity Model

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Abstract

This study employs the gravity model to assess Nepal's trade potential and its relationships with neighboring and significant trading partners. The model, which links trade volume to country size and proximity, forecasts Nepal's trade for 2023 using coefficients derived from the model. By comparing expected trade volume with actual trade, the study determines Nepal's trade potential with 10 key partners. Results showed that while some nations trade above their potential, others trade below it. Notably, Nepal surpasses its trade potential with all 10 partners, including neighboring giants India and China, indicating the strong trading performance of the country.

Keywords: Real GDP, Trade, Gravity Model, Distance, Size

Introduction

Trade, a complex phenomenon, is shaped by a multitude of interconnected variables. It is affected by a blend of economic and non-economic factors such as distance, language, and culture. Extensive efforts are dedicated to understanding trade dynamics, predominantly focusing on identifying trends. Research in Nepal's international commerce primarily adopts a qualitative approach, emphasizing tariff rates and structures but also examining the volume, direction, and composition of trade. Additionally, studies have been conducted to determine optimal trade partnerships between countries and the goods they should exchange. However, the extent to which these goods are traded remains a significant unresolved issue. There is a scarcity of studies employing a gravity model and quantitative methodologies to address this matter (Bhatt, 2005). The gravity model is gaining increasing importance in this regard. As per this theory, trade volumes between two countries are positively associated with their relative sizes and inversely related to the distance between them.

The model has gained popularity for empirical research due to its ability to effectively represent a considerable portion of real trade flows observed globally (Berg and Joshua, 2007). Foreign commerce stands as a pivotal aspect of economic development. Recognizing the multitude of factors influencing trade volume is essential, considering its profound impact on the developmental trajectory.

The sectors of tourism, hydropower, and agro-processing are recognized for leveraging comparative advantages. Nepal boasts a range of products it excels in producing, including handmade woolen carpets, Pashmina items, ready-to-wear garments (RMG), leather goods, handicrafts, and gold and silver jewelry. Positioned between China and India, the world's largest industrial powers, Nepal faces considerable challenges in terms of scale due to its limited infrastructure and lack of necessary technology. Consequently, Nepal possesses minimal comparative advantage in manufacturing goods.

Nepal's foreign industry has long been exposed to vulnerabilities. Its trade balance, constituting the majority of this industry, has consistently shown a deficit (Acharya, 2010). Primarily comprising merchandise trade, Nepal's international trade has witnessed a notable increase in value over the past two decades, spanning from the late 20th century to the early 21st century.

Nepal faces a significant trade deficit, largely due to a series of development strategies and practices that have hindered its competitiveness in trade and commerce. Presently, the country is primarily limited to exporting raw agricultural materials while relying heavily on expensive imports for finished goods. This exclusion from the global market, coupled with its status as one of the least developed, agriculture-based nations, underscores the critical importance of foreign commerce for achieving genuine economic growth and progress. Despite the introduction of various measures such as the Export Exchange, the Twin Rate, the Direct Money Grant, and frequent adjustments to procedural elements like the licensing system and tariff structure, the trade sector remains inadequately monitored and its impact limited.

Nepal faces challenges in exporting an adequate volume of goods to other countries. Particularly, India imposes trade restrictions on Asian nations, hindering Nepal's export opportunities. The primary exports from Asian countries include pashminas, clothing, handicrafts, woolen carpets, and goatskins, yet their export volumes are currently declining. Consequently, foreign trade has not played a significant role nor met the state's expectations. The geographical disadvantage further limits Nepal's overseas trade performance. This study aims to analyze Nepal's trade patterns and flows with its key trading partners using a comprehensive dataset and a gravity model.

Literature Review

Before the emergence of Adam Smith, often regarded as the founder of economics, mercantilism held sway over trade theory. Mercantilists advocated for restricting imports while promoting exports, emphasizing the accumulation of silver and gold.

Theoretical Foundations

Smith (1776) made a pivotal critique of protectionism, asserting that a nation's absolute advantage in producing particular goods is the fundamental catalyst for trade. He staunchly opposed protectionist measures. Smith argued that a nation possesses a clear advantage over competitors when it excels in manufacturing specific goods. He advocated for specialization in producing and exporting commodities where a nation holds a distinct competitive edge while importing other essential goods.

In 1817, Ricardo reshaped the theory of trade by transitioning its focus from absolute advantage to comparative advantage, aiming to elucidate the motivations behind countries' engagement in international trade. According to Ricardo, a nation should prioritize the production of goods in which it is relatively more productive, even if it holds an absolute advantage in all areas of production. He posited that absolute advantage essentially represents a specific instance of comparative advantage. Ricardo advocated for unrestricted or laissez-faire trade. Since the introduction of laissez-faire, the concept of international trade has undergone significant evolution, giving rise to a multitude of new theories aimed at explaining the movement of goods and services across national borders.

