Market Access: A Case Study on Indian Pharmaceutical Goods in U.S. Market

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ABSTRACT

North-South trade failure with skewed income distribution has been a topic of debate for many decades despite the promises supported by many theories. The present paper gives different criticisms in three different versions: the first version criticises the faulty fixation of price of the goods based on marginal cost of production (inputs) in the manufactured country and not on the marginal cost of production (same inputs) in the importing country and exchange rate differences; the second version gives criticism on behavioural differences of firms in the North and the South; the third version criticises the differences in the technologies of production (whether licensed or not). Owing to the above criticisms, market access of the goods (from both the South and North) has differences and hence income distribution in equity cannot be achieved.

Keywords: Increasing Returns to Scale, Intra Industry Trade, Home market effect, Reciprocal dumping, The Flying Geese Approach.

1.0 Introduction

It was Leontief (1954) who gave the first criticism on the failure of North-South trade against the propounded theories. Many economists had opined the North as engine of growth which means that without an increase in Northern growth, the South as a whole cannot experience sustained increases in its growth. It is explained by increase in production due to technology transfer from the North to the South. The Northern engine, however, was not necessarily a very effective engine, for a number of reasons. First, the Northern and Southern goods have different income elasticities of demand. Thirlwall (1983) pointed out that the South would have to grow at a slower rate than the North to keep the North-South terms of trade constant.

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A model of balanced North-South trade with differential income elasticities of demand shows that in fact the global economy will converge to long-run equilibrium with stable terms of trade and unequal growth, the North growing at a faster rate than the South (Dutt, 2002). In addition to a large amount of empirical evidence on individual countries and products, there is some evidence to suggest that the overall Northern income elasticity of the demand for Southern goods is lower than the Southern income elasticity for Northern goods (Dutt, 2003), implying that there is a reason to believe that the result of divergent growth due to this mechanisms is likely to hold in the real world given the assumptions of the model. Second, the pattern of specialisation of North-South trade arguably implies that the North and South experience different rates of technological change. In addition to these problems that arise from the production of many kinds of Southern goods, the fact that many Southern countries are specialising narrowly in the production of one or a few primary goods creates additional problems UNCTAD (2011, 4). The present paper discusses this issue in three different versions viz. Heckcher-Ohlin-Samuelson (HOS), competition of firms (New Trade Theory by Krugman) and Technology transfer theorems.

The remaining paper is organised as follows. The second section deals with HOS (Factor Price Equalisation Theorem); the third section deals with competition of firm version, and the fourth section is technology transfer version. The fifth section deals exclusively with market access of Indian pharmaceutical goods in US market. The last section gives conclusion. This paper is constructed based on the earlier writings by many economists and UNCTAD annual reports and data for empirical study is collected from UNCOMTRADE.

2.0 Failure of North-South Trade: Critics on HOS (Factor Price Equalisation version)

According to the Old Trade Theory propounded by Ricardo, international trade will take place due to differences in the labour costs in two nations. According to HOS theory, trade will take place due to different proportions of factors of production in two states. In this trade theory, labour abundant countries will export labour-intensive goods and capital abundant countries will export capital intensive goods. These theories were accepted to be valid till 1970s. But since the late 1970s, there have been various arguments which question the validity of the Old Trade Theory. In the first argument against the Old Trade Theory, it has been observed that developed countries like the US and western European countries which are having similar technology and are capital abundant, had greater volume of trade among them whereas trade volume of these
developed countries with less developed and developing countries were witnessed to be very less. In the second case, there is high divergence in the relative incomes between developed and developing countries despite the factor price equalisation theory of the Old Trade Theory school. The third case argues that firms around the world haven’t followed the doctrines of perfect competition and constant returns to scale.

2.1 Explanation of failure

In order to explain failure of North-South trade, we take two hypothetical countries (say the North Country which is relatively abundant in capital and scarce in labour and a South Country which is relatively scarce in capital and abundant in labour compared to the North partner country). Again it is assumed that the North Country produces both capital intensive goods (say M goods) and food using scarce labour (say F goods). Before international trade is opened up, both the commodities are consumed by the North Country. However, it is considered that in the North Country, marginal cost of F is higher than the marginal cost of M due to relative abundance of capital and relative scarce of expensive labour. In similar fashion, in the South Country, both F and M goods are produced and consumed at marginal cost of M goods higher than the marginal cost of F due to its relative abundance of labour (Figure 1).

