A Game Theoretic Analysis of a Regional Approach toward the Sustainability of Kolkata-Agartala Transit Route

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Abstract: *This paper attempts to explore the possibilities of a viable transport network in the long run which can respond to the demand for communication by people of Tripura as well as the demand of Tripura's projected economy. Since, Tripura is constantly facing the problem of lack of a smooth transportation and naturally, it is an economic imperative for this landlocked state to seek benefits for itself through greater regional integration. Most of the cargo originates from Kolkata (Port) and terminates at Guwahati and distributed to various destinations of north eastern states. This paper examines the perspectives of such cargo movement from Kolkata to Agartala and the strategic options of the transiting countries, namely Bangladesh and Myanmar. The development of a new transit route through Myanmar, depriving Bangladesh of its former monopoly, has modified the situation profoundly. The thrust of the paper is an analysis of the strategies that Bangladesh and Myanmar may pursue in transiting cargo for Agartala in terms of a game theoretic structure. The long run sustainability of such transit route from Kolkata to Agartala depends on regional cooperation among these countries in a political emotional state of nature.*

Introduction: Before partition[1], Tripura was very much connected with India's hinterland both by roads and railways through the then East Bengal (presently known as Bangladesh). So, no need was felt to connect Tripura with the rest of the states in the northeast[2]. But the partition made Tripura an extreme outpost not only from the heartland of India but also from the north eastern region, too. After partition, Tripura emerged as a mirror image of the whole north eastern region. It was land locked- an outpost away from the remaining parts of the country, only connected by tenuous Churaibari corridor. Though it shared some boundary with neighboring Mizoram in the eastern part but smooth transportation was not possible due to the presence of Jampui Hills in Mizoram state border. The remaining boundary is covered by Bangladesh in the whole Western, Southern and maximum portion of the Eastern side. The surface transport system for movement of cargo/passengers to and from the north eastern states consists of road, rail and waterways. As far as cargo movement is concerned, most of the cargo originates from Kolkata (Port) and terminates at Guwahati and vice-versa. From Guwahati, the cargo gets distributed to various destinations of north eastern states. The transport links to states particularly Mizoram, Tripura, Manipur and Nagaland are affected many a time by floods, landslides, blockages of roads and local agitations. Apart from that, the stretches and curves of roads in the hilly area do

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[1] In 1947, August 15, India got independence and bifurcated as India and Pakistan. At that time, Tripura was a Princely state and formally integrated with India on October 15, 1949.

[2] The North Eastern region comprises of seven states viz. Assam, Arunachal Pradesh, Meghalaya, Manipur, Mizoram, Nagaland and Tripura (known as Seven Sisters). Recently, Sikkim is also incorporated into this region.

not permit smooth and feasible cargo services in this region. Though, partition makes the whole north eastern India a partially landlocked region, since the chicken neck shaped geographic location coupled with the presence of hilly terrain across the region makes this a partially isolated region from its heartland. This may be identified as a pseudo landlocked region where being a part of the Indian territory this particular state is not landlocked in true sense but the feasible road distance from the nearest sea port i.e. Kolkata port is more than four times the Arial distance from the same, ultimately, makes this state economically landlocked.

As a result, Tripura is constantly facing the problem of a lack of a smooth transportation and naturally, it is an economic imperative for this landlocked state to seek benefits for itself through greater regional integration. Development of this State requires the existence of viable road network so that the transport cost for both inflows and outflows of commodities from Tripura will be cheaper. The State Government of Tripura is continuously demanding for transit route through Bangladesh but they were not ready, at least up to 2010 to implement this because of possible threat of loss. So, the debate on the possibility of a viable transit facility is relevant for economic progress of the state.

In 2010, India and Bangladesh agreed to provide for transit route through Bangladesh to connect north eastern states of India with the rest of India. This raises some serious questions of economics, politics and sub regional development strategy (Murshid, 2011). In that study, it was also pointed out that for Bangladesh; the question is no longer whether it should allow transit rights to Indian goods but what is in its best interest. There are a number of bilateral issues that are remained unsolved including water sharing, marine boundary demarcation (Myanmar is another party in this issue) and insecure border. Last but not the least, Bangladesh suffering a mountain trade deficit of One billion US $ in its trade with India.

