INITIATING THE PRODUCT SPACE:
A VIEW ON EXPORTING PRODUCTS OF BANGLADESH

A THESIS
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Of
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DEPARTMENT OF
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STATEMENT OF ORIGINALITY

It is hereby declared that the content of this thesis is original and any part of it has not been submitted elsewhere for the award of any degree or diploma of the university or other institute of higher learning.

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The thesis titled "**Initiating The Product Space: A view on the exporting products of Bangladesh**" by Roll No: ASH 1201037M has been accepted as satisfactory in partial fulfillment of the requirement for the degree of Bachelor of Science in Computer Science and Telecommunication Engineering (CSTE) to be awarded by the Noakhali Science and Technology University.

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Abstract

Much of industrial development is a gradual and path-dependent process. Countries move from the products that they already produce to others that are similar, in terms of capital requirements, knowledge and skills. Not all the feasible new products however contribute in the same way to aggregate value added and growth. Economic growth of a country depends on the improvement of quality of the products. In this thesis, we investigate the product which are dominating in world market using the methods given by Hausmann and Klinger (2007), Hausmann et al. (2007), and Hidalgo et al. (2007). We find out six products (jute, leather, shrimp, textile yarn and fabric, knitted cloth, frozen fish) out of 43 products that are exported by Bangladesh. However, the product qualities are decreasing in the recent years. We compare the RCA of these products with evolution of time with India and observe that the quality of this products of India is increasing with time. We also analyze the PRODY, a criterion that denotes the economic sophistication. Finally, we suggest that to be a developed country, we have to improve the quality of our product.

Keywords: Trade flow, RCA, PRODY, Product Space.

I. INTRODUCTION

Economic development is a long and challenging process of structural transformation. It involves large-scale changes as new and leading sectors emerge as drivers of employment creation and technological upgrading. This process is particularly challenging for developing countries like Bangladesh since their efforts to upgrade and diversify their economies take place in an interdependent world where earlier industrializers have already accumulated significant cost and productivity advantages. In this context, it is critical to use targeted and selective government policies to sustain the transformation process and boost economic dynamism.

History shows that successful governments have addressed different challenges and used a variety of policies encompassing, for instance, market building, technological upgrading, removal of infrastructural bottlenecks and support to enterprise development.

This paper focuses on the criterions of the product space like revealed comparative advantage and PRODY. It presents a simple methodology to identify the growth of export potential sectors and goods where a country is more likely to be competitive,

given its productive capabilities. In doing so, we operationalize the notion of the product space, developed by Hausmann and Klinger (2007), Hausmann et al. (2007), and Hidalgo et al. (2007).
We consider 114 countries and 43 products and build a dataset that provides a concept of the trade flow of the past eight years (2008-2015) of Bangladesh. And Considered the trade value of each product to calculate the Revealed Comparative Advantage from UN-COMTRADE.
The paper is intended solely to present the data, lay out the methodology and show how it can be made operational. Our approach is entirely supply-side based and implicitly assumes demand to be present for any of the products identified. In fact, our methodology simply determines which goods are feasible to produce (i.e. goods not so distant from the current export basket in the product space) and also improve average sophistication, but does not look into their effective marketability.

The methodology can be seen therefore as a tool to pre-screen products and locate them in the product space, but policymakers would need to complement this analysis by looking at the existing demand, in internal and external markets, and design appropriate policies.[1] Policymakers would also need to choose the appropriate policy mix to support those goods identified as potentially worth to produce and export. In this sense, this paper proposes a new instrument(RCA) to be added to the policymakers' toolset and by no means an alternative to existing industrial policymaking practices.

The remainder of the paper is organized as follows. Section II provides some background on the World Trade Topology & Product space literature. Section III presents the methodology in detail. Section IV presents the potential benefits of implementing our methodology, its feasibility and some of its limitations. Section V contains the conclusion.

II. BACKGROUND

Bangladesh is one of the quick growing economy country since last decade. So we tried to sort out the Trade flow(Export) of Bangladesh for last eight years (2008-2015). Due to do this we needed to come in aid of a few articles of World Trade Flow by Ma A´ngeles Serrano and Maria´n Bogun ˜a (2003). In the articles they applied topology of the world trade web. And We are plotting a Year Vs Trade Flow graph that shows of yearly growth of Bangladesh economy.

Again We are going to see the growth of product exportation individually. To do so we followed a few articles base on Revealed Comparative Advantages and PRODY by Hausmann and Klinger (2007), Hidalgo et al. (2007) and Hidalgo and Hausmann (2009).

In a series of articles, Hausmann and Klinger (2007), Hidalgo et al. (2007) and Hidalgo and Hausmann (2009) explain economic development as a process of learning how to export (and produce) more complex products. They show that a country's development path is determined by its capacity to accumulate the capabilities required to produce different and progressively more sophisticated goods. In this framework, capabilities are the set of product-specific factors (capital, knowledge, institutions, etc.) needed to produce a good. At the firm level, they are the "know-how" or working practices held collectively by the group of individuals comprising the firm.

Hidalgo et al. argue that the assets and capabilities needed to produce one good are imperfect substitutes for those needed to produce another good, but this degree of asset specificity varies from product to product. Correspondingly, the probability that a country will develop the capability of competitively producing one good is related to its current capability to produce other goods that are similar or closely related, and for which the existing productive capabilities can be easily adapted. According to this view, economic development is not only a process of continuously improving the production of the same set of goods, but more importantly, a process that pursuits new lines of activity associated with higher levels of productivity.

The notion of product space introduced by Hidalgo et al. (2007) encapsulates these ideas. The product space is a representation of all products exported in the world, where the distance between each pair of products represents the probability of producing one of them for a country that already produces the other. The lack of connectedness between the products in the periphery (low-productivity products) and in the core (high-productivity products) explains the difficulties poor countries face to reach a production structure that fosters income level convergence with rich economies.

To measure the productivity (or sophistication) of different products, Hausmann, Hwang and Rodrik (2007) suggested a measure based on the income per capita of countries with comparative advantage to produce a specific good. More precisely, the sophistication of a product is calculated as an average of the income per capita of the countries exporting the good, weighted by each country's share in the global exports of the product. Economic (or country) sophistication on the other hand, is given by the productivity level associated with a country's export basket, and it is calculated as a weighted average (where the weight is the share of the product in the country's export basket) of the sophistication of the products

exported by the country.
Hausmann et al. (2007) show that not all products have the same effect on economic development. There are productive capabilities used for the production of some goods that can be easily redeployed for the production and export of other goods with higher value added. And there are other products that embody capabilities that can hardly be used for the production of other goods. They also show that their measure of economic sophistication is a good predictor of future growth

We operationalize the above mentioned methodology by mapping on the product space the export structure of 43 products and classifying them according to their degree of sophistication(PRODY) and distance from the current export basket. We then compare them with Bangladesh neighboring country (in this case India).

III. METHODOLOGY

Our approach builds on the idea that at each moment in time an economy faces a set of upgrading possibilities and that it needs to select among them, assuming no constraints on the demand side. We therefore adopt a measure of productive capabilities which gives us information on the feasible set of new production and export possibilities, and a measure of the value associated with each one of these possibilities. In our analysis, we use variables previously used in earlier contributions to the Trade Flow literature.

3.1 Trade Flow

Trade Flow is the criteria that designates the buying and selling of the goods between countries. Trade flows measure the balance of trade.

Trade Flow=(Export-Import)

This is the amount of goods that one country sells to other countries minus the amount of goods that a country buys from other countries. This calculation includes all international goods transactions and represents a country's trade balance. Countries that are net exporters export more to international clients than they import from international producers.Net exporters run a trade surplus. This is due to the fact that they sell more goods to the international market than they purchase from the international market. Demand for that country's currency then increases because international clients must buy the country’s currency in order to buy these goods. This causes the value of the currency to rise. Countries that are net importers import more from international producers than they export to international clients.Net importers run a trade deficit. This is due to the fact that they purchase more foreign goods than they sell to the international market. In order to purchase these international goods, importers must sell their domestic currency and buy a foreign currency. This causes the value of the domestic currency to fall.

As an example, let us look at Japan, which is an export-driven economy which usually runs a trade surplus. Japan exports more goods to international clients than they import from international producers.

Japan's trade surplus is the major reason why the JPY has not depreciated sharply despite severe economic weakness.

Japan is a net exporter with a current account surplus of about 3% of GDP. This creates international demand to buy the JPY in order for international clients to purchase Japanese products.

Clearly a change in the balance of payments from one country to another has a direct effect on currency levels.

Therefore, it is important for traders to keep abreast of economic data relating to this balance and understand the implications of changes in the balance of payments.

3.2 Revealed Comparative Advantage

The product space is a geometrical representation of products, built on the notion of *proximity* between different goods. Several factors may determine the level of proximity between products. For instance, Leamer (1984) stresses the importance of the intensity of broad factors of production such as labor, land, and physical capital; Lall (2000) emphasizes instead the level of technological sophistication; and Rodrik et al. (2002) look at the role played by institutions. All of these measures are based on a priori notions on what makes a product more similar to another, assuming that factors of production, technological sophistication or institutional quality exhibit little specificity.

The product space literature builds on a purely outcome-based measure, based on the idea that if two goods are related, because they require similar institutions, infrastructure, physical factors, technology, or some combination thereof, then they will tend to be produced in tandem; whereas highly dissimilar goods are less likely to be produced together. For example, a country with the ability to export apples will probably have most of the conditions suitable to export pears. They would certainly have the soil and the climate, together with the appropriate packing technologies, frigorific trucks and containers. They would also have the human capital, particularly the agronomists that could easily learn the pear business. However, when we consider a different business such as mining, textiles or appliance manufacture, all or most of the capabilities developed for the apple business are useless.

Closely following Hausmann and his co-authors to generate such an outcome-based measure of proximity based, on the assumption that similar products are more likely to be exported in tandem, we do not consider marginal exports and focus only on those products for which the country examined has a revealed comparative advantage (RCA). We thus use the notion of RCA introduced by Balassa (1977), which puts forwards that a country *j* has a comparative advantage in product *k* if the share of this product within the country's export basket is larger than the share of this product in the global market (RCA > 1),

$$\mathbf{RCA}(\mathbf{c},\mathbf{i}) = \frac{\dfrac{\mathbf{x}(\mathbf{c},\mathbf{i})}{\sum_{\mathbf{i}} \mathbf{x}(\mathbf{c},\mathbf{i})}}{\dfrac{\sum_{\mathbf{c}} \mathbf{x}(\mathbf{c},\mathbf{i})}{\sum_{\mathbf{i},\mathbf{c}} \mathbf{x}(\mathbf{c},\mathbf{i})}}$$

where X_{ci} is the value of exports by country *c* of good *i*.

This definition of RCA allows us to set a threshold for a country's exports. When RCA_{ci} is greater or equal to 1, we say that country *c* is an effective exporter of product *i*, and when $RCA_{ci}<1$ we say that country *c* is not an effective exporter of that product.

Using RCA as an indication of a country effectively exporting a good, Hausmann and Klinger (2007) define the proximity between goods *k* and *h.*

where P (RCA_k Σ 1|RCA_h Σ 1) is defined as the probability that a country exports good *k* with RCA > 1, given it also exports good *h* with RCA > 1. More specifically, proximity is

calculated by comparing how many countries that export product *k* with RCA > 1 also export product *h* with RCA > 1. For example, if 10 countries export product *k* with RCA > 1, and 5 out of those 10 countries
also export product *h* with RCA > 1, then the *proximity* (or the general probability to export) for product *k* in relation to product *h* is 0.5.
This definition considers the minimum of the two conditional probabilities because conditional probability is not a symmetric measure: $P(k|h)$ is not equal to $P(h|k)$, yet the notion of proximity between two goods is symmetric. More importantly, as the number of exporters of any good *k* falls and eventually goes to one, the conditional probability of exporting another good given you export *k* becomes a dummy variable, equal to 1 for every other good exported by that particular country, and 0 otherwise, thus reflecting the peculiarity of the country and not the similarity of the goods.
Since we are interested in the probability of moving from a given set of products (the current export basket) to a new not-yet exported product *h,* we adopt the aggregate measure of proximity proposed by Hausmann and Klinger (2007): *distance*. Distance is the conditional probability of exporting a new good *h*, given the current export structure. Intuitively, this implies that if a country exports goods embedding most of the capabilities required to produce a new product *k*, the likelihood of producing this good and start to export it is relatively high.
We Calculate Revealed Comparative Advantages to see the probability of the product wheather it can be exported in future or not. The more the value of RCA, the more the product can be exported in future in comparison with the neighboring country.

3.3 PRODY

To measure the quality of exports and its variation over time we use a measure of export sophistication introduced by Hausmann et al. (2007). The export sophistication index attempts to capture the implied productivity of exported goods, by relating the gross domestic product (GDP) per capita to the export basket of the country. The intuition behind it is that, when exporting a good, countries implicitly reveal their productivity levels. For instance, in the absence of trade interventions, products exported by richer countries will have features that allow high wage earning producers to compete in world markets. Advanced technological content is certainly one of these features, but is not the only one. Other factors, such as the availability of natural resources, marketing or branding, quality of infrastructure, transportation costs or the degree of fragment ability of the production process may also play a role in determining a country's export basket.
Hausmann et al. (2007) developed constructed a quantitative index that ranks traded goods according to their implied productivity and that, in a broad sense, captures the different factors determining a country's export basket. The overall assumption is that the higher the average income of the exporter, the more sophisticated the export is. We follow Hausmann et al. (2007) and construct an export sophistication index by country.
We measure the level of sophistication both at the product and at the country level. We first calculate the GDP per capita (i.e. the implicit productivity level) associated with each exported product. This product-level measure of sophistication is designated PRODY.