**Figure 1: HOS theorem**

Before trade: the North Country                            The South Country

![Diagram of HOS theorem](source: Krugman (1988), International Economics)

Now, it is considered that both countries open up for international trade and become each others’ trade partners. Now, the North produces M goods in more number
utilising its abundant capital (at lower marginal cost, MC) and also exports it to the partner South country. At the same time, the North is also producing F goods at level lower than its production before opening of trade and demanded F goods are again imported from the South Country. The situation is opposite in the case of the South country where trade leads it to produce more in F goods at lower marginal cost and importing excess demanded M goods from the north. In short both countries specialise in production of potential single goods (figure 2).

Figure 2: HOS theorem

\[ \text{Figure 2: HOS theorem} \]

\[ \text{Source: Krugman (1988), International Economics} \]

Condition 1: For North Country, \( P_m = MC_m < MC_f = P_f \)
For south Country, \( P_m = MC_m > MC_f = P_f \)
Condition 2: When the countries are in trade, in order to find the value of price of their products in international price, exchange rate of relative countries are brought in which is defined below:
Let \( \alpha = \frac{\text{Currency value of the South}}{\text{currency value of the North}} \)
\[ \rightarrow 0 < \alpha < 1 \]
In the world market,
Price of food in world market, \( P_f(w) = \alpha P_f \)
Similarly, Price of manufactured goods, \( P_m(w) = P_m \) (north), say the currency value of the North is prevailed in world market.

In the North Country, the amount of expenditure for import of F from the south in actual price = \( \alpha P_f Q \)
Where, \( Q = \) Quantity of imported
The above expenditure is based on the cost of production and exchange value in the south country.
However, theoretically (HOS) the value should be defined by the marginal cost incurred in production of food in the North Country and the price of F from the South should be given at the level of price of food produced domestically.
Hence, amount of value of import of \( F = P_f Q \)
Difference in amount of expenditure (Theory-Actual) = \( P_f Q - \alpha P_f Q \)
= \( P_f Q (1 - \alpha) \)

In the South country, actual value of expenditure incurred on the import of M from the North = \( P_m Z \)
However, according to theory, the value of import should be given at the marginal cost incurred in production of M at the south country = \( \alpha P_m Z \)
Hence the excess expenditures leaked out = \( P_m Z - \alpha P_m Z \)
= \( P_m Z (1 - \alpha) \)
Owing to above paradoxical conditions, income distribution became polarised and it had been in favour of the technologically advanced North countries. In order to protect the sectors where the North countries are not specialised due to scarcity of labours, they levy higher import taxes on the imported items from the south. This led to market inaccessibility of the goods from the South.

3.0 Competition of Firms (New Trade Theory) Version

Krugman in 1979, proposed a new theory assuming two countries having similar technology in production and labour as the only factor of production. Both Ricardian and HOS models would predict that there was no basis of trade between two such countries. Krugman’s innovation was to allow for increasing returns to scale (IRS) in the form of the fixed costs unrelated to the volume of output. He also used monopolistic trade theory instead of perfect competition where firms in these two countries produce using identical technology for differentiated products. This made price fall to the level of average cost.
(AC). So each country exports some varieties and imports others: intra-industry trade (IIT). This new trade model involves no changes in income distribution. But all the workers will be better off due to, first because they can now buy all the varieties produced by the both countries; and consumers can consume at lower price. Krugman in 1980 propounded a simpler version of this model includes transport costs with two important consequences. The first one is that now the firms will try to locate themselves in the larger market to minimise transport cost. This is called “home market effect” which means that a country will produce and export varieties for which it has greater demand. The second one is that allowing transport costs on exporting items, the price of that goods will higher in the world market which will lead to higher wage in that sector. Krugman (1984) propounded another theory whose market is oligopolistic rather than monopolistic. This framework states “reciprocal dumping” in which firms will export at lower price than what they charge in the home market. His competition version explains trade in the North and South that the South’s trade with the North is HOS. There is no product differentiation and firms work on perfect competition.