Apart from this a debate has been raging in Bangladesh on whether transit facilities should be given to India or not through the land territory of Bangladesh. The main reason behind this debate is more of political in nature than that of pure economic logic. Some argue that what India is demanding is some kind of rights on the territory of Bangladesh to move goods and people from the western part of India to its landlocked north eastern region and hence, they try to solve some of the core bilateral issues with India before giving this type of facility. The other groups are advocating this transit issue as an economic issue for trade facilitation and should not be politicized. Whatever be the view, it is fact that transit issue is a complex one and multi-faceted issue. The ambiguity arises due to two concepts: corridor versus transit. In the corridor, a country gives some kind of rights or control on the land to the other country making it a defacto of its territory, while in transit there is no question of rights involved in the land territory allowed for transit. It provides only transit facilities under certain conditions and can be withdrawn. On the other hand, transit, an inter-country passage (like waterway-transit already provided to India since 1972), where India wants to dispatch goods and other materials from western parts of India to its seven land-locked north eastern states through Bangladesh and no kind of rights exists on the land territory of Bangladesh.

Against this backdrop, the objectives of this paper is to investigate the nature of sustainability of transit route for India to move cargo through Bangladesh from Kolkata port to the capital city of Tripura i.e. Agartala keeping in mind the advantage and disadvantage of the existing road network in Tripura as well as future opening of Myanmar route as an alternative transit route via Mizoram state border for north eastern region in general and for Tripura, in particular. As such, no such significant work has been found with particular reference to this type of problem for a

less developed and geographically sequesters state like Tripura in the Indian context. Hope, this proposed paper will attempt to fill up that caveat in the existing literature.

To pursue the aforesaid objective, the present paper has been divided into five sections. Including the present **Introductory** one, the remaining paper is structured as follows: **Section 2** provides the theoretical exposition and related studies with this study. **Section 3** deals with the core of the paper i.e. the modeling of the present scenarios and the possible consequences. On the basis of proposed model, long run sustainability of transit route between Kolkata to Agartala has been analyzed considering different alternatives for each of three countries in **Section 4**. Finally, this paper concludes in **Section 5**.

2. Review of Literature: In a review of Urban Transport Strategy of the World Bank (2001); Venter et al (2003) and Maunder et al (2004) recognize the need to address more systematically access issues, especially for those who are mobility impaired. This is particularly the case for most of the Land Locked[3] countries who do not have any sea cost. As a result, in order to trade with the rest of the world, these countries must depend on the neighboring one or more countries for transit to reach the sea. Arvis (2005) has pointed out that at present; about one out of five countries in the world is landlocked. The problem mostly affects the poorest countries: 20 out of 54 low-income economies are landlocked, with a majority of them in Sub- Saharan Africa; while only three high-income economies out of 35 are landlocked. Arvis et al further pointed out that nine of the twelve countries ranked lowest on the 2002 Human Development Index are landlocked. Although landlocked developing countries represent 12.5 per cent of the world's land area and 4 per cent of the global population, their combined gross domestic product accounts for only 0.3 per cent of the total. Without direct access to the oceans, these countries must pay an average of 15 per cent of export earnings on transport; for some African countries it is as high as 50 per cent, other developing countries spend only 7 percent on such services and developed countries 4 per cent. The case of landlocked developing countries has naturally received special attention, including a specific set of development priorities which was reflected in the Almaty Conference (2003).