It is calculated as the RCA-weighted gross national income (GNI) per capita of each country exporting product *k*:

$$\mathbf{PRODY(c,i)} = \sum \frac{\frac{\mathbf{x(c,i)}}{\sum_{\mathbf{i}} \mathbf{x(c,i)}}}{\frac{\sum_{\mathbf{c}} \mathbf{x(c,i)}}{\sum_{\mathbf{i,c}} \mathbf{x(c,i)}}} \times \boldsymbol{Y}$$

PRODY denotes a product's sophistication which suggests a notional level of per capita income. It shows the growth of Trade flow. The more the PRODY, the stronger a country's economics is.

3.4 Picking products

We consider 114 countries at different levels of economic development and build a dataset collecting information on the position of each country in the product space and on their upgrading possibilities, at a progressively increasing distance from the current export basket. More precisely, for each country we classify all not-yet produced items into ten different groups progressively farther from the current export basket. We later identify in each of this group those products with the highest sophistication.

To clarify our approach to product-selection, consider figure 1 below which depicts the upgrading opportunities of an imaginary country A in the product space. The vertical axis measures the level of sophistication of different products while on the horizontal we report the distance among them. The export bundle of country A is represented by the shaded area located next to the vertical axis, while the small circle inside this area indicates the average level of sophistication of the goods exported by country A. The figure also depicts the different upgrading opportunities faced by the country and characterizes both the sophistication level of the potential new products (i.e. the vertical axis value of any product outside the bundle) and its distance from the current export basket. The further away the country's current export basket is from a specific good, the less likely it is for the country to start producing that good. In the figure, for example, country A is more likely to produce T-shirts than wrist-watches and weighing machinery than semiconductors. However, as shown in the figure, the latter would provide a much bigger gain in terms of sophistication.

Taken together, these two measures provide important information on what is more feasible and profitable to produce in terms of contribution to economic growth. For instance, semiconductors are very far away from the set of production capabilities present in the country. T-shirts and sportswear are more likely to be produced, but the effort may not be worth it since the country already produces more sophisticated goods. On the other hand, the country is equally likely to produce wrist-watches, bookbinding machinery and weighting machinery. However, pursuing the production of bookbinding machinery and wrist-watches is more profitable because they have a higher level of sophistication.

One can consider our methodology as first reproducing a bi-dimensional space, analogous to the one depicted for country A, for any of the economies in our sample. Then we identify the most sophisticated potential new products at different levels of distance (in the case of country A, these would be trousers, sportswear, wrist-watches and finally semiconductors).

We also identify within the existing export structures those most sophisticated items whose production could be easily intensified. In order to do this, we classify country by country the exported goods and categorize each good on the basis of its RCA; we identify: (1) transition products (RCA < 0.5 in 2008, RCA > 1 in 2015), (2) underdeveloped products (RCA < 0.5 in 2008, RCA < 0.5 in 2015), (3) established products (RCA > 1 in 2008, RCA > 1 in 2015), and (4) losing products (RCA > 1 in 2008, RCA< 1 in 2015). This allows us to identify goods that are more sophisticated than the average of the ones already exported by each country while at the same time being relatively well placed in terms of competitiveness on the international markets.

IV. APPLYING METHODOLOGY &RESULT ANALYSIS: Trade Flow OF Bangladesh, RCA Comparison, PRODY

4.1. Trade Flow of Bangladesh

This is a study based on the methodology connected to the gravity analysis in Bangladesh Trade flow. Here we tried to show the increase of trade flow of Bangladesh through the year (2008-2015).

TRADE FLOW OF BANGLADESH (2008-2015)

Year	Trade Flow Code	Reporter Code	Trade Value (US$)
2008	2	50	15506719178
2009	2	50	15558633995
2010	2	50	19230982559
2011	2	50	24313744243
2012	2	50	24513500832
2013	2	50	24537341006
2014	2	50	31208940000
2015	2	50	31734162419

From the trade flow analysis, we see that in the year of 2008 and 2009 the the trade value of export was quite stable. In the year of 2010 it increased in a huge way and the next three years it increased quite slowly. After 2013 the trade value increased geometrically.

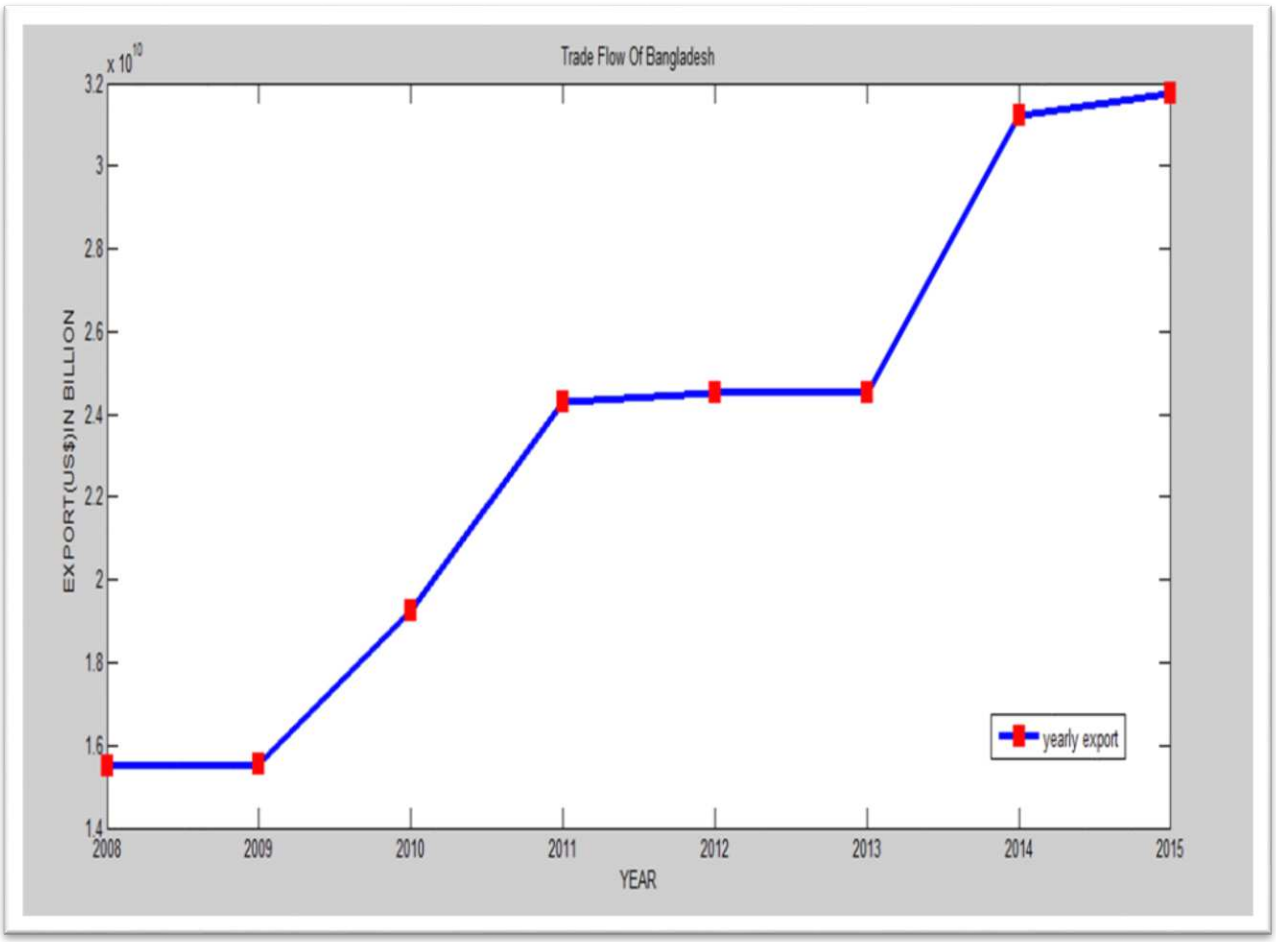

Fig 1: Trade Flow of Bangladesh

The figure shows the increase of trade value from 2008 to 2015. In 2008 trade value was 15.55 billion US dollar. From then the trade value of Bangladesh to 15.60, 19.2, 24.3, 24.5, 24.55, 31.2, 31.73 billion US dollar. Though the trade value increased we cannot say that the economy of the country developed that much. To see the development, we actually need to see all the individual products trade value that are highly exported to the world from Bangladesh.

4.2. Revealed Comparative Advantage (Top Products of Bangladesh)

The revealed comparative advantage(RCA) is the criterion that reveals the future of exporting a product. When the value of RCA of a product in a country is greater than the RCA of that product in other country, it is confirmed that product of that country (which has greater RCA) will dominate in exporting of that product.

So we calculated the revealed comparative advantage of 43 products that are exported by Bangladesh, using the SITC rev 4 data of eight Years and Compared the RCA of top six exporting product with the neighboring country India.

4.2.1. Jute

Jute is the main cash crop of Bangladesh. Jute has always played an important role in the economy of Bangladesh. It has become an industrial raw material for production of packaging. As the production of the Jute decreased, the exportation of Jute of Bangladesh is no.2 in the world. So we calculated Both Bangladesh and India's RCA.

Revealed Comparative advantages of Jute in Bangladesh and India

Year	Trade Flow Code	Reporter Code	Trade Value (US$)	Total Export Of The Product	Total Export (Bangladesh)	Total Export India ($US)	Total Export (Wrld)	RCA (BD)	RCA (INDIA)
2008	2	50	1.62E+08	1.97E+08	1.55E+10	1.61E+11	1.42E+13	753.7003	0
2009	2	50	1.63E+08	2.02E+08	1.56E+10	1.77E+11	2.33E+13	1203.917	4.59E+00
2010	2	50	2.79E+08	3.49E+08	1.92E+10	2.2E+11	2.88E+13	1194.804	1.25E+01
2011	2	50	2.95E+08	3.37E+08	2.43E+10	3.01E+11	1.74E+13	6.26E+02	3.03E+00
2012	2	50	2.42E+08	2.83E+08	2.45E+10	2.9E+11	1.75E+13	6.11E+02	2.17E+00
2013	2	50	1.52E+08	2.04E+08	2.45E+10	3.37E+11	1.86E+13	5.67E+02	2.47E+00
2014	2	50	4.29E+08	4.88E+08	3.12E+10	3.18E+11	1.83E+13	5.16E+02	1.87E+00
2015	2	50	1.23E+08	1.9E+08	3.17E+10	2.64E+11	1.6E+13	328.4425	3.37E+00

As we calculated The RCA of jute of both countries we compared them in a plot.

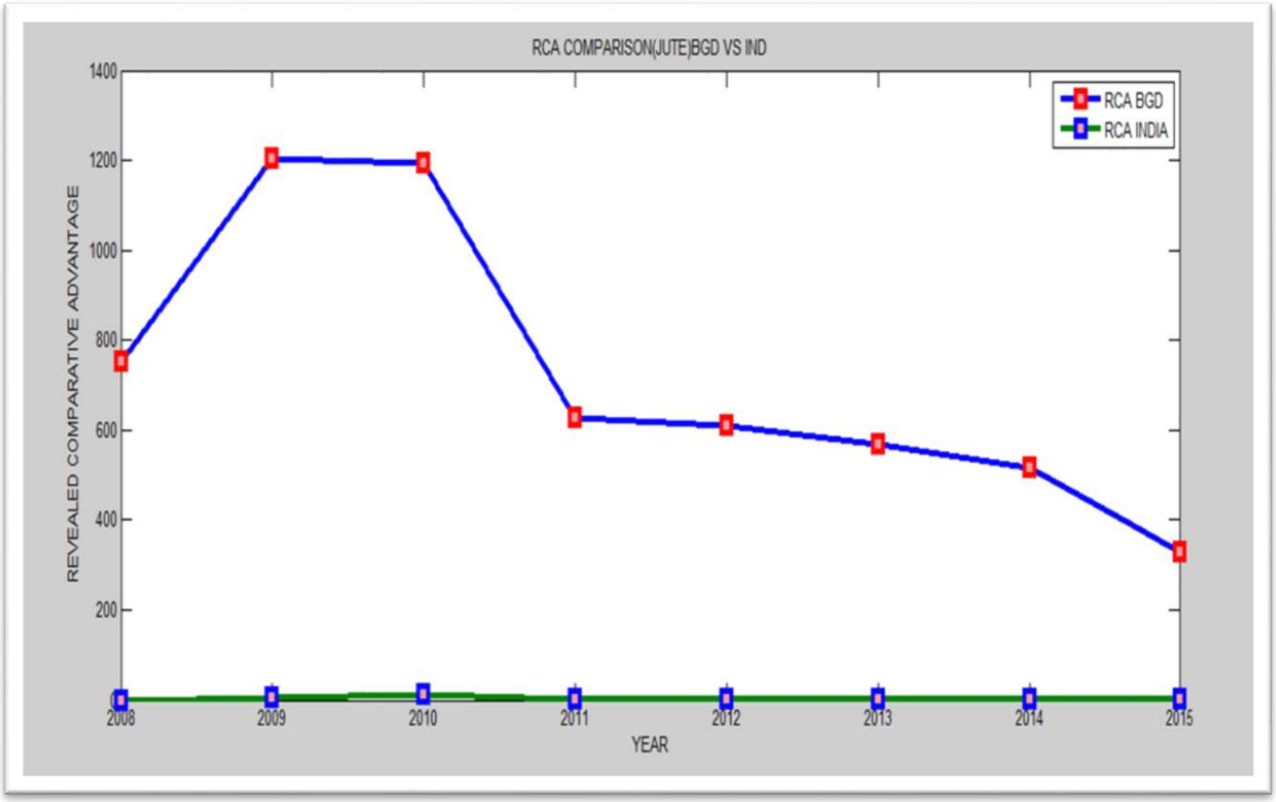

Fig 2: Comparison of revealed comparative advantage of jute (BGD vs IND)

Figure shows that the RCA of jute in Bangladesh for last 8 years is way too much larger than India's RCA of jute. From the figure we see that the RCA of jute in Bangladesh was growing till 2010.But after 2010 the RCA of jute is decreasing gradually. In 2009 the RCA was 1203.91 and in 2015 it decreased to 328.4425 which is alarming.