In the theoretical framework proposed by Heckscher (1919) and Ohlin (1933), patterns of trade are primarily determined by disparities in factor endowments rather than disparities in productivity. This theory, also referred to as factor proportion theory, emphasizes the absolute quantity of factor endowments as the crucial factor. According to Heckscher-Ohlin's theory, variations in national factor endowments give rise to comparative advantage, with the cost of a factor decreasing as its abundance increases. They anticipated that nations would import goods

reliant on factors that are locally scarce while exporting goods reliant on locally abundant factors. However, the Leontief Paradox has sparked significant criticism of this notion.

Leontief (1954) identified a dilemma within the Heckscher-Ohlin trade theory. According to this theory, the United States would import labor-intensive goods and export capital-intensive ones due to its substantial capital abundance compared to other nations. However, Leontief discovered that the United States required less capital for exporting than for importing goods, challenging the predictions of the Heckscher-Ohlin theory.

Empirical Review

Tyler (1981) used data from a cross-section of different nations to investigate the empirical relationship between rising exports and economic growth in developing nations. The study revealed a significant positive correlation between growth and several other economic indicators, such as manufacturing output, investment, total exports, and manufacturing exports, using data from 55 middle-income developing nations between 1960 and 1977. The results show that export performance is related to both capital formation and the intercountry variation in GDP growth rates between 1960 and 1977.

Gershon (1983) introduced a formal model illustrating the crucial relationship between exports and economic growth. The author developed a mathematical model with GDP as the dependent variable and exports and non-exports as the independent variables. Within this framework, Gershon categorized labor and capital as non-export variables. Through analysis, Gershon identified a robust correlation between exports and growth, investigating the marginal product of labour and capital alongside the rate of export growth.

Bergstrand (1985) examined international trade dynamics utilizing the gravity model. The study noted that while the gravity equation effectively describes trade flows in empirical studies, its theoretical foundations lack precision in predicting the model's potential.

Bergstrand (1989) investigated the compatibility of the gravity equation with contemporary concepts of intra- and inter-industry trade. This study's gravity equation incorporated variations in factor endowments and non-homothetic preferences, building upon the microeconomic principles elucidated in his previous paper from 1985.

Montenegro and Soto (1997) employed simulation tools to examine distortions of Cuba's economic system and delineated the impacts of trade liberalization. The study identified a discrepancy between the projected and actual values in the simulation, attributing this difference to non-economic factors. Notably, the actual import volumes from the USA into Cuba were significantly lower than anti……..?

Subedi (2012) contended that eight years after Nepal's WTO membership, the trade deficit in the nation multiplied four-fold and the export proportion of GDP fell to five percent from ten percent.

Acharya (2013) employed the gravity model approach to study the factors influencing Nepal's exports. The results indicated that the distance to Nepal's trading partners was highly significant, implying that greater distance resulted in less trade.

Sapkota (2014) stated that regular trade between Nepal and the Chinese mainland began after 1956. However, the barter system was initially utilized in Nepal's historical trading relations with Tibet during the Malla and Lichchhavi eras. Due to the commercial policy of the Malla monarchs, which facilitated trade, the relationship between Nepal and Tibet expanded in terms of trade. People from both sides engaged in trade between Nepal and Tibet through numerous crossings or boundaries. The trade between Nepal and China consisted of trade with Tibet, the Chinese mainland, and Hong Kong. However, due to the amalgamation of trade transactions

between Tibet and China in 2007–2008, there hasn't been a separate trading relationship with the TAR. The trade balance between China and Nepal was dominated by imports rather than exports. Nepal primarily exported to Tibet from the three regions of China, but since 2000/01, it has been importing roughly equal amounts from each of the three regions. However, until 1999–2000, Hong Kong accounted for the majority of import proposals. Regarding the three parts of China, the commodity composition of trade differed both in terms of export and import.

Magar (2016) found that the structure and trends of Nepalese international trade were not very satisfying. The gradual deterioration of the trade imbalance situation indicated that imports predominated in Nepalese commerce. Additionally, it indicated that there were numerous restrictions on Nepalese trade. Despite the government of Nepal implementing various policies and procedures that were regularly modified, the country's trade could not progress constructively. However, there was potential to increase export commerce in the future. Therefore, the government should have acted right away.

Methodology

While conducting the study, the intended purpose was consistently considered. As a result, the study utilizes an inferential statistical quantitative research methodology. Alongside data on per capita income (GNI) for both countries and the distance between Nepal's capital cities and its trading partners, the study employs a quantitative methodology based on cross-section data for 2021 regarding bilateral trade (merchandise flows) between Nepal and its main trading partners. The units of measurement are as follows: GNI is represented in billions of dollars, bilateral trade flows are measured in millions of dollars, per capita GNI is expressed in dollars, and distance is measured in kilometers.