Variants of the new economic geography, new trade theory, neoclassical and endogenous growth theories have been applied to highlight the nexus between geographic location, trade and economic growth. Amjadi and Yeats (1995) point out that the incidence of transport costs fall heavily on the landlocked African countries since they have to adjust their selling price to world prices. Bloom and Williamson (1998) highlighted that the land locked countries are always experienced a weaker growth as compared to the other maritime developing countries. According to their estimates, sometimes it is reduced by 1.5% points as compared to the later which again supported by the study of MacKellar *et al* (2002). Therefore, landlockedness can be thought as raising import prices and reducing export revenues. It is one reason why Radelet and Sachs (1998) advocate the idea that a re-export model is extremely difficult to achieve in landlocked developing countries due to higher cost of intermediate products. Gallup, Sachs and

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[3] Actually, there are 42 landlocked countries in the world today. Except for the relatively wealthy landlocked states in Western and Central Europe (for example, Switzerland, Austria, the Czech Republic, Hungary and Slovakia), the rest are all poor and 31 landlocked countries can accurately be classified as LLDCs. Sixteen of the LLDCs are also categorized as least developed countries (LDCs). In SAARC region, there are three LLDCs: Afghanistan, Nepal and Bhutan.

Mellinger (1999) identified two reasons behind the disadvantaged position of landlocked countries which may be stated as: (i) Coastal countries may have military or economic incentives to impose costs on landlocked countries; and (ii) Infrastructure development across national borders is more difficult to arrange than similar investments within a country. Limao and Venables (2001) estimate that the landlocked countries trade on average 30% less than coastal countries. In this context, MacKellar et al. (2002) explain the negative relationship between landlockedness and growth using a neoclassical theory. They highlight that crossing a border implies higher transaction costs due to customs and handling costs.

Dependence over the transit state necessarily implies high transaction costs (notably transportation costs). In this regard, UNCTAD (2002) identified the "Transit charges" like port charges, road tolls, forwarding fees, customs bonds or transport quota restrictions. Hence, the impact of being landlocked is based on the idea of dependence over the transit state.

While there is a consensus on the problems of landlocked countries, the analysis so far has mainly focused on their transport cost disadvantage. Transport costs, however, account for only part of the real cost of being landlocked as they do not account for the transit delays and unpredictability which are critical in international trade. In the literature, macro-data are usually used to estimate the transportation costs burden. Radelet and Sachs (1998) find these costs to be about 50% higher for landlocked countries. Stone (2001) using the ratio of 'freight payments as percent of total imports' shows that landlocked developing countries, especially in Africa, bear exorbitant transport costs: out of 15 landlocked African countries, 13 had a ratio higher than 10% and for 7 the ratio was even higher at 20% as compared with 4.7% for industrial countries and 2.2% for the US. Again, Arvis et al (2007) questioned about the notion that costs of transportation supported by developing countries are intrinsically high. Neither the distance covered, nor the unit cost of transportation services, are necessarily much higher in landlocked developing countries than in the wealthiest countries. Yet there are significant variations; for instance, Central and East Africa have higher unit costs than the European Union but this is not the case of South and East Asia or other sub-regions in Africa. Furthermore, transportation costs only explain one part of the real impact of being landlocked. Delays and even more importantly low degree of reliability and predictability of services create massive disincentives to invest and higher total logistics costs. Moreover, Arvis et al demonstrated in that study that the gap between landlocked countries and gateway countries may not be very high – if transport cost is the only parameter taken into account. Shippers in most African gateway countries already face high logistics costs when adding maritime transport, port charges (which can be ten times higher in some African ports as compared to ports in developed countries), and domestic transport (especially to/from remote areas, as is the case for several export crops). In Africa, many shippers in landlocked developing countries have the same charges to move goods from/to ports as shippers in the gateway country.

In order to remove the disparity of transportation facility among the member countries, particularly for the landlocked developing countries, Article V of the GATT 1994 (Freedom of Transit) provides for the freedom of transit of goods, vessels and other means of transport across the territory of WTO Members via the routes most convenient for international transit, without distinguishing between flag of vessel, origin, departure, entry, exit, destination, or ownership of the goods, vessels or other means of transport involved.

Freedom of transit and a viable Customs transit regime for international transit are both particularly important for landlocked developing countries, many of which are among the poorest of the developing countries with the weakest growth rates, and typically dependent on

commodity exports or imports of intermediate goods. In this context, the Almaty Conference in August 2003 drew attention to the problem of transit for these countries and devised an action programme. Customs transit regimes usually tend to suffer from the same shortcomings as other Customs transactions. These include the lack of simplified and standardized Customs procedures, documents and data processing, publication of fees and charges, cooperation among national Customs authorities, adequate security measures to combat fraud and smuggling, risk management techniques, computerization and electronic messaging. Inadequate transport infrastructure, logistics, vehicle standards and container seals add to these problems.