4.2.2. Shrimp

The country's shrimp export earnings in 2009-10 fiscal was recorded at $375 million, posting a more than 7 per cent negative growth. But, in the first 10 months [July-April] of year the quantity of shrimps exported would cross the 100 million pound compared to 82 million pounds exported in 2009-10. Exporters find high demands again for the product in Bangladeshi shrimp at the beginning of the current fiscal year when the recession lack of spiritedness from the of growing up, Restaurant and in the Home of the European Union and The United States. So we calculated the RCA of Shrimp and compared them with India.

Revealed Comparative advantages of Jute in Bangladesh and India

Year	Total Export (Bangladesh)	Total Export India($US)	RCA(BD)	RCA(INDIA)
2008	15506719178	1.60872E+11	54.87331	8.15
2009	15558633995	1.76765E+11	52.08517	10.09
2010	19230982559	2.20408E+11	57.61331	11.6
2011	24313744243	3.01483E+11	27.1	7.08
2012	24513500832	2.89565E+11	14.5	8.32
2013	24537341006	3.36611E+11	22.2	9.6
2014	31208940000	3.17545E+11	16.1	11.4
2015	31734162419	2.64381E+11	25.58099	24.8

As we calculated The RCA of jute of both countries we compared them in a plot.

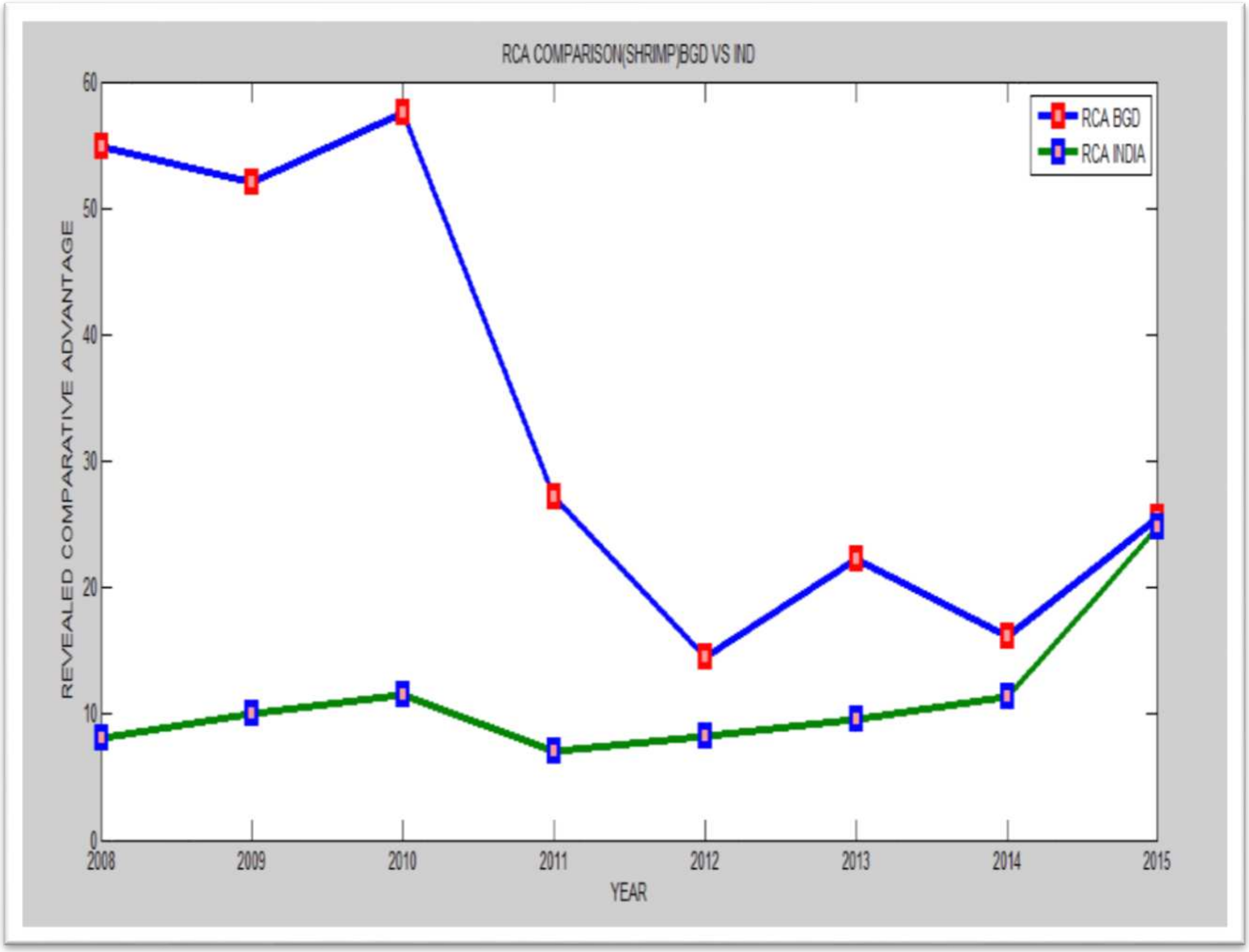

Fig: Comparison of revealed comparative advantage of Shrimp (BGD vs IND)

From the figure we can see that though Bangladesh was greater in RCA of Shrimp after 2011 it started to decrease and the RCA of India started to increase. That means in exporting Shrimp Bangladesh losing its market and India is covering it. shrimp, contributes about 6% to the national GDP and 5% to the national export earnings. If the RCA decrease at this rate it is a matter of great concern.

4.2.3. Leather

Leather was the largest industry of Bangladesh in the year 2014-15. But it could not have managed to export as before. We calculated the RCA for leather of Bangladesh & India and we can see the decrement in the RCA of the leather of Bangladesh. Local leather experts calculate potential exports at $5 billion if environmental compliance concerns are appropriately addressed. Foreign customers have expressed serious concerns over the environmentally damaging practices of the leather industry in its current location of Hazaribagh, and some, including the European Union, have considered suspending sourcing of leather from Bangladesh. The government of Bangladesh is working to address these concerns by establishing the new Savar Tannery Estate, which conforms to strict environmental standards. The Central Effluent Treatment Plant (CETP) will be the primary waste management facility of the new industrial estate. While construction of the CETP officially began on March 30, 2014, as of mid-2016, the CETP and Dumping Yard remained unfinished. The construction may be completed by the end of 2016.

Revealed Comparative advantages of Leather in Bangladesh and India

Year	Reporter Code	Total Export (Bangladesh)	Total Export India($US)	RCA(BD)	RCA(INDIA)
2008	50	15506719178	1.60872E+11	8.857	0
2009	50	15558633995	1.76765E+11	12.93273	4.403198
2010	50	19230982559	2.20408E+11	14.52339	4.30E+00
2011	50	24313744243	3.01483E+11	8.310737	2.30E+00
2012	50	24513500832	2.89565E+11	9.182014	2.520353
2013	50	24537341006	3.36611E+11	1.10E+01	2.64E+00
2014	50	31208940000	3.17545E+11	8.68E+00	2.72
2015	50	31734162419	2.64381E+11	5.8167	2.73E+00

As we calculated the RCA of Both Bangladesh and India we plotted the comparison and from the plot we can see that the value of RCA of Bangladesh is continuously decreasing after the year of 2010. And we got a slight pick in the year of 2013.But after that year the RCA is decreasing again.

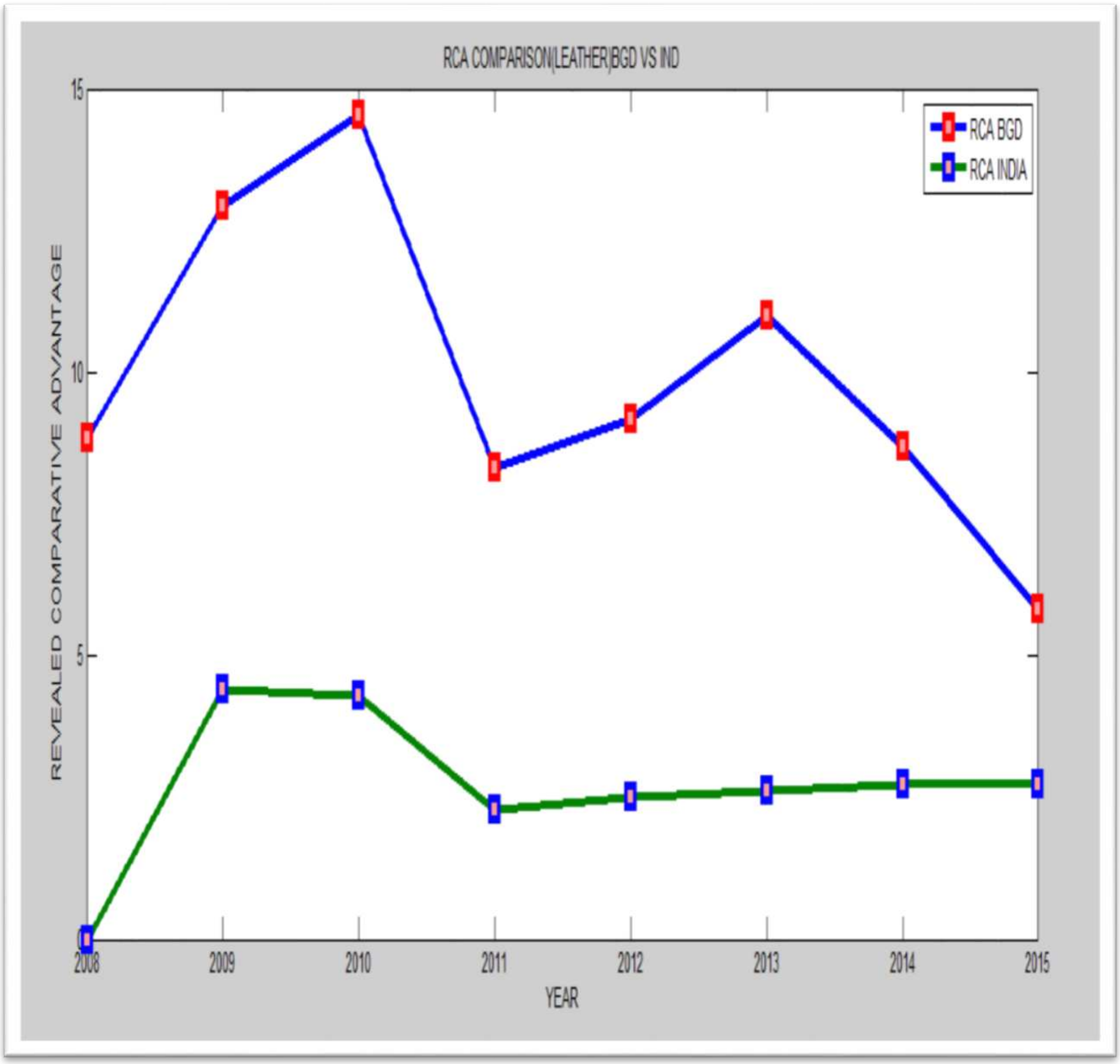

Fig: Comparison of revealed comparative advantage of Leather (BGD vs IND)

4.2.4. Frozen fish

Bangladesh has achieved a remarkable progress in export marketing of frozen fish. It occupies the 4th position in the list of exportable items in terms of their total export earnings. The contribution of frozen fish to Bangladesh total earnings increased to 92.98% in the year 2003-04. But in the recent Years the contributions are unstable. We can see that from the RCA comparison with Our neighboring country India.