4.0 Capital movements and technology transfers version

Capital movements here mean the inflow of capital from the North which augments saving, capital accumulation, hence, growth rate. However, such capital movements are not embodied with technology on which the South increase their production with improved technology. The next one is technology transfer embodied with Foreign Direct Investments. It is assumed that it can lead to convergence (Lucas, 2000). It may be supposed that the South can learn about Northern technology by importing and observing Northern goods, and through the activities of transnational corporations which can bring in advanced technology which can even spread to domestic firms. It has been argued that the rate of technology transfer will be higher, if there is greater technology gap between the North and the South (Findlay, 1978). However, technology transfer needs some preconditions for the recipient country. The country should have capacity to build infrastructure, maintenance of IPRs, well-educated human resources. In short, the South needs to build up technological capability, which allows its firms to do these things, and not just obtain more productive technology. It has therefore been found that the rate of technology transfer depends not just on the gap between Northern and Southern technology, but also on the technological capability of the South to effectively transfer such technology. Effective transfer of technology depends not only on above conditions but also prevailing economic policies of the South. Most of the South countries are socialist countries, where import-substituting policies prevail. Such
policies are in favour of developing its own technology rather than permitting hosting of technology from the North due to political ideology. This leads the South to a state of technologically backwardness in production.

Another variant of technology transfer is “The Flying Geese Approach” which was proposed by Japanese economist, Akamatsu (1961) to explain the growth of late developers like Japan and which spread to other neighbouring countries (the Newly Industrialised Countries (NICs)), and then to other countries. According to this approach, the Japanese economy was argued to develop by first importing simple Northern consumer goods. Secondly, it needs to build up the capacity to produce these goods domestically with government support. Thirdly, learning to produce these better and exporting them. At last, it has to switch to a similar sequence for more technologically sophisticated capital goods. After Japan developed in this manner, its wage increased, and Japanese firms found it profitable to shift production of simpler goods to neighbouring Southern economies with lower wages, bringing in capital and technology, UNCTAD (2011, 46).

In order to explain North-South trade differences, the Southern countries are classified into two Developing Countries (DCs) and Less Developed Countries (LDCs) as done by UNCTAD in its report. DCs are the ones which have globalised their economy and hence allow Foreign Direct Investment (FDI) in manufacturing sectors. Foreign firms are permitted to open the manufacturing branches or as joint venture with local firms. They have tradable goods ranges from primary to high skilled manufactured goods. However, LDCs have comparatively restricted economies and the most of the firms are local. Hence their tradable goods are primary or semi-finished manufactured goods only. Tradable goods are classified into three – primary, semi-finished and manufactured goods. Again the manufactured goods also categorised into manufactured goods by either licensed foreign firms or joint venture foreign and domestic firms. LDCs export primary and semi-finished goods to the North countries and such goods are fully patented in the North since they are by nature inputs to the supply chain of production. Patenting of such primary and semi-finished goods by the North relieve them of the hike in input costs and tariff on the import of such goods are either very low or null. DCs export mainly semi-finished and manufactured goods to the North. Semi finished goods in this case also bear patented and fewer tariffs as found in LDCs. However, manufactured goods based on the firms of their production face discrimination. Manufactured goods produced by licensed foreign owned firms or joint venture firms have full patent in the market of the North and bear fewer tariff rate and hence they have full market access to all countries (developed, developing and less developed). Yet, the goods manufactured by local firms using the copied technology from the North face
severe restriction in their access to the market of the North. They have neither patent nor tariffs relaxation in the market of the North. Such types of goods are very common to the pharmaceutical, electrical and telecommunication industries. However, they have easy market access to the DCs and LDCs since they are closely substitute of their highly patented rival goods and mediocre by nature. It is found that total cost borne for the goods produced using copied technology are the sum of costs in production and cost incurred in paying tariff. Cost borne for the goods produced using the licensed or patented technology derived from the North are the sum of cost of production and cost incurred in the form of royalty to the parental firm of the North. For the similar goods cost of production using copied technology is reported less than the cost of production using the technology from the North. It is also reported that for similar goods produced using patented or licensed technology, they will bear lesser tariff rate than the rate borne by the goods using copied technology for close substitute goods, for their access to the northern market, Maskus (2004, UNCTAD, Issue No. 7, p. 24).