However, to confirm smooth transportation from the gateway country to the landlocked one, transshipment instead of transit is a better alternative in reducing the extent of custom procedure as well as related data work. Since, Transshipments refers to the same inter-country passage using gateway country-owned transportation, whereas in transit, landlocked country –owned surface transport move through the transit from one end to the other. For example, Germany or Austria sends goods to Italy through Switzerland. Another instance of transit, Alaska dispatches goods to mainland USA through Canada. While the basic obligations in Article V aim at ensuring optimal conditions for transit, there are indications that, on the ground, real freedom of transit is often absent or compromised. The conditions of international trade and the requirements for transit have changed since Article V was originally formulated in the late 1940s, and comments from business, international organizations and WTO members, in particular developing ones, have suggested a number of obstacles and shortcomings in relation to transit. Hence, this study shall attempt to enrich the existing literature by considering the long term sustainability of transit route for land locked developing countries particularly for those counties which have more than one feasible transit gateway through the neighboring countries.

3. Model: When the Myanmar Route for transit/transshipment was not available, the Transit/Transshipments Route through Bangladesh was the only available alternative to avoid the staggering transport cost to ship the commodities from hinterland to its north eastern counterpart. Obviously, in the absence of a land transit link between India and Bangladesh, the traffic between Kolkata and Assam is mainly carried by rail and road links through the *Siliguri Corridor* and the requirements of additional transport costs for carrying goods is staggering. To transport goods to and from the northeast through the corridor, it is estimated that seven billion Rupees are being spent as additional costs to transport goods and services to and from northeast India. The figure is estimated in 1990s and it is expected that the cost has increased in tandem with economic growth both in northeast India and the rest of India. As such, as a transit route through Bangladesh can integrate the northeast India with its mainland and is set to reduce transportation cost significantly. In a recent paper, Sen, Gupta and Mukhopadhyay (2011) tried to explain the methodological issues in the pricing strategy of Kolkata - Agartala transit route in terms a differentiated Bertrand type competition where the transit cost per unit of transshipped product is expected to reduce after the opening of proposed alternative transit route through Myanmar. Staring with their model, this paper attempts to study the sustainability of such transit route towards an integrated continental transport network through a 3-person two phase game theoretic approach.

For this, this paper assumes the following:

(1) Here, Transit route itself is treated as tradable commodity;
(2) Amount of Transit is measured in terms of total amount of cargo movement from Kolkata port to Agartala during that period; and

(3) All cargo may not be homogeneous.

The last assumption needs to be explained in detail. Apart from providing transit route through their own territory, both the gateway countries have some export basket for India. Hence, any cargo containing readymade garments originating from Kolkata port towards Agartala can hardly get any passage through Bangladesh because this item is one of the most important exportable items for Bangladesh. But the same cargo can easily reach Agartala through Myanmar route. Similarly, any cargo containing rice can hardly expect to get passage through Myanmar though it can reach Agartala via Bangladesh. In this sense, it is assumed that all cargos are not homogeneous.

Notations:
t_{jI}: Actual Average transportation cost per unit from Kolkata Port to Guwahati at par with the all India level;
t_{jB}: Average transportation cost per unit from Kolkata Port to Agartala via Bangladesh Route;
t_{jM}: Average transportation cost per unit from Kolkata Port to Agartala via Myanmar Route; and
t_{jA}: Actual Average transportation cost per unit from Guwahati to Agartala via the existing Route;
X_j: be the total unit of cargo to be transshipped.
Further, we assume that $(t_{jB}, t_{jM}) < (t_{jA}+t_{jI})$. Otherwise, the issue of transit or transshipment through the neighboring counties will not arise.
But, $t_{jB} >=< t_{jM}$
It may be noted that the normal transportation cost is assumed to be included in the cost schedule in contemporary economic literature. Hence, if the producer operates under break even situation then they hardly find any inducement to sell their products beyond Guwahati market due to this extra cost burden above its normal level. Simply, due to this adverse geographical locational problem, the transport subsidy for this region is staggering.