The necessary information is available from the following sources. Distances (in kilometers) between Kathmandu, the capital of Nepal (country 'i'), and other capital cities in country 'j' can be obtained from www.indo.com/distance and www.cepii.fr in Indonesia. Statistics on Gross National Income (GNI) and GNI per capita are provided in The World Bank's World Development Indicators 2021 report. Additionally, data on the total trade value can be accessed through the WITS database.

In this study, Nepal's top ten trading partners were examined. The selection of these 10 countries followed a specific method. Referring to the article "A Glimpse of Nepal's Foreign Trade from 2021" by the Trade and Export Promotion Center, Nepal's 30 significant import partners and 30 important export partners were identified. Among these, 21 countries were listed as both importers and exporters. Consequently, nations not included in either the imports or exports lists were excluded from consideration.

Model Specification

The theoretical model, known as the Gravity model of international trade, finds its foundation in Newton's Law of Gravitation (Head, 2003). Newton introduced the "Law of Universal Gravitation" in 1687, which describes the force of attraction between two objects, denoted as "i" and "j." According to this law, the force (Fij) between the objects is calculated using the equation:

$Fij = G\, Mi\, Mj / Dij^{2}$ ……(i)

Where,

Fij = Force of attraction,

Mi and Mj = Mass of trade,

Dij = Distance between the two, i and j.

G = Constant.

A practical empirical model for examining cross-national trade flows is the gravity model of global commerce. According to this model, bilateral trade is positively associated with the GDP or GNI of each nation and inversely related to the distance between countries "i" and "j". Here's a simplified version of the gravity model.

Tij = A (YiYj)/(Dij)……..(ii)

Where,

Tij = Trade flows (exports plus imports) between country i and j.

Yi (j) = GDP of country i(j).

Dij = Distance between two countries i and j.

A = Constant.

Taking log, the equation (ii) can be written as

*Ln (Tij) = β0 + β1 Ln (Yi * Yj) + β2 Ln (Dij)……..*(iii)

The Present Approach

This study makes use of both basic and improved gravity models. Because it simply considers GNI and distance as independent variables, the model is simple. Several other variables that potentially affect bilateral commerce have been added to the model, improving it beyond only the GNI and distance. An extra measure that is part of the enhanced gravity model is the GNI per capita. The gravity model is shown in equations (iv) and (v), respectively, in its basic and improved forms. The current study satisfies both equations. For the sake of Nepal's trade projection for 2022, however, only equation (v) has been considered.

*Ln (Tij) = β0 + β1 Ln (Yi * Yj) + β2 Ln (Dij) + Uij ……..(iv)*

*(Tij) = β0 + β1 Ln (Yi * Yj) + β2 Ln (Y/Pi * Y/Pj) + β3 Ln (Dij) + Uij…… (v)*

Where,

Tij = Trade flows (exports plus imports) between country i and j.

Yi (j) = GDP of country i(j).

Pi(j) = Total midyear population of country i(j)

Y/Pi(j) = Per capita GDI of country i(j)

β0 = Constant

β1, β2, and β3 are the parameters

Dij = Distance between two countries i and j. Ln = Natural log

Discussion and analysis of results

Factors Affecting Nepal's Foreign Trade

The gravity model of international trade is a popular approach for identifying the variables that affect bilateral trade flows between countries. The model works both conceptually and experimentally. In this study, the gravity model is utilized to examine the variables affecting Nepal's international commerce. The anticipated answers to equations 5 and 6 are displayed in Table 1.

Table 1:

Result of Gravity Model. Dependent Variable: natural log of trade between countries

Variables	Equation 4		Equation 5	
	Coefficients	standardized Coefficients	Coefficients	Standardized Coefficients
C	2.1461* (3.758)		2.0371** (4.166)	
PGDP	0.612** (0.166)	0.567	0.626** (0.171)	0.569

PPGDP	--------	--------	0.064*** (0.226)	0.057
Distance	-1.524* (0.279)	-0.831	-1.608** (0.391)	-0.871
N	10		10	
R^2	0.680		0.682	
Adj R^2	0.630		0.617	
F	16.980		10.605	
C	2.1461* (3.758)		2.0371** (4.166)	

Source: Authors computation through EViews10.

Note: PGDP and PPGDP mean product of GDPs and product of per capita GDPs Numbers in the parenthesis are the std. error.

* significance at 1%

** significance at 5%

*** not significant.

The OLS estimates for the gravity model are shown in Table 1. According to statistics, the estimated regression lines closely match the observed data and account for almost 60% of the variation in bilateral commerce between the two nations (64 and 61.8 percent, respectively, in equations 5 and 6).