Based on the findings from the reports, a clear diagrammatical picture of combination of patent versus tariff constrained to total costs can be derived for exported goods (Figure 3). Supported by the report, we can derive the Production Mode Curve (PMC) which is formed by the combination patent and tariff. Production Mode Curve (PMC) has the following assumptions:

- PMC like indifference curves, slopes downward from left to right. This is so, because when tariff rate increases, the rate of patent reduces. For exported goods, the role of patent and tariff rate plays crucial role in its production. If exporter firm wants to face lower tariff rate, it need to produce the goods using patented technology of the North. If it uses copied technology, it needs to face higher tariff rate.
- No two PMCs can intersect each other, which mean that different goods should have different PMCs in their mode of productions.
- PMCs are convex to origin. The convexity of PMCs means that as we move down the curve successively smaller degree (or extent) patent are required to be substituted by a given increment in tariff rate.
- Like Cobb Douglass production, there should be two market access elasticities of patent and tariff rate of exported goods. It is necessary that market accessibility of exported goods should have different levels of elasticities to combinations of different level patents and tariff rates.
The PMC and cost curve figure shows horizontal axis as tariff rates, and vertical axis as degree of patent. PMC is convex to origin. There are different cost curves as shown in the figure. PMC cuts higher cost curve at A and C; and touches lower cost curve at B. Three cases can be put forward with regard to the combinations of degree of patent and tariff rates and the best combination can explained as follows:

1. At B, the exported goods have a combination of degree of patent, and tariff rate with lower cost curve. According to economic theories, this combination can be identified as the best point of combination with minimum cost.

2. At A, the combination has higher degree of patent, and at the same time, it has lower tariff rate. However, cost is comparatively higher compared to point B. The reason is that there is higher cost of production as well as higher royalty for licensed technology from the North.

3. At C, combination of degree of patent and tariff rate is such that having lower degree of patent and higher rate of tariff with higher cost compared to cost at B. Cost of production is low due to using lesser licensed technology. However, high cost is
incurred at time of access to the Northern market owing to lower patented exported goods. Hence the total cost borne at last will be high.

The above three cases put forward a decision to firms in the exporting country that what type goods to be manufactured using what extent of patent of technology and how much tariff rate it can face in its access to northern market so that cost incurred to be set at the lowest level.

The above given properties of PMC and three cases of combination deduce the idea of market access of an exported goods as below

\[
\text{Market Access of goods} = \frac{T^\beta P_t^{1-\beta}}{C}
\]

where,
- \(T\) = Tariff rate levied on the goods originated from the South by the North
- \(P_t\) = Degree of patent given the goods
- \(C\) = Marginal cost of production of the goods
- \(\beta\) = Market access elasticity of tariff rate

The above given formula has some limitations. Firstly \(C\), the marginal cost of production should not be zero. Secondly, \(\beta + (1-\beta) = 1\), which means that constant returns to scale of patent and tariff. Such characters on elasticity are valid for perfectly substitutable goods only. However, values of elasticity for imperfectly substitutable goods may not hold as above. The following cases are witnessed.

1. Market access of the goods manufactured in the DCs and LDCs using licensed or patented technology innovated in the North with lower marginal cost of production have highest score both in the North and South.
2. Market access of the goods; the same goods manufactured in the North using the same technology with higher marginal cost of production is less in the market of DCs and LDCs.
3. It can be strongly said that the substitute goods using unpatented copied technology mainly in DCs do not have market access to the North.