Figure 1: Map of the Transshipment Route from Kolkata Port to Agartala

Note: The Transshipment route is prepared on the basis of route map of Asian Highway Network in Bangladesh.

3.1 Determination of Transit Fees:
The exact amount of transit fee from Kolkata (Port) to Agartala is a function of expected sale in Tripura where as actual amount of cargo booking in Kolkata depends on both sale and transit

charge imposed by the transiting countries. This paper attempts to shape the three players game for three constellations among these countries.

(A) **Transit Monopoly**: At the point of Inception, India and Bangladesh are not integrated. Obviously, Bangladesh is the transit monopolist and as an independent player it charges a monopolistic transit fees.

The Demand function for cargo through the Bangladesh transit route may be considered as:

$tjB = B - b.Xj$--Equation (9)

Where B>0 is the intercept and b>0 is the slope coefficient of the demand function thereby confirming the negatively sloped demand curve.

The Cost structure may be considered as: C_B= Fb-C1.Xj---------------------------------Equation (10)

Where again, F>o denotes the Fixed cost and C denotes the Marginal Cost

Hence, under monopoly situation, $Xj* = \dfrac{B-C1}{2b}$--Equation (11a)

Accordingly, $tjB* = B - C1.Xj*$---Equation (11b)

Further, Equation (8) reveals that the maximum per unit transit/ transshipment cost the transiting country can charge is $\sum_{j=1}^{n}(tjI - tjB).xj + \sum_{j=1}^{n}tjA.xj$.

i.e. $\boldsymbol{tjB* \leq \sum_{j=1}^{n}(tjI - tjB).xj + \sum_{j=1}^{n}tjA.xj}$ --Result (1)

Hence, the natural monopoly of Bangladesh in providing transit facility for Kolkata to Agartala route can no longer be exercised. Rather, the monopoly price of such transit route will be bounded by the above term. The pseudo landlockedness character of the region force the transit providing country to restricts its monopoly power in order to continue the service. This would be the same for Myanmar, too.

(B) **Transit Duopoly:** In case of transit duopoly three players are involved in this game: India (I), Bangladesh (B) and Myanmar (M). Assuming the demand function at Agartala, the two transit players: Player B and Player M has to decide their transit fees. Whereas, Player I has to chose the sales price at Agartala by observing the transit fees set by the above mentioned two players. Here, this paper identified two mutually exclusive strategies set by the transiting players: (a) The Non cooperative game with Bertrand type price competition for non homogeneous cargo and (b) The Cooperative game with long term cartel solution for a reduced form of homogeneous cargo.

Case (a): The Non cooperative game with Bertrand type price competition for non homogeneous cargo:

We retain the same demand function with $Xj = XjB + XjM$. Hence the demand fuction appears to be:

For Bangladesh: $tjB = A1 - a1.tjB + b1.tjM$--Equation (12a)

For Myanmar: $tjB = A2 - a2.tjM + b2.tjB$ --Equation (12b)

Where (A1,A2)>0 are the intercepts term and a1,a2.b1,b2>0 are the slope coefficients of the demand functions thereby confirming the negatively sloped demand curves for each country.

Accordingly, the cost functions may be assumed as:

For Bangladesh: C_B= Fb-C1.XjB---Equation (13a)

For Myanmar: C_M= Fm-C2.Xj_M---Equation (13b)

Similarly, Where again, F>o denotes the Fixed cost and C denotes the Marginal Cost, respectively, for each country.

Under non-cooperative type situation, the optimal amount of transshipment through different routes found to be as following:

tjB**= $\frac{2(A1-C1)a2+(A2-C2)b2}{4a1a2-b1b2}$ and tjM**= $\frac{2(A2-C2)a1+(A1-C1)b1}{4a1a2-b1b2}$ ------------------------Equation (14)

In the case the marginal costs for both players are different; the marginal cost price will be set slightly below the level of the higher marginal costs. The player with the smaller marginal costs has no incentive to reduce the price further, since the competitor is not yet making a profit, we must have

$$tj* = \begin{cases} \textbf{tjB** - ε} \\ \textbf{tjM** - ε} \end{cases}$$ ---Result (2)

ε > 0, however small it may be.