The basic components of the gravity model operate as expected: distance and GNI have the expected signals, with distance having the negative sign and GNI having the positive sign. Per capita GNI has little effect. The GNI's positive sign indicates how trade value rises as economies grow among nations. The distance's negative sign shows that when two countries are farther apart, the value of international trade declines. When all other factors are held constant, the positive and statistically significant coefficient on the GNI variable explains why bilateral trade increases as GNI rises and vice versa.

A one percent increase in the GNI of the aforementioned nation pairs would result in a roughly 0.626 percent increase in bilateral commerce, which is less than a proportionate increase. This is the economic significance of equation 6's OLS coefficient of 0.626. The estimated coefficient on log of distance, which is statistically significant, has an expected negative sign, and is about near 1.6, predicting that trade between nations declines by about 1.6 percent (actually 1.608 percent) for every 1% rise in the distance, and the opposite is also true. It has a negligible impact on the per capita GNI coefficient calculation. The definitions of the explanatory variable coefficients in Equation 5 are identical.

Nepal's Trade Potentiality

The fundamental elements of the gravity model function according to expectations: GNI and distance have the predicted signals, with GNI having the positive sign and distance having the negative sign. GNI per capita has minimal impact. The positive sign of the GNI shows how trade value increases as national economies expand. The negative sign of the distance indicates that the value of international trade decreases with increasing distance between two countries. The positive and statistically significant coefficient on the GNI variable explains why bilateral trade rises as GNI rises and vice versa when all other parameters are maintained constant.

The core components of the gravity model operate as anticipated: Gross National Income (GNI) exhibits the expected positive sign, while distance displays the anticipated negative sign. GNI per capita demonstrates minimal influence. The positive sign of GNI illustrates how trade

value grows alongside national economic expansion. Conversely, the negative sign of distance signifies a decline in international trade value as the distance between two countries increases. The positive and statistically significant coefficient on the GNI variable elucidates the rise in bilateral trade with increasing GNI, and vice versa, when all other parameters remain constant.

Table 2

Nepal's Actual Trade, Predicted Trade (both in US $ millions) and Potentiality of Trade

Serial No.	Country	Actual Trade Flow (A)	Predicted Trade Flow (P) γ	P/A
1	Australia[1]	35.20	15.48	0.43
2	Canada[1]	22.28	17.2	0.77
3	China[1]	445.26	261.77	0.59
4	France[2]	46.18	56.19	1.22
5	Germany[2]	64.96	79.16	1.22
6	India[1]	2694.73	136.03	0.05
7	Japan[2]	86.32	137.38	1.6
8	Switzerland[1]	29.23	21.50	0.73
9	UK[1]	101.41	52.49	0.51
10	USA[1]	111.27	65.62	0.569

Source: Authors computation through EViews10.

No possibility of trade expansion.

Possibility of trade expansion.

Table 2 enumerates Nepal's trade with other countries, broken down into three categories: prospective, forecast, and current. The P/A ratio in the fifth column shows Nepal's trading potential. It is feasible to discern between the nations with whom Nepal has already surpassed its trade potentiality (overrated, or P/A 1) and those with which Nepal has the potential to do so (underrated, or P/A >1) based on the value of P/A. Below are the conclusions. It appears that Nepal's trading capacity with her two large neighbors has already reached its maximum.

Conclusions and Implications

Nepal embraced the trade diversification initiatives outlined in the second plan. Since the mid-1980s, the nation has embraced market-oriented trade policies. Subsequently, each administration has endeavored to integrate the Nepalese economy into both local and global markets. During this period, Nepal also ratified the SAFTA agreements, joined BIMSTEC, and became a member of the WTO. This essay estimates Nepal's trade potential for the year 2020. To identify the variables influencing Nepal's trade flows with its major trading partners, the article employed the gravity model technique. The resulting coefficients were then used to forecast Nepal's trade potential with the other 10 sample countries.

The gravity equation demonstrates a good fit with the data, as indicated by the OLS results, which also reveal statistically significant income and distance elasticity coefficients. While the economic scale of Nepal's ten trading partners positively influences the volume of commerce between them, distance and variations in per capita income have limited impact. The evaluation of Nepal's trade potential using the gravity model suggests opportunities for increased commerce with Bangladesh, Brazil, Denmark, France, Germany, Hong Kong, Italy, Japan, and the Netherlands. Nepal must implement effective trade promotion strategies to enhance trade and reduce the trade deficit with these nations. The assessment of trade potentiality indicates that Nepal's actual trade volume with other countries in the sample surpasses trade potential. Nepal has already traded more than anticipated with Australia, Canada, China, India, Malaysia, New

Zealand, Singapore, Switzerland, the UK, and the USA. However, this does not preclude Nepal from strengthening trade ties with nations where it currently faces trade imbalances. Future developments in GNI may lead to increased trade with specific nations, while suitable trade facilitation measures could reduce distance in the future.

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