Revealed Comparative advantages of Frozen fish in Bangladesh and India

Year	Trade Flow Code	Reporter Code	Trade Value (US$)	Total Export Of The Product	Total Export (Bangladesh)	Total Export India($US)	Total Export (World)	RCA(BD)	RCA(IND)
2008	2	50	53405242	1.24E+10	1.55E+10	1.61E+11	1.42E+13	3.927784	1.84E+00
2009	2	50	42459457	1.38E+10	1.56E+10	1.77E+11	2.33E+13	4.605117	2.65E+00
2010	2	50	62384719	1.68E+10	1.92E+10	2.2E+11	2.88E+13	5.565169	4.60E+00
2011	2	50	69582687	2.07E+10	2.43E+10	3.01E+11	1.74E+13	2.40E+00	2.40E+00
2012	2	50	34487334	2.12E+10	2.45E+10	2.9E+11	1.75E+13	1.16E+00	1.87E+00
2013	2	50	38118472	2.15E+10	2.45E+10	3.37E+11	1.86E+13	1.34E+00	2.04E+00
2014	2	50	41317970	2.21E+10	3.12E+10	3.18E+11	1.83E+13	1.10E+00	1.84E+00
2015	2	50	34451739	1.92E+10	3.17E+10	2.64E+11	1.60E+13	9.06E-01	1.84E+00

We plotted the comparison of RCA between INDIA and BANGLADESH

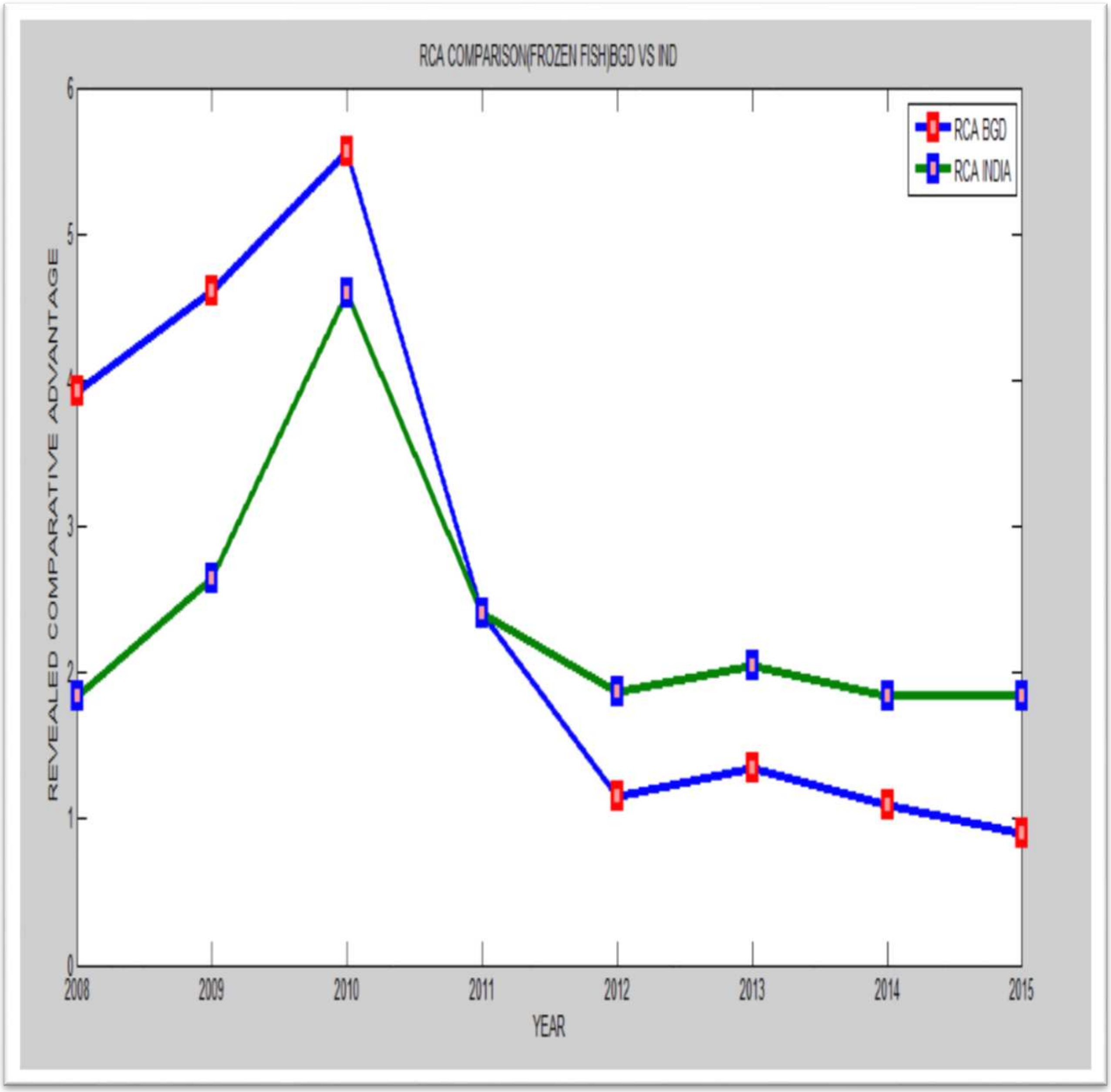

Fig: Comparison of revealed comparative advantage of Leather (BGD vs IND)

4.2.5. Textile yarn and fabrics

Exports of textiles and garments are the principal source of foreign exchange earnings. By 2002 exports of textiles, clothing, and ready-made garments (RMG) accounted for 77% of Bangladesh's total merchandise exports. We Calculated the RCA between Bangladesh and India.

Revealed Comparative advantages of Textile Yarn and Fabric in Bangladesh and India

Year	Trade Flow Code	Reporter Code	Total Export (Bangladesh)	Total Export India($US)	Total Export (World)	RCA (BD)	RCA(INDIA)
2008	2	50	15506719178	1.60872E+11	1.42E+13	4.232787	3.323538
2009	2	50	15558633995	1.76765E+11	2.33E+13	8.054395	5.717979
2010	2	50	19230982559	2.20408E+11	2.88E+13	9.29525	6.570867
2011	2	50	24313744243	3.01483E+11	1.74E+13	4.56E+00	2.973583
2012	2	50	24513500832	2.89565E+11	1.75E+13	4.59E+00	3.22E+00
2013	2	50	24537341006	3.36611E+11	1.86E+13	4.05E+00	3.38
2014	2	50	31208940000	3.17545E+11	1.83E+13	3.13E+00	3.322453
2015	2	50	31734162419	2.64381E+11	1.60021E+13	2.78E+00	3.549215

And plotted the Comparison between them.

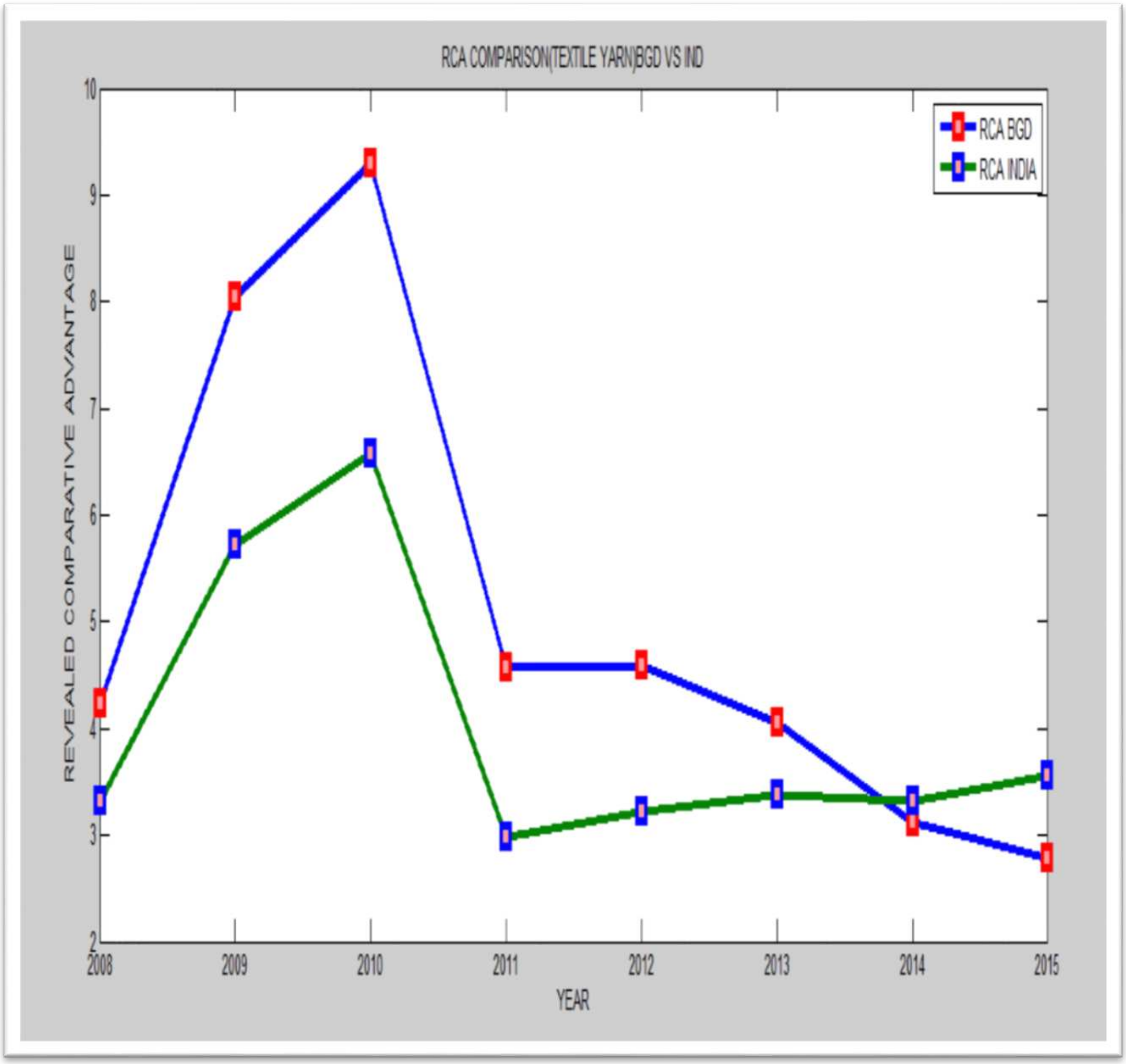

Fig: Comparison of revealed comparative advantage of Textile Yarn and fabrics (BGD vs IND).

From the figure we can see that after 2011 the RCA of textile yarn and fiber in Bangladesh Started to decrease and yet decreasing which is very concerning.

4.2.6. Knitted Clothes

Bangladesh Knitwear industry keeps great contribution in the Bangladesh Economy through generating Employment; Involving Women in the Formal Sector, Increased Substantial Export Earnings, Women Empowerment, Reduction of Child Labor, Gender Equality, Health & Nutrition, and Diminishing Child Marriage etc. along with the gradual increase of knitwear exports to across the globe. Bangladesh now holds number two position in the world in terms of knitwear export and is bandied about as the Next possible champion in exporting knitwear products as China is gradually backing out of apparel business. The value addition from the knitwear sector is about 75%. The contribution in GDP is about 6.92% in FY 2013-14.

Revealed Comparative advantages of Knitted clothes in Bangladesh and India

Year	Trade Flow Code	Reporter Code	Trade Value OF BD(US$)	Total Export Of The Product	Total Export (Bangladesh)	Total Export India($US)	Total Export (World)	RCA(BD)	RCA(IND)
2008	2	50	19174479	2.25E+10	15506719178	1.60872E+11	1.42E+13	0.780745677	4.07E-01
2009	2	50	19004864	2.16E+10	15558633995	1.76765E+11	2.33E+13	1.316223587	6.66E-01
2010	2	50	20020599	2.61E+10	19230982559	2.20408E+11	2.88E+13	1.145364043	7.18E-01
2011	2	50	23845531	3.06E+10	24313744243	3.01483E+11	1.74E+13	0.558	4.84E-01
2012	2	50	16769955	3.02E+10	24513500832	2.89565E+11	1.75E+13	0.398	4.20E-01
2013	2	50	16385984	3.27E+10	24537341006	3.36611E+11	1.86E+13	0.38	4.34E-01
2014	2	50	17539794	3.39E+10	31208940000	3.17545E+11	1.83E+13	0.304	4.40E-01
2015	2	50	33810028	3.32E+10	31734162419	2.64381E+11	1.60E+13	0.514	5.14E-01

We compared the RCA of both Bangladesh and India and plotted them.