Case (b): The Cooperative game with long term cartel solution for homogeneous cargo:

For this scenario, we must drop our third assumption since under cartel, both the players; B and M are expected to act jointly as monopolist. In that case, for long term sustainability of their cartel situation, the players are expected to maintain the relative advantage of the products which are already exported either of the party to north eastern region. As a result, cargo will no longer be treated as non homogeneous rather it would be a homogeneous one simply by excluding those products in the cargo.

Starting with the same demand and cost function already used in the previous case, we must have

tij[*] (cartel) = a- b*X(monopoly)--Result (3)

From the above analysis, it is clear that, transit/ transshipment facility cannot solve the whole transport disadvantage for India. But, under continental transshipment, India can substantially reduce its inter regional disadvantage substantially and there is a possibility that the intra regional loss will also reduce from its present level. Transshipment alone cannot solve the

staggering transportation cost burden but undoubtedly, the extent will be reduced from its present level. Simultaneously, the transshipment providing countries like Bangladesh and Myanmar will gain significantly in terms of derived demand of Transport infrastructure and allied sectors. Further, this continental transport network can lead towards integrated transport network for this region.

4. Simulation of Model Solution & Discussions:

The game theoretic approach here is primarily used to understand the regional political dynamics that influence the sustainability of transit route from Kolkata to north eastern states in general and for Tripura, in particular and it may also provide different courses of actions for India, to exploit, in order to ensure affordable transit route for its north eastern states. Moreover, it provides a road map to form a cooperative working alliance between SAARC members and regional players, which can support stability in this region through greater level of regional transport integration.

Geographically, Bangladesh has some natural monopoly in this particular issue. Now the question is why Bangladesh was reluctant to permit such facilities to India. Being the natural monopolist in this particular issue, it tried to solve some basic bilateral issues with India. Two major bilateral issues can be identified in this case. Firstly, it wants similar transit facilities from India to access Nepal and Bhutan. These landlocked Himalayan countries are geographically quite close to Bangladesh but they are surrounded by India. Nepal and Bangladesh are separated by a narrow piece of Indian Territory of about 15 kilometres in the southeast. Had there been transit facilities (Nepal-India- Bangladesh), landlocked Nepal (so is Bhutan) could use Chittagong and Mongla port of Bangladesh that could cut down its transportation cost dramatically and one could see better trade and tourism relations between these two countries. Secondly, Bangladesh's export to India accounts for less than seven percent of its total import from the latter. As a result, it has a massive trade deficit with India. Moreover, large volumes of informal imports from India cross the land border avoiding Bangladesh import duties. There are allegations from Bangladesh that its products often face India's non-tariff barriers and other bureaucratic hurdles. But the Trade Complementarity Index shows that trade complementarity between Bangladesh and India is very low (5.42). This is due to less diversified export basket of Bangladesh for India as well as the later country is highly concentrated on readymade garment product which is not a significant import item for India. On the other hand, India has a broad export basket and close geographical proximity which, in turn, has helped Bangladesh to source for many commodities and final products with comparatively cheaper price. Hence, until and unless these complementarity issues are not overcome, it is hardly possible for Bangladesh to redress such imbalances. Though, in recent years, trade barriers have declined, both in Bangladesh and India, in line with their commitments to World Trade Organization and South Asian Preferential Trade Arrangement (SAPTA). Moreover, India has given preferences to Bangladesh on approximately 2,925 tariff lines under SAPTA. However, these two bilateral issues have already been solved through a bilateral treaty between them. From the above analysis, it seems that Bangladesh was not fully reluctant to allow India to use its territory to access northeast India but what it wants is a continental transit facility, especially in the southern part of the SAARC region (Bangladesh-India-Nepal-Bhutan) which does make more economic sense. There is an overwhelming consensus that, to integrate South Asia with southeast- and other parts of Asia, there is a need for greater transport network across Asia. But India and Bangladesh have significant differences on the selection of the Asian Highway Network (AHN).