5.0 Market Access of Indian Pharmaceutical Goods in US market

The present study is highly suitable for pharmaceutical industry, since this industry has a number of issues arising out of patents. There have been three major phases of pharmaceutical industry in India. The first phase covers a period from 1970 to 1994; the second phase starts from 1995 till 2004; and third phase has been since 2005
till date (Choudhuri, 2005). The salient features of the first phase is that Indian Patents Act of 1970 did not recognise product patents but only process patents, that allowed Indian pharmaceutical companies to reverse engineer and manufacture at significantly lower costs. Then in 1995 India became the member of WTO and the second phase of pharmaceutical industry started. The patent regime has been made TRIPs compliant. This TRIPS compliance, in very specific terms, has led to the introduction of the following set of measures such as introduction of EMR (Exclusive Marketing Rights) provision with retrospective effect from January 1, 1995 till 2005; reversal of burden of proof from patent holder to alleged infringer; product patents relating to Chemicals, Drugs, Medicines and Food Products etc. There was a small sub-period of revision in 1999. The third period starts from 2005 and the Indian pharmaceutical firms opened to three choices: (a) They can focus on products that are either off patent (essentially the generics market); (b) They can collaborate with Western MNCs and biotech companies (two areas that are likely to witness an increase in collaborations are clinical trials and R&D outsourcing) and; (c) They can focus on innovations that the MNCs will not be interested in; that is mainly ‘tropical’ or developing world diseases. These periods have been coincident with slashing tariff rates in successive periods, and have led to increase in the access of Indian pharmaceutical products to world as well as home markets. In the present study, cost incurred (inputs, labours, etc) is assumed to be similar in all products. PMC may not be convex to origin necessarily since exponents embodied on degrees of both patent and tariff rate are assumed to be 1. The present study deals with the empirical analysis only on US market. Scaling (1 to 10) of both tariff and patent are made in order to make them possible for estimation. In the case of tariff, scale 1 is given, when tariff rate is 0% in ad valorem duty; scale 3 is given for tariff rate below 1%; scale 5 for 1.03%; and scale 9 for 1.24%. In similar fashion, patent scaling are also done- scale 2 is given to patent from 1990 to 1994; scale 5 for period from 1995 till 1999; scale 6 is given for 1999-2004; and scale 9 for 2005-2009. Related table on market access (here value of trade) and tariff rates are given in table 2. Related PMC is given in Figure 4. The Related PMC gives a linear curve with $R^2$ (0.96). Horizontal axis (X axis) is tariff rate, and vertical axis (Y axis) as degree of patent (Figure 4). In order to check, significance (at 5% level) and contribution of these two variables on Market access, OLS (Ordinary Least Square) method is run after taking log of all dependent and independent variables. The estimated values are given in Table 1. The Table shows that logpatent is highly significant since value of probability is 0.0 which is much lower than 5%. Similarly logtariff is not much significant since its probability (6.7%) is higher than 5% but significant at 10% level of significance. However, number of observation is 19 which is lower and more number of observations is expected to make variables significant.
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Figure 4: PMC

\[ y = -0.8286x + 9.2286 \\ R^2 = 0.9611 \]

Source: Author’s own calculation

Table 1: Estimated Results

|          | Coef.  | Std. Err. | t     | P>|t| | 95% Conf. Interval |
|----------|--------|-----------|-------|-----|-------------------|
| logimport| 1.75754| 0.894326  | 1.97  | 0.067| -0.1383461 - 3.653427 |
| logtariff| 6.769549| 1.055974  | 6.41  | 0.000| -4.530984 - 9.008115 |
| logpatent| -0.7127894| 0.8396896| -0.85 | 0.408| -2.492852 - 1.067273 |
| _cons    | -0.7127894| 0.8396896| -0.85 | 0.408| -2.492852 - 1.067273 |

R² = 0.78; No. Observation = 19

Source: Author’s own calculation

6.0 Conclusion

Despite the theory, trade differences, and skewed income distribution between the South and the North are hardly solved. Reasons according to the analysis in this paper are (a) faulty fixation of price of the goods based on marginal cost of production (inputs) in the manufactured country not on the marginal cost of production (same inputs) in the importing country; (b) exchange rate differences; (c) behavioural differences of firms in the North and the South; and (d) differences in the technologies of production (whether licensed or not). As long as these situations prevail, market access of the goods (from both the North and South) would have differences and hence income distribution in equity cannot be achieved.
References


**Weblinks**


[www.uncomtrade.org](http://www.uncomtrade.org)

**Appendix: Trade data**

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<th>Trade Year</th>
<th>Tariff rate</th>
<th>Imports Value in 1000 USD</th>
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*Source: UNCOMTRADE.*