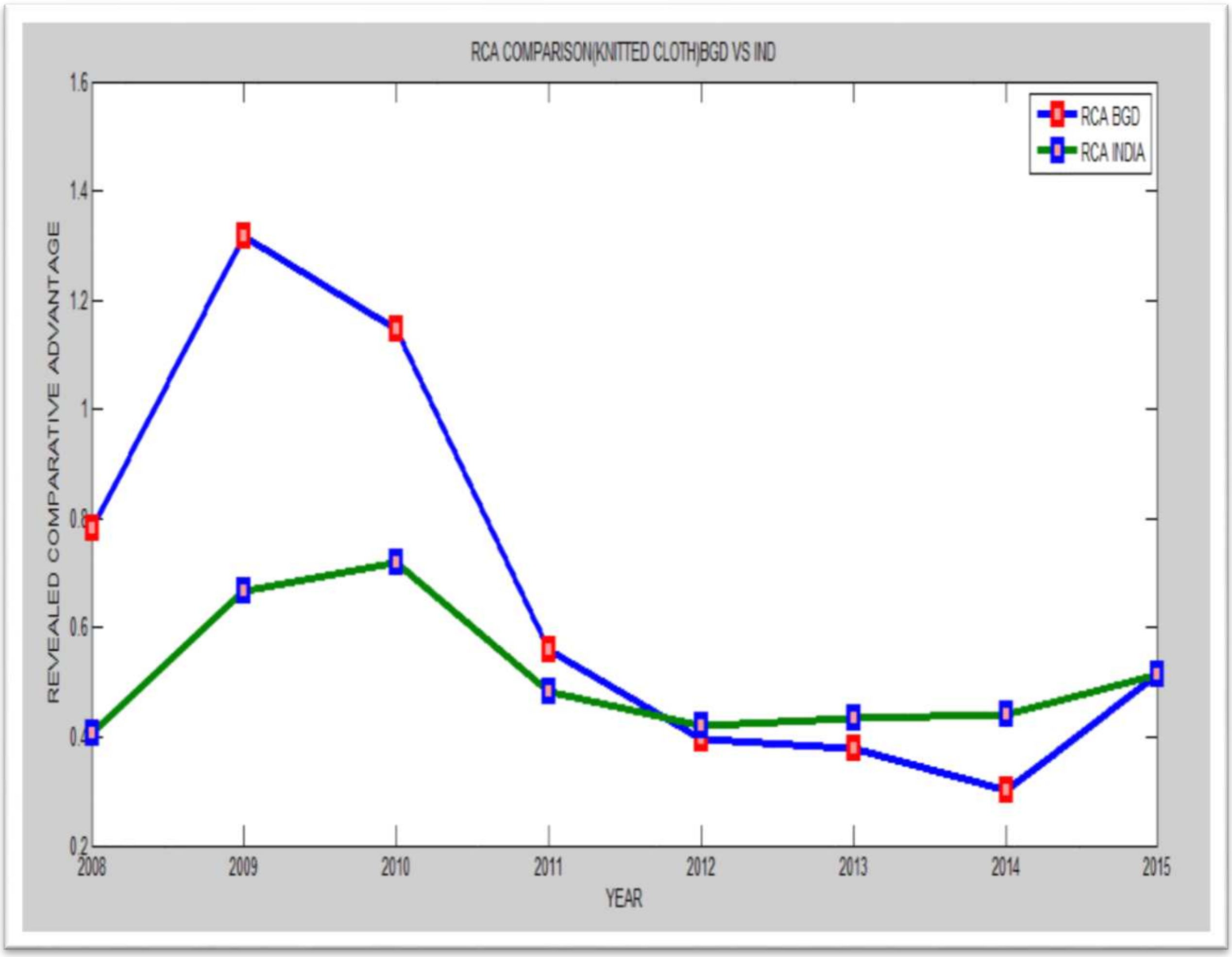

Fig: Comparison of revealed comparative advantage of Knitted clothes (BGD vs IND)

The plot shows that The RCA is decreasing after the Year of 2011 and at the same time The RCA of India is increasing continuously. The good thing is the RCA is continuously increasing again for Bangladesh.

4.3. PRODY

PRODY denotes a product's sophistication which suggests a notional level of per capita income. PRODY is concerned with the national GDP. The more the value of a Products PRODY, the more it contributes in the growth of a nation's economy. So Here we analyzed the top exporting product's PRODY from 2008 to 2015 of Bangladesh to see How much the products contributes in the national income of Bangladesh.

4.3.1. JUTE

PRODY of jute in Bangladesh (2008-2015)

Year	RCA (BD)	GDP	PRODY
2008	753.7002539	6	4522.201523
2009	1203.916694	5	6019.58347
2010	1194.804331	5.6	6690.904254
2011	6.26E+02	6.5	4.07E+03
2012	6.11E+02	6.5	3.97E+03
2013	5.67E+02	6	3.40E+03
2014	5.16E+02	6.1	3.15E+03
2015	328.4424924	6.6	2.17E+03

To know the PRODY specifically we calculated the value of Jute and plotted them with respect to Year.

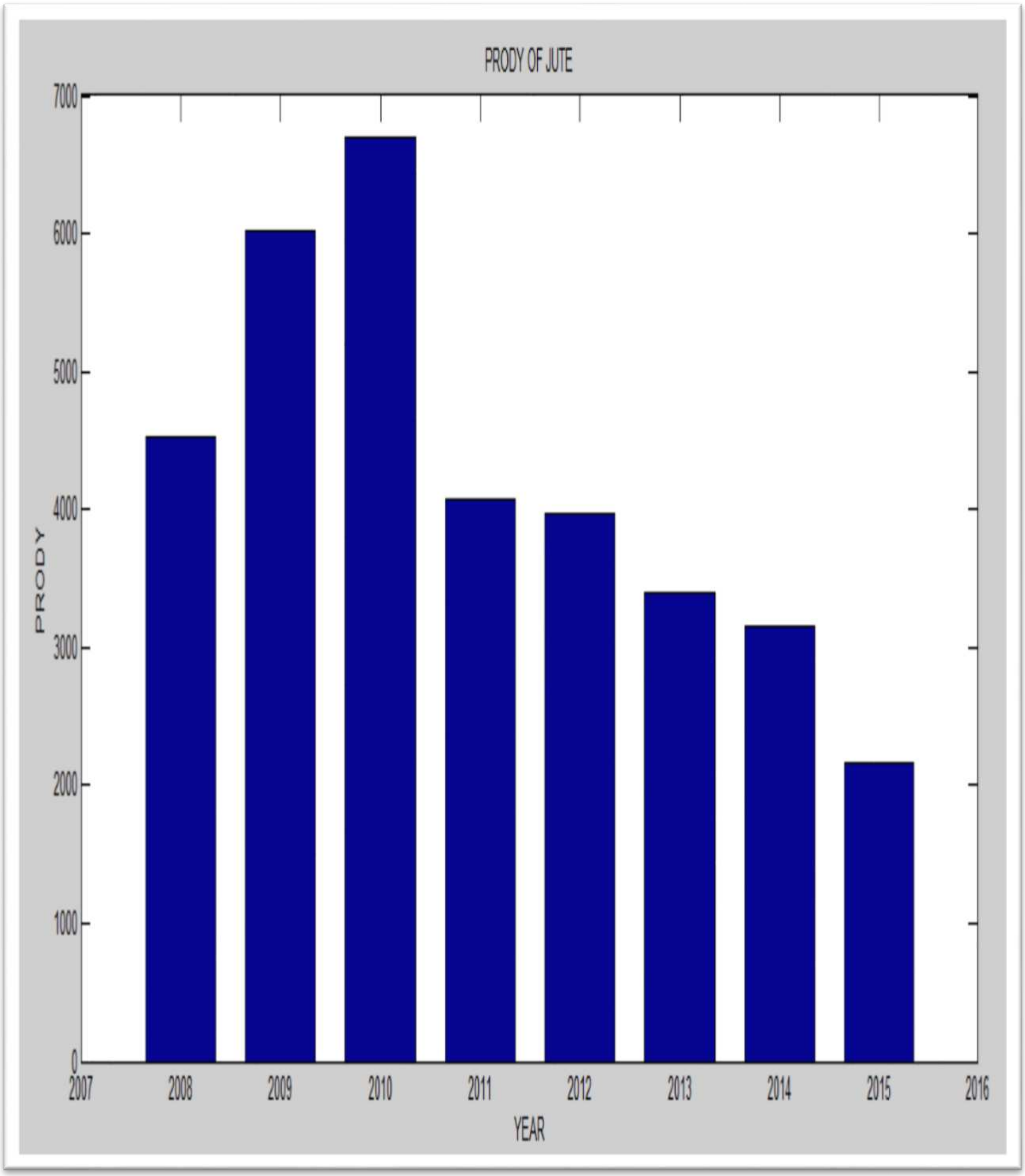

Fig: PRODY of Jute in Bangladesh.

The PRODY shows that Jute contributed most in the economy in the year of 2010.And from then on it is decreasing.

4.3.2 Shrimp

PRODY of shrimp has been calculated. We can see the PRODY values from the table given below.

PRODY of Shrimp in Bangladesh (2008-2015)

Year	RCA(BD)	GDP	PRODY(RCA x GDP)
2008	54.87331	6	329.2398472
2009	52.08517	5	260.4258569
2010	57.61331	5.6	322.6345102
2011	27.1	6.5	176.15
2012	14.5	6.5	94.25
2013	22.2	6	133.2
2014	16.1	6.1	98.21
2015	25.58099	6.6	168.8345463

Plot of the PRODY on Shrimp is given below:

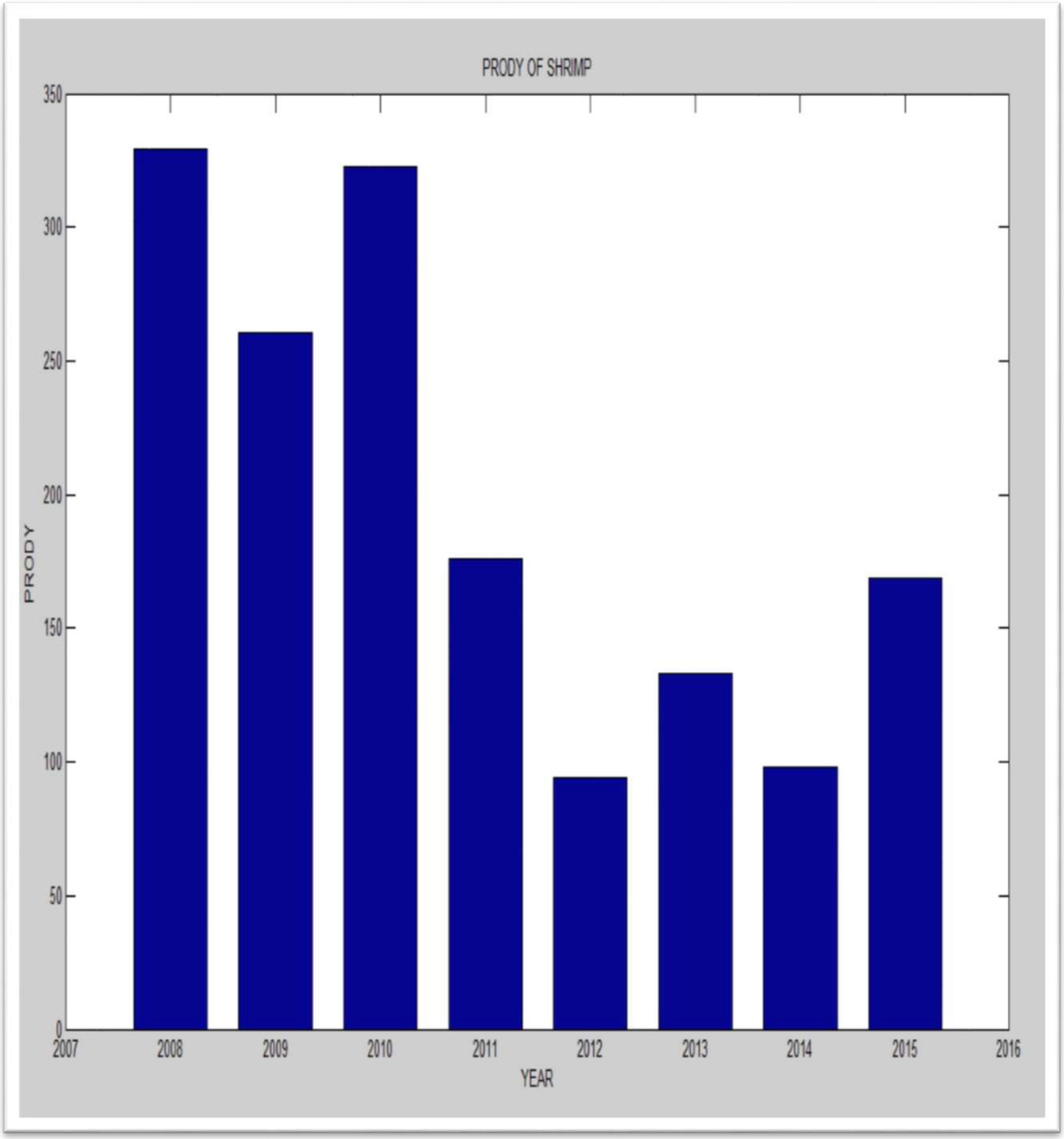

Fig: PRODY of Shrimp in Bangladesh.

4.3.3. Leather

PRODY of leather has been calculated. We can see the PRODY values from the table given below.