Bangladesh opposes the proposed route (India-Bangladesh portion) that enters into Bangladesh from India and again, goes back into India. Bangladesh wants to initiate a route that connects it with Southeast Asia as well going through Chittagong and Myanmar, as the proposed route, as it argues, will virtually become a transit route for Indian goods between rest of India and northeast India. For this, Islam (2008) commented that Bangladesh always tried to maintain this natural monopoly situation in order to solve all its bilateral issues with India in a single package. Indeed, this is one of the reasons why the tripartite gas pipeline project (Myanmar-Bangladesh-India) had not implemented finally.

Here, Bangladesh was always contemplating the transshipment/transit issues with Nepal and Bhutan but Myanmar was not ready to accept the proposed AHN route through Myanmar-Bangladesh-India route rather they are more interested to propose this route in Myanmar-North Eastern India-Bangladesh-India line. Once, the role of Myanmar is incorporated in this game, the relative advantage of Bangladesh will turn into potential disadvantage when the later are not ready to provide transit/transshipment facility for north eastern region of India. Another, major issue in this context is to determine the pricing of such transit/transshipment route. Since, transporter country India will utilize the transport infrastructure of Bangladesh, India has to pay the requisite fees or in other words, how much price Bangladesh can charge at most to provide such transit/ transshipment facility through its own territory. More specifically, whether this transit facility will continue in the long run or may be utilized for solving all the bilateral issues with India if the ruling power changes in Bangladesh. To answer these questions, we consider the following model to determine the long term sustainability of operation of such route in the situations: (1) Bangladesh Route is the only available alternative; and (2) Myanmar is also interested in providing transit/transshipment facility to India for its North Eastern region.

Here, the game has been constructed in two phases; the first phase illustrates a game that describes the political approaches of the two main regional core players "India and Bangladesh", which traditionally has been described as a zero-sum game; however, in the course of this research, the India-Bangladesh game has been translated into a "partial sum" prisoner dilemma game. In the second phase, we introduce the third player 'Myanmar', to examine its effect on the game.

4.1 First Phase of the Game: Zaman (2011) has applied the game theory from the perspective of SAARC regional and Indo-Bangladesh cooperation in two ways – (1) where countries/member states know the equilibrium strategies of the other players (Nash Equilibrium); and, (2) where one country faces difficulties in comprehending the others' strategies (Prisoner's Dilemma). Following the above study and the model solution obtained in the preceding sub section;

Table 1: Nash Equilibrium & Prisoner's Dilemma solution for Transit Fee Determination

The Transit Game		Player I (India)	
		Co-operation (C)	Non Co-operation (NC)
Player B (Bangladesh)	**Co-operation (C)**	(tjB*, lower Inter Cost)	(potential loss of tjB*, Intra & Inter Cost)
	Non Co-operation (NC)	(0, potential loss of Inter Cost)	(0, Inter & Intra Cost)

The standard game theory solution leads to a Nash Equilibrium solution with (**C,C**) as the pay off in a symmetric information game when the policy makers of the two countries agreed on starting Transit/ Transshipment facility from Kolkata to Agartala. However, the same game can lead to a Prisoner's Dilemma with **(NC, NC)** where neither player has any incentive to interact with each other in the absence of symmetric information. It is a fact that without Bangladesh, it is hardly possible to for Player I to connect its north eastern region with Kolkata port. But, the concept of alternative solution concept of either Nash equilibrium or Prisoner's Dilemma depends solely on the policy of ruling government in Bangladesh.

4.1 Second Phase of the Game: This is the extension of the First Phase Game with the introduction of Player M in the present scenario. The first phase of the game will simply converted into a transit duopoly situation where Player B can choose either to cooperate and enjoy cartel solution between Player B and Player M or go for adopting a non cooperative strategy with Bertrand type completion model. In either of the alternative, Player I would be the gainer in terms of the sustainability of such transit facility in the long run. This is depicted in the following:

For Player B

Best Strategy (B1): Provide Transit Facility Unilaterally and enjoy monopolistic (bounded upward) transit fee