PRODY of Leather in Bangladesh (2008-2015)

Year	RCA(BD)	GDP	PRODY
2008	8.857	6	53.142
2009	12.93273	5	64.66365
2010	14.52339	5.6	81.331
2011	8.310737	6.5	54.01979
2012	9.182014	6.5	59.68309
2013	1.10E+01	6	66
2014	8.68E+00	6.1	52.948
2015	5.8167	6.6	38.39022

Plot of the PRODY on Leather is given below:

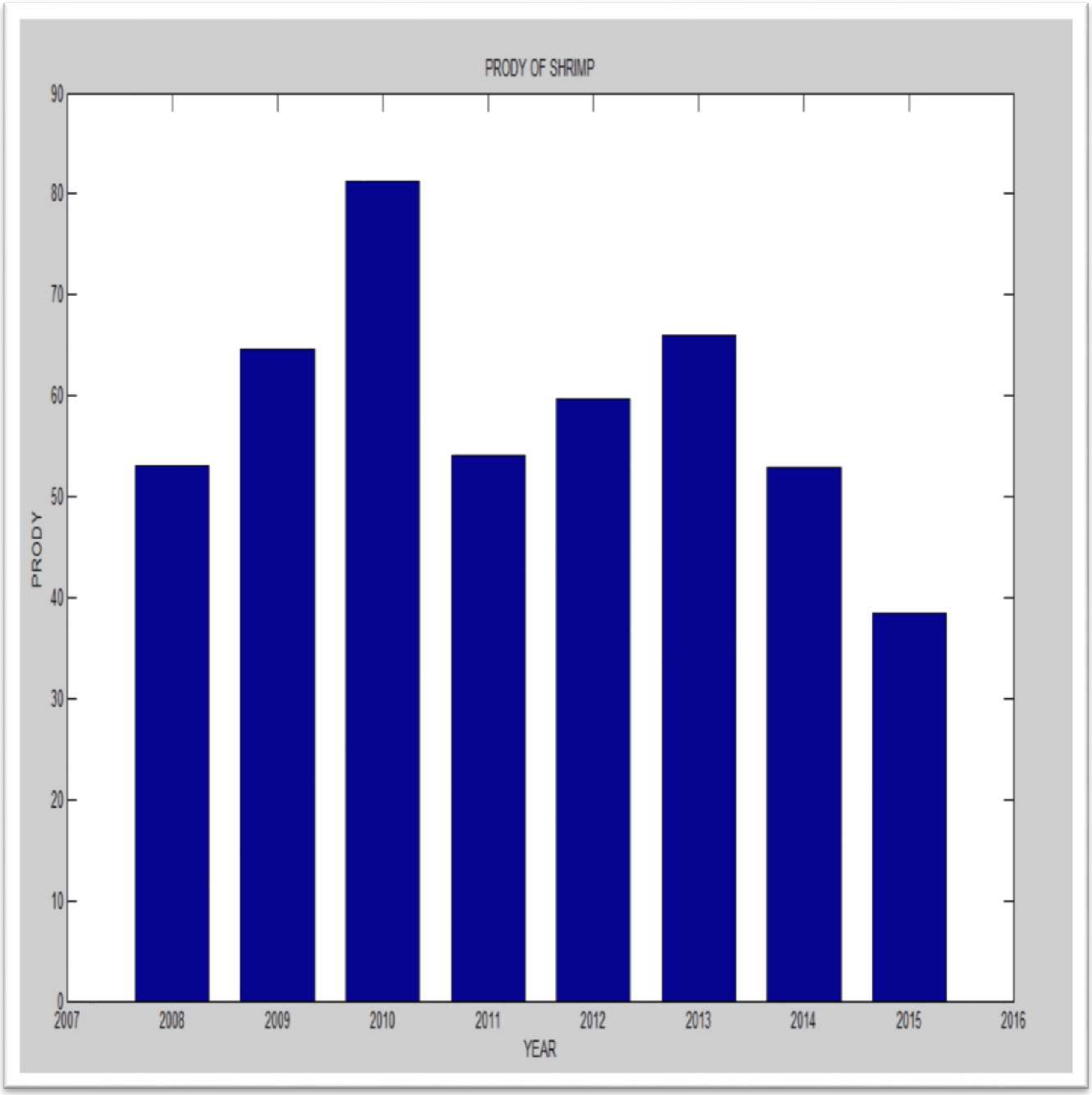

Fig: **PRODY of Leather in Bangladesh (2008-2015)**

The plot Shows that the PRODY of leather has slight ups and downs. It picked in the year of 2010 and 2013.But after that it's contribution is decreasing.

4.3.4. Frozen Fish

Frozen fish had a great contribution in the economy of Bangladesh. But after 2011 it has reduced to floor. It is now slightly contributing in its economy.

PRODY of Frozen fish in Bangladesh (2008-2015)

Year	RCA(BD)	GDP	PRODY
2008	3.927784	6	23.5667
2009	4.605117	5	23.02558
2010	5.565169	5.6	31.16494
2011	2.40E+00	6.5	15.6
2012	1.16E+00	6.5	7.54
2013	1.34E+00	6	8.04
2014	1.10E+00	6.1	6.71
2015	9.06E-01	6.6	5.9796

The plot of the PRODY of Frozen food given below.

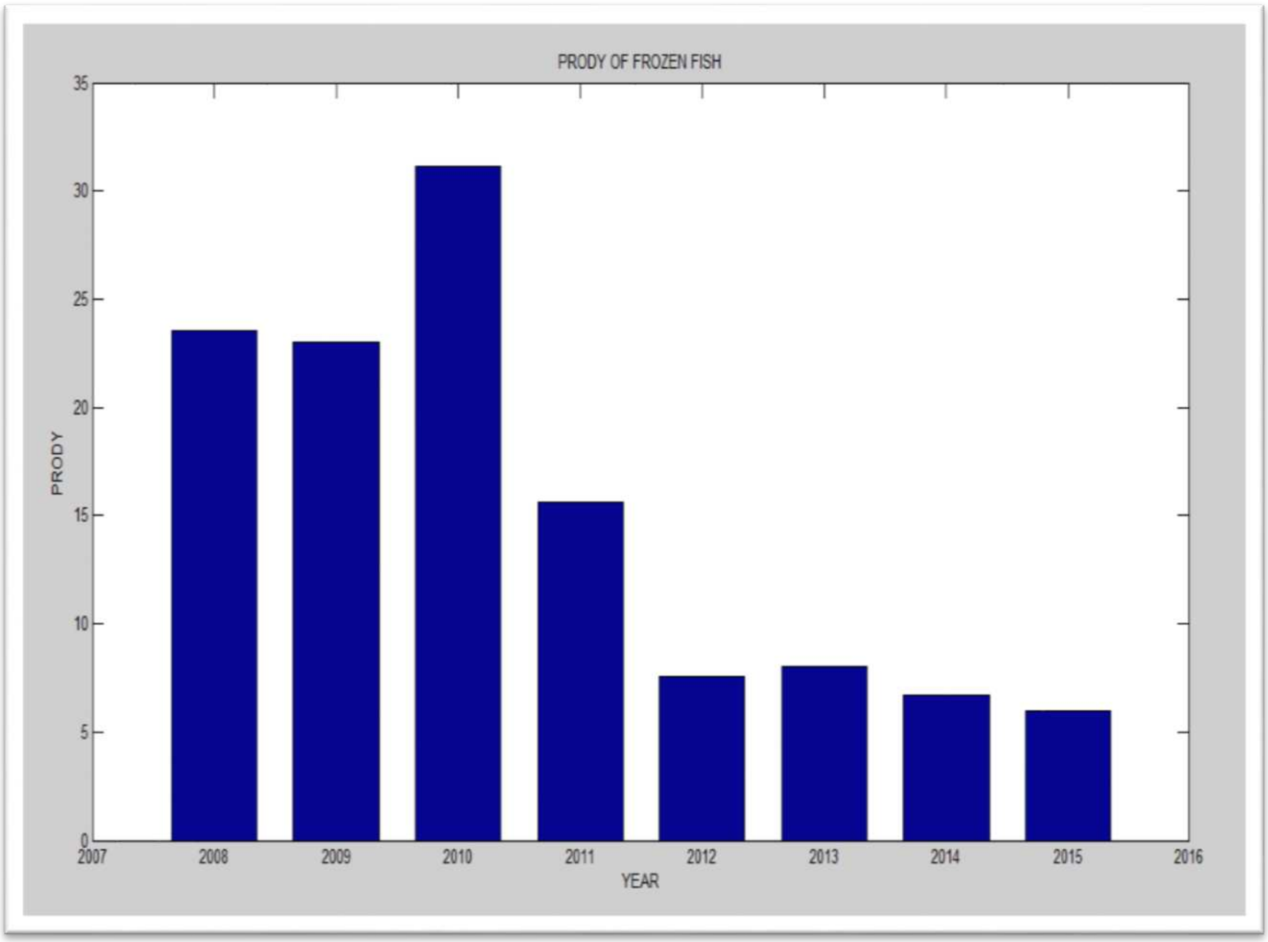

Fig: PRODY of Frozen fish in Bangladesh (2008-2015)

4.3.5. Textile Yarn & fabrics

Exports of textiles and garments are the principal source of foreign exchange earnings. By 2002 exports of textiles, clothing, and ready-made garments (RMG) accounted for 77% of Bangladesh's total merchandise exports.

PRODY of Textile Yarn and Fabrics in Bangladesh (2008-2015)

Year	RCA (BD)	GDP	PRODY
2008	4.232787	6	25.39672
2009	8.054395	5	40.27198
2010	9.29525	5.6	52.0534
2011	4.56E+00	6.5	29.6484
2012	4.59E+00	6.5	29.83446
2013	4.05E+00	6	24.3
2014	3.13E+00	6.1	19.0848
2015	2.78E+00	6.6	18.38052

The YEAR vs PRODY Graph of Textile Yarn and fabrics is plotted below:

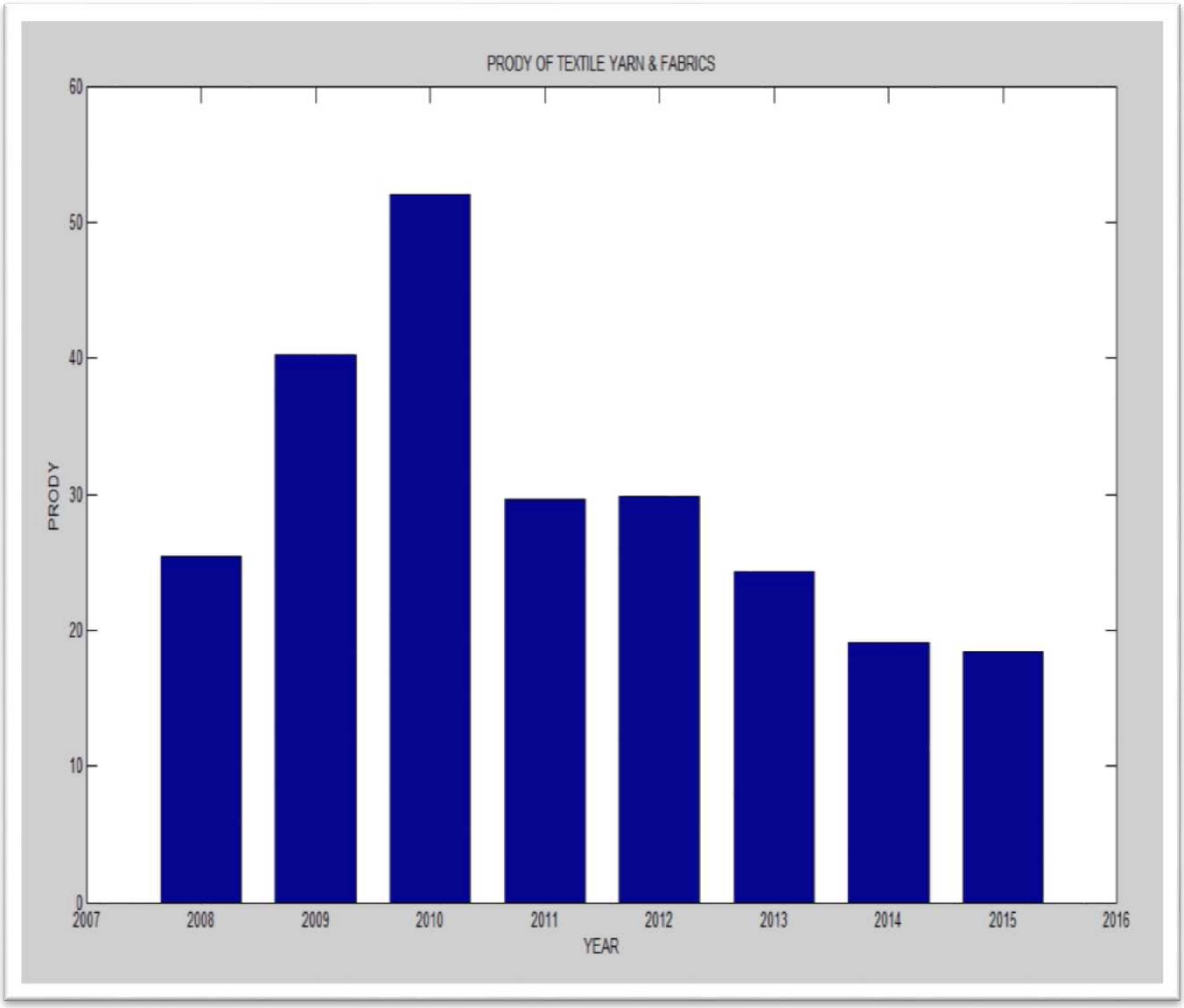

Fig: PRODY of Textile Yarn and fabrics in Bangladesh (2008-2015)

4.3.6. Knitted Clothes

Bangladesh now holds number two position in the world in terms of knitwear export and is bandied about as the Next possible champion in exporting knitwear products as China is gradually backing out of apparel business. The value addition from the knitwear sector is about 75%. The contribution in GDP is about 6.92% in FY 2013-14. The PRODY of Knitted Clothes is given below:

PRODY of Knitted Clothes in Bangladesh (2008-2015)

Year	RCA(BD)	GDP	PRODY
2008	0.780746	6	4.684474
2009	1.316224	5	6.581118
2010	1.145364	5.6	6.414039
2011	0.558	6.5	3.627
2012	0.398	6.5	2.587
2013	0.38	6	2.28
2014	0.304	6.1	1.8544
2015	0.514	6.6	3.3924

The Graph shows that the growth of the knitted clothes is increasing last few years. Which is a good intimation.

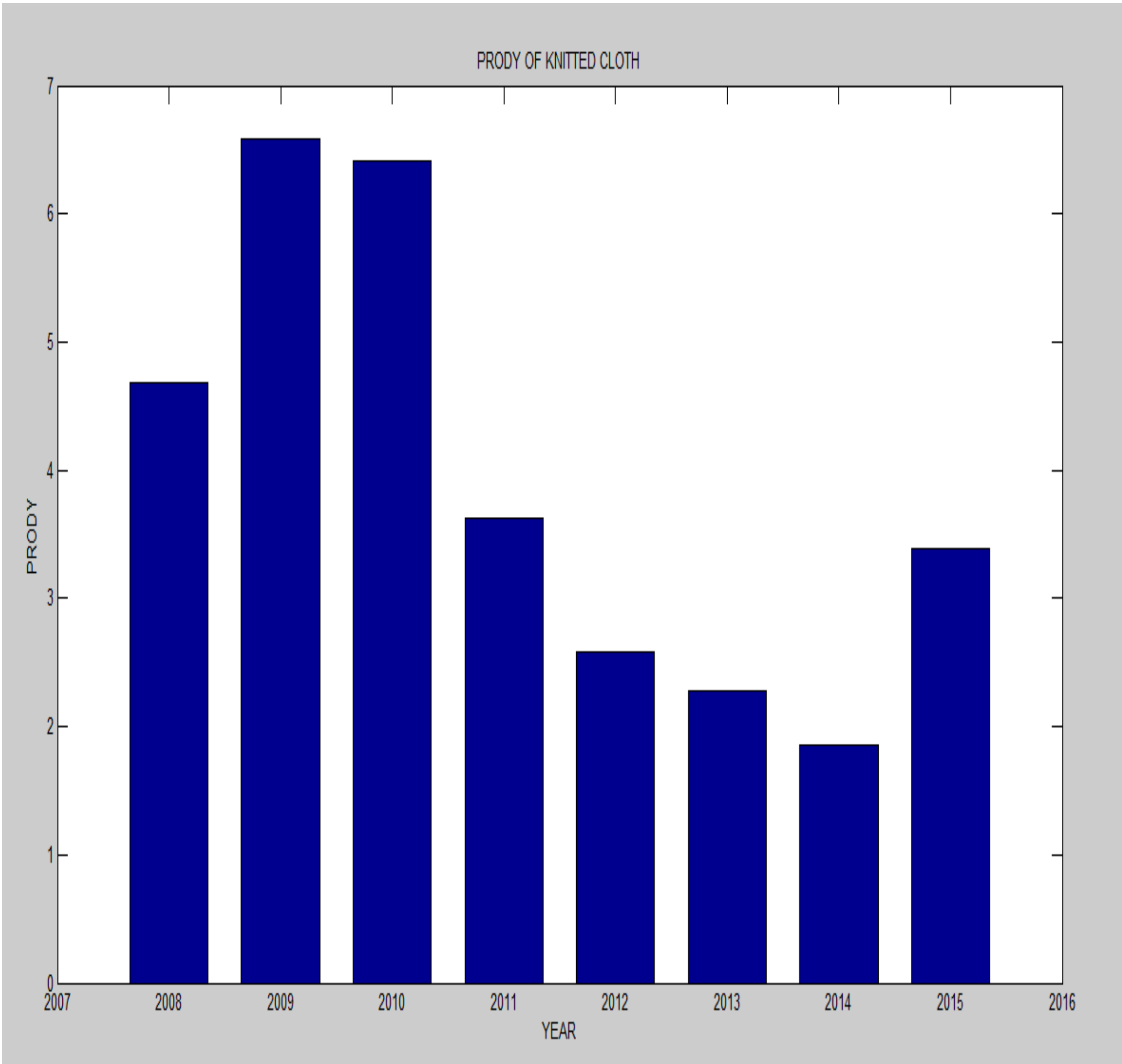

Fig: PRODY of Knitted Clothes in Bangladesh (2008-2015)

4.4. Data and Methodological limitations

The above methodology based on the use of trade data and the sophistication index (PRODY) is subject to a number of limitations. First, we note that trade data is only a proxy for the productive structure of an economy, and in some cases can substantially deviate from actual sectoral contributions to GDP. The accuracy of using a country's export structure as a proxy for its productive capabilities depends on the country's degree of trade openness, domestic market size, and a range of similar factors. Ideally, to study what countries produce and what they could easily begin to produce, it would be better to use production data. However, such data are not available for a large number of products, countries, and years, especially for developing economies. We therefore use international data on trade from the UN Comtrade Database.

The UN Comtrade Database contains detailed cross-country information linking countries to the products that they make using a comparable standardized classification across time. The advantages of this dataset is that, following the Standard International Trade Classification Revision 2 at the 4-digit level (SITC4), it provides information of the export baskets of countries using over 1,000 different product categories. While export data at an even higher level of disaggregation can be obtained from the UN Comtrade Database, we decided to use the 4-digit classification for comparability Hidalgo et al. (2007), who work with international trade data with products disaggregated at the four-digit level using data from Feenstra et al. (2005). We use UN Comtrade data to ensure we use the most recent data available, given that the goal of our methodology is to provide timely information to assist policymakers.

While using trade data offers great advantages, it also has important limitations. First, countries may be able to produce goods that they do not export. The fact that they do not export them, however, suggests that they may not be very good at them. Countries may also export goods they do not produce because they simply serve as trading hubs. Second, UN Comtrade data is not always complete. Specifically, as some countries now have transitioned to more granular systems of classification, once the data is converted into the 4-digit system, information is lost. As a result, a number of countries have a significant share of 'unclassified transactions' in the database. Finally, because the data are collected by customs offices, they include only goods and not services. Nevertheless, services trade data have neither the level of disaggregation nor the time coverage to allow for the type of analysis undertaken in the current study.

Also the index that we employ to capture the level of sophistication of a product or a country's export sector has been subject to several criticisms (Yao, 2009). The sophistication index relies in fact on two critical assumptions, namely that exports only use domestic inputs in their production and that the product classification scheme is detailed enough to exhaust all critical differentiations for any given type of product. It is important to discuss in detail both of them.

First, the logic behind the sophistication index is that only domestic factors are embodied in a country's exports, which makes it possible to infer from trade theory that rich countries with abundant capital and human capital will necessarily export skill-intensive sophisticated products. Given the nature and scale of processing trade, this assumption does not hold necessarily true especially for those economies heavily involved in global supply chains. As argued by some scholars, a country like China is likely to import high-tech components from the Republic of Korea and Japan under the processing trade regime and then export them as assembled products, with local labor-intensive assembly operations as the only value added (Van Assche and Gangnes, 2010). The sophistication index relative to Chinese exports might therefore represent an upward biased estimate of the actual sophistication level. However, the value of the sophistication index associated with exports that are technological-intensive but are manufactured with low-skilled labor using imported components, like most electronic products, is generally low. This is the case since, precisely because of their nature (being produced using imported components), they tend to weigh heavily in the export baskets of developing countries.

Second, the calculation of the sophistication index (PRODY) is based on the SITC classification and the SITC codes may not be sufficient for identifying products in international trade. The use of 4-digit disaggregation in fact provides a fairly detailed account of differentiation between products, but may still fail to distinguish between products exhibiting very different unit values. Huge disparities in unit values for products identified with the same SITC codes signal that they should be treated as totally different products (that is, as products with different levels of quality or vertically differentiated products), otherwise we could end up with an upward (or downward) biased export sophistication index. Rodrik (2006) shows, for example, that China's unit values of most of its leading electronics exports are lower than those of the Republic of Korea, Malaysia, or Singapore.

Despite these drawbacks, classifying the products on the basis of the sophistication index created by Hausmann and his co-authors is by now very common in the literature and has two clear advantages over other classifications used in the past (Fortunato and Razo, 2014). First, it is defined at a highly disaggregated level which allows for very detailed analysis and also partly addresses the concern related to unit values discussed above. Second, it is outcome-based, whereas metrics used previously were based on a priori assumptions of sophistication (e.g. agricultural products are less sophisticated than manufactures).

V. CONCLUSION

This thesis presents a methodology designed to operationalize the concepts of Revealed Comparative Advantages (which is a component of product space) and PRODY (export sophistication.). The methodology allows identifying the export tendency of Product that a country exports and improvement of economic growth.

We applied this methodology to a sample of 114 countries and 43 products during the period 2008–2015 to compare the changes in RCA. We identify top six products which are dominating in world trade network. The products are Jute, Shrimp, Leather, frozen fish, Textile yarn & fabrics, Knitted clothes. But it is a matter of concern that the Value of RCA of these Products in Bangladesh is decreasing since 2011.

We compared the Top Exporting Product's RCA of Bangladesh with its neighboring country India. In the year of 2008 the RCA of these six product in India were remarkably less than Bangladesh. But with time they were able to Increase the RCA of most of these products and from 2011 to now they are dominating in four of these six products with respect to Bangladesh.

RCA is also notion of the quality of the products. That means The Quality of the top exporting Products of Bangladesh is decreasing.

If the Quality of products cannot be increased, economic development of Bangladesh could be reduced. If we observe the recent developed countries (like Ethiopia, Cambodia, Chile, N.Korea), we see that they become developed by improving the product quality.

So Government Should Pay an attention to increase the Quality of the top exporting Products as these are the key to gain the economic development of the country.

APPENDIX

Sample Code:

Trade Flow of Bangladesh:

Bangladesh Trade Flow:

```
[~, ~, raw0_0] = xlsread('E:\New folder (2)\bd trade flow\BD Trade
flow.xlsx','Sheet1','A1:A9');
[~, ~, raw0_1] = xlsread('E:\New folder (2)\bd trade flow\BD Trade
flow.xlsx','Sheet1','D1:D9');
raw = [raw0_0,raw0_1];
raw(cellfun(@(x) ~isempty(x) && isnumeric(x) && isnan(x),raw)) = {''};
R = cellfun(@(x) ~isnumeric(x) && ~islogical(x),raw);
raw(R) = {NaN};
data = reshape([raw{:}],size(raw));
Year = data(:,1);
TradeValueUS = data(:,2);
clearvars data raw raw0_0 raw0_1 R;
%plot(Year,TradeValueUS)
%plot(Year,TradeValueUS)
figure1 = figure;
axes1 = axes('Parent',figure1);
box(axes1,'on');
hold(axes1,'all');
 plot(Year,TradeValueUS,'Parent',axes1,'MarkerFaceColor',[1 0 0],...
'MarkerEdgeColor',[1 0 0],...
'Marker','square',...
'LineWidth',3,...
'DisplayName','yearly export');
xlabel('YEAR');
ylabel('EXPORT(US$)IN BILLION');
title('Trade Flow Of Bangladesh');
legend1 = legend(axes1,'show');
set(legend1,...
'Position',[0.77416509795719 0.182374666038032 0.0973645680819912
0.0577557755775578]);
```

RCA LEATHER

```
%
%% Import the data
[~, ~, raw0_0] = xlsread('E:\New folder (2)\Top exporting product\61
leather\rcaleather.xlsx','Sheet1','A1:A9');
[~, ~, raw0_1] = xlsread('E:\New folder (2)\Top exporting product\61
leather\rcaleather.xlsx','Sheet1','G1:H9');
raw = [raw0_0,raw0_1];
raw(cellfun(@(x) ~isempty(x) && isnumeric(x) && isnan(x),raw)) = {''};
R = cellfun(@(x) ~isnumeric(x) && ~islogical(x),raw);
raw(R) = {NaN};

%% Create output variable
data = reshape([raw{:}],size(raw));

%% Allocate imported array to column variable names
Year = data(:,1);
RCABD = data(:,2);
RCAINDIA = data(:,3);

%% Clear temporary variables
clearvars data raw raw0_0 raw0_1 R;
plot(Year,RCABD,Year,RCAINDIA);

plot(Year,RCABD,'-s','linewidth',3,'MarkerSize',10,...
    'MarkerEdgeColor','red',...
    'MarkerFaceColor',[1 .6 .6]);
hold all;
plot(Year,RCAINDIA,'-s','linewidth',3,'MarkerSize',10,...
    'MarkerEdgeColor','blue',...
    'MarkerFaceColor',[1 .6 .6]);
hold off;
legend('RCA BGD','RCA INDIA');
title('RCA COMPARISON(LEATHER)BGD VS IND');
xlabel('YEAR');
```

```
ylabel('REVEALED COMPARATIVE ADVANTAGE');
```

PRODY LEATHER

```
%% Import the data
[~, ~, raw0_0] = xlsread('E:\New folder (2)\Top exporting product\61
leather\prodyleater.xlsx','Sheet1','A1:A9');
[~, ~, raw0_1] = xlsread('E:\New folder (2)\Top exporting product\61
leather\prodyleater.xlsx','Sheet1','D1:D9');
raw = [raw0_0,raw0_1];
raw(cellfun(@(x) ~isempty(x) && isnumeric(x) && isnan(x),raw)) = {''};

%% Replace non-numeric cells with NaN
R = cellfun(@(x) ~isnumeric(x) && ~islogical(x),raw); % Find non-numeric cells
raw(R) = {NaN}; % Replace non-numeric cells

%% Create output variable
data = reshape([raw{:}],size(raw));

%% Allocate imported array to column variable names
Year = data(:,1);
PRODY = data(:,2);

%% Clear temporary variables
clearvars data raw raw0_0 raw0_1 R;
bar(Year,PRODY);
xlabel('YEAR');
ylabel('PRODY');
title('PRODY OF SHRIMP');
```