Next Best Strategy (B2): Go for market sharing with a cartel like solution with Player M converting the non homogeneous cargo into homogeneous cargo to protect the interest of both Player B and Player M

Worst Strategy (B3): Withdrawal of transit facility and suffers potential loss

For Player M

Best Strategy (M1): Provide Transit Facility Unilaterally and enjoy monopolistic (bounded upward) transit fee

Next Best Strategy (M2): Go for market sharing with a cartel like solution with Player B converting the non homogeneous cargo into homogeneous cargo to protect the interest of both Player B and Player M

Worst Strategy (M3): Withdrawal of transit facility and suffers potential loss

Table 2: Payoff matrix of Players with a Transit Duopoly Structure

Transit Duopoly		Player B		
		B1	B2	B3
Player M	M1	(TjB=TjM=MC, Low Transit Fees)	(Follower, Leader, Gain)	(TjM*,HPL, Gain)
	M2	(Follower, Leader, Gain)	(Cartel, Cartel, Gain)	(TjM*,HPL, Gain)
	M3	(HPL, TjB*, Gain)	(HPL, TjB*, MPL)	(HPL,HPL,HPL)

Note: 3 Person Game with pay off in the format (M, B, I)

1. TjB=TjM= MC: Represents Bertrand Solution;
2. Leader, Follower: Represents Stackelberg Solution;
3. Cartel: Cartel solution with homogeneous cargo;
4. MC: Marginal Cost;
5. HPL: High Potential Loss;
6. MPL: Moderate Potential Loss; and
7. Gain: Gain to India in terms of reduced transport subsidy for north eastern region.

From the above pay off matrix, it is clear that though (M1, B1) are the dominant strategy unilaterally for both the player to opt for monopolistic transit fees, separately but when the game will be played it will reduced to a Bertrand type solution with marginal cost pricing of transit fees to be charged from India. On the unilateral deviation from the game by either of the Player will simply promote the other player to opt for monopolistic transit fees and suffering potential loss for the player who will try to exit. Hence, the strategy of withdrawal of transit facility is always dominated by other two available strategies. Ultimately, the game will be reduced to a 2X2 form.

Within this reduced form game, the transit facility will continue thereby, giving Player I some relief in terms of reduction in staggering transport subsidy spent for its states in the north eastern region. The reduced form game also reveals that though M1 and B1 strategies are the dominant strategies unilaterally for Player M and Player B, respectively the game will end up with a stable solution at (M2, B2). The sustainability of such solution is further strengthening by the relaxation of third assumption of the model. The homogeneity of cargo simply implies that export advantage of the transit providers are maintained within the cartel solution. As mentioned above, if cargo is not homogeneous, Player I can easily transships rice through Bangladesh or transships readymade garments through Myanmar avoiding Myanmar and Bangladesh, respectively. Under homogeneity assumption, both the countries will try to maintain their relative advantages of their product through mutual cooperation. In this sense, (M2, B2) strategy will be a stable Nash solution for both the players. Simultaneously, Player I should not have any object against this strategy since cooperation would be the dominant strategy rather than to withdrawal from the game. Hence, this type of Nash equilibrium scenarios will benefit all the players where none of the players has any incentive to deviate from the game, thereby, making it sustainable In the long run.

5. Conclusion:

Though Bangladesh is suffering from mounted trade deficit with India but a close look towards its deficit component clearly shows that it is a net importer in multiple dimensions so far as its western side is considered. At the same time, it is a net exporter to India if its trade statistics is considered, it enjoys trade surplus with the north eastern region. Due to this strategic advantage, Bangladesh has some specific interest for trade with this region. Initially, Bangladesh was hesitating to allow India to provide transshipment facility for the north eastern region but India reciprocate it in right direction by providing similar transit facility to Bangladesh to reach the Himalayan landlocked countries like Nepal and Bhutan, thereby, actively participate in moving towards an integrated transport network for this region as a whole. Opening of Myanmar route further gives India some relief in terms of reduced transportation cost due to both inter and intra regional disadvantage for the partially landlocked state like Tripura. Further, a cartel solution with homogeneous cargo movement will make the game sustainable over time where none of the players has any incentive to deviate from the game

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