RCA Textile

```
[~, ~, raw0_0] = xlsread('E:\New folder (2)\65 Textile yarn &
febric\rcatextileyarn.xlsx','Sheet1','A1:A9');
[~, ~, raw0_1] = xlsread('E:\New folder (2)\65 Textile yarn &
febric\rcatextileyarn.xlsx','Sheet1','G1:H9');
raw = [raw0_0,raw0_1];
raw(cellfun(@(x) ~isempty(x) && isnumeric(x) && isnan(x),raw)) = {''};
R = cellfun(@(x) ~isnumeric(x) && ~islogical(x),raw);
```

```
raw(R) = {NaN};
data = reshape([raw{:}],size(raw));
Year = data(:,1);
RCABD = data(:,2);
RCAINDIA = data(:,3);
clearvars data raw raw0_0 raw0_1 R;
plot(Year,RCABD,Year,RCAINDIA);

plot(Year,RCABD,'-s','linewidth',3,'MarkerSize',10,...
    'MarkerEdgeColor','red',...
    'MarkerFaceColor',[1 .6 .6]);
hold all;
plot(Year,RCAINDIA,'-s','linewidth',3,'MarkerSize',10,...
    'MarkerEdgeColor','blue',...
    'MarkerFaceColor',[1 .6 .6]);
hold off;
legend('RCA BGD','RCA INDIA');
title('RCA COMPARISON(TEXTILE YARN)BGD VS IND');
xlabel('YEAR');
ylabel('REVEALED COMPARATIVE ADVANTAGE');
```

PRODY TEXTILE

```
[~, ~, raw0_0] = xlsread('E:\New folder (2)\Top exporting product\65 Textile yarn & febric\prody-taxtile-yarn.xlsx','Sheet1','A1:A9');
[~, ~, raw0_1] = xlsread('E:\New folder (2)\Top exporting product\65 Textile yarn & febric\prody-taxtile-yarn.xlsx','Sheet1','D1:D9');
raw = [raw0_0,raw0_1];
raw(cellfun(@(x) ~isempty(x) && isnumeric(x) && isnan(x),raw)) = {''};


R = cellfun(@(x) ~isnumeric(x) && ~islogical(x),raw);
raw(R) = {NaN};


data = reshape([raw{:}],size(raw));


Year = data(:,1);
PRODY = data(:,2);

clearvars data raw raw0_0 raw0_1 R;
bar(Year,PRODY);
xlabel('YEAR');
```

```
ylabel('PRODY');
title('PRODY OF TEXTILE YARN & FABRICS');
```

RCA Jute

```
[~, ~, raw0_0] = xlsread('E:\New folder (2)\Top exporting product\264 jute\RCA
JUTE.xlsx','Sheet1','A1:A9');
[~, ~, raw0_1] = xlsread('E:\New folder (2)\Top exporting product\264 jute\RCA
JUTE.xlsx','Sheet1','I1:J9');
raw = [raw0_0,raw0_1];
raw(cellfun(@(x) ~isempty(x) && isnumeric(x) && isnan(x),raw)) = {''};
R = cellfun(@(x) ~isnumeric(x) && ~islogical(x),raw);
raw(R) = {NaN};
data = reshape([raw{:}],size(raw));
Year = data(:,1);
RCABD = data(:,2);
RCAINDIA = data(:,3);
clearvars data raw raw0_0 raw0_1 R;
plot(Year,RCABD,Year,RCAINDIA);

plot(Year,RCABD,'-s','linewidth',3,'MarkerSize',10,...
    'MarkerEdgeColor','red',...
    'MarkerFaceColor',[1 .6 .6]);
hold all;
plot(Year,RCAINDIA,'-s','linewidth',3,'MarkerSize',10,...
    'MarkerEdgeColor','blue',...
    'MarkerFaceColor',[1 .6 .6]);
hold off;
legend('RCA BGD','RCA INDIA');
title('RCA COMPARISON(JUTE)BGD VS IND');
xlabel('YEAR');
ylabel('REVEALED COMPARATIVE ADVANTAGE');
```

PRODY Jute

```
%% Import the data
[~, ~, raw0_0] = xlsread('E:\New folder (2)\Top exporting product\264 jute\JUTE
PRODY.xlsx','Sheet1','A1:A9');
[~, ~, raw0_1] = xlsread('E:\New folder (2)\Top exporting product\264 jute\JUTE
```

```
PRODY.xlsx','Sheet1','D1:D9');
raw = [raw0_0,raw0_1];
raw(cellfun(@(x) ~isempty(x) && isnumeric(x) && isnan(x),raw)) = {''};

%% Replace non-numeric cells with NaN
R = cellfun(@(x) ~isnumeric(x) && ~islogical(x),raw); % Find non-numeric cells
raw(R) = {NaN}; % Replace non-numeric cells

%% Create output variable
data = reshape([raw{:}],size(raw));

%% Allocate imported array to column variable names
Year1 = data(:,1);
PRODY1 = data(:,2);

%% Clear temporary variables
clearvars data raw raw0_0 raw0_1 R;

bar(Year1,PRODY1);
xlabel('YEAR');
ylabel('PRODY');
title('PRODY OF JUTE');
```

Frozen Fish

```
[~, ~, raw0_0] = xlsread('E:\New folder (2)\Top exporting product\0342 frozen fish\RCA frozenfish.xlsx','Sheet1','A1:A9');
[~, ~, raw0_1] = xlsread('E:\New folder (2)\Top exporting product\0342 frozen fish\RCA frozenfish.xlsx','Sheet1','I1:J9');
raw = [raw0_0,raw0_1];
raw(cellfun(@(x) ~isempty(x) && isnumeric(x) && isnan(x),raw)) = {''};
R = cellfun(@(x) ~isnumeric(x) && ~islogical(x),raw);
raw(R) = {NaN};
data = reshape([raw{:}],size(raw));
Year = data(:,1);
RCABD = data(:,2);
RCAINDIA = data(:,3);
clearvars data raw raw0_0 raw0_1 R;
plot(Year,RCABD,Year,RCAINDIA);

plot(Year,RCABD,'-s','linewidth',3,'MarkerSize',10,...
   'MarkerEdgeColor','red',...
   'MarkerFaceColor',[1 .6 .6]);
hold all;
plot(Year,RCAINDIA,'-s','linewidth',3,'MarkerSize',10,...
```

```
    'MarkerEdgeColor','blue',...
    'MarkerFaceColor',[1 .6 .6]);
hold off;
legend('RCA BGD','RCA INDIA');
title('RCA COMPARISON(FROZEN FISH)BGD VS IND');
xlabel('YEAR');
ylabel('REVEALED COMPARATIVE ADVANTAGE');
```

PRODY Frozen Fish

```
%% Import the data
[~, ~, raw0_0] = xlsread('E:\New folder (2)\Top exporting product\0342 frozen fish\PRODY-frozenfish.xlsx','Sheet1','A1:A9');
[~, ~, raw0_1] = xlsread('E:\New folder (2)\Top exporting product\0342 frozen fish\PRODY-frozenfish.xlsx','Sheet1','D1:D9');
raw = [raw0_0,raw0_1];
raw(cellfun(@(x) ~isempty(x) && isnumeric(x) && isnan(x),raw)) = {''};

%% Replace non-numeric cells with NaN
R = cellfun(@(x) ~isnumeric(x) && ~islogical(x),raw); % Find non-numeric cells
raw(R) = {NaN}; % Replace non-numeric cells

%% Create output variable
data = reshape([raw{:}],size(raw));

%% Allocate imported array to column variable names
Year = data(:,1);
PRODY = data(:,2);

%% Clear temporary variables
clearvars data raw raw0_0 raw0_1 R;
bar(Year,PRODY);
xlabel('YEAR');
ylabel('PRODY');
title('PRODY OF FROZEN FISH');
```

Knitted Clothes RCA

```
[~, ~, raw0_0] = xlsread('E:\New folder (2)\Top exporting product\655 knitted clothing\RCA knitted cloth.xlsx','Sheet1','A1:A9');
[~, ~, raw0_1] = xlsread('E:\New folder (2)\Top exporting product\655 knitted clothing\RCA knitted cloth.xlsx','Sheet1','I1:J9');
raw = [raw0_0,raw0_1];
raw(cellfun(@(x) ~isempty(x) && isnumeric(x) && isnan(x),raw)) = {''};
R = cellfun(@(x) ~isnumeric(x) && ~islogical(x),raw);
```

```
raw(R) = {NaN};
data = reshape([raw{:}],size(raw));
Year = data(:,1);
RCABD = data(:,2);
RCAINDIA = data(:,3);
clearvars data raw raw0_0 raw0_1 R;
plot(Year,RCABD,Year,RCAINDIA);

plot(Year,RCABD,'-s','linewidth',3,'MarkerSize',10,...
    'MarkerEdgeColor','red',...
    'MarkerFaceColor',[1 .6 .6]);
hold all;
plot(Year,RCAINDIA,'-s','linewidth',3,'MarkerSize',10,...
    'MarkerEdgeColor','blue',...
    'MarkerFaceColor',[1 .6 .6]);
hold off;
legend('RCA BGD','RCA INDIA');
title('RCA COMPARISON(KNITTED CLOTH)BGD VS IND');
xlabel('YEAR');
ylabel('REVEALED COMPARATIVE ADVANTAGE');
```

PRODY Knitted Clothes

```
%% Import the data
[~, ~, raw0_0] = xlsread('E:\New folder (2)\Top exporting product\655 knitted
clothing\prody-knittedcloth.xlsx','Sheet1','A1:A9');
[~, ~, raw0_1] = xlsread('E:\New folder (2)\Top exporting product\655 knitted
clothing\prody-knittedcloth.xlsx','Sheet1','D1:D9');
raw = [raw0_0,raw0_1];
raw(cellfun(@(x) ~isempty(x) && isnumeric(x) && isnan(x),raw)) = {''};

%% Replace non-numeric cells with NaN
R = cellfun(@(x) ~isnumeric(x) && ~islogical(x),raw); % Find non-numeric cells
raw(R) = {NaN}; % Replace non-numeric cells

%% Create output variable
data = reshape([raw{:}],size(raw));

%% Allocate imported array to column variable names
Year = data(:,1);
PRODY = data(:,2);

%% Clear temporary variables
clearvars data raw raw0_0 raw0_1 R;
bar(Year,PRODY);
```

```
xlabel('YEAR');
ylabel('PRODY');
title('PRODY OF KNITTED CLOTH');
```

Shrimp RCA

```
[~, ~, raw0_0] = xlsread('E:\New folder (2)\Top exporting product\03611 shrimp\Shrimp RCA.xlsx','Sheet1','A1:A9');
[~, ~, raw0_1] = xlsread('E:\New folder (2)\Top exporting product\03611 shrimp\Shrimp RCA.xlsx','Sheet1','I1:J9');
raw = [raw0_0,raw0_1];
raw(cellfun(@(x) ~isempty(x) && isnumeric(x) && isnan(x),raw)) = {''};
R = cellfun(@(x) ~isnumeric(x) && ~islogical(x),raw);
raw(R) = {NaN};
data = reshape([raw{:}],size(raw));
Year = data(:,1);
RCABD = data(:,2);
RCAINDIA = data(:,3);
clearvars data raw raw0_0 raw0_1 R;
plot(Year,RCABD,Year,RCAINDIA);

plot(Year,RCABD,'-s','linewidth',3,'MarkerSize',10,...
    'MarkerEdgeColor','red',...
    'MarkerFaceColor',[1 .6 .6]);
hold all;
plot(Year,RCAINDIA,'-s','linewidth',3,'MarkerSize',10,...
    'MarkerEdgeColor','blue',...
    'MarkerFaceColor',[1 .6 .6]);
hold off;
legend('RCA BGD','RCA INDIA');
title('RCA COMPARISON(SHRIMP)BGD VS IND');
xlabel('YEAR');
ylabel('REVEALED COMPARATIVE ADVANTAGE');
```

PRODY Shrimp

```
%% Import the data
[~, ~, raw0_0] = xlsread('E:\New folder (2)\Top exporting product\03611 shrimp\PRODYSRIMP.xlsx','Sheet1','A1:A9');
[~, ~, raw0_1] = xlsread('E:\New folder (2)\Top exporting product\03611 shrimp\PRODYSRIMP.xlsx','Sheet1','D1:D9');
raw = [raw0_0,raw0_1];
```

```
raw(cellfun(@(x) ~isempty(x) && isnumeric(x) && isnan(x),raw)) = {''};

%% Replace non-numeric cells with NaN
R = cellfun(@(x) ~isnumeric(x) && ~islogical(x),raw); % Find non-numeric cells
raw(R) = {NaN}; % Replace non-numeric cells

%% Create output variable
data = reshape([raw{:}],size(raw));

%% Allocate imported array to column variable names
Year1 = data(:,1);
PRODYRCAxGDP = data(:,2);

%% Clear temporary variables
clearvars data raw raw0_0 raw0_1 R;
bar(Year1,PRODYRCAxGDP);
xlabel('YEAR');
ylabel('PRODY');
title('PRODY OF SHRIMP');
```

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Supporting Online Material

1)
www.sciencemag.org/cgi/content/full/1142834/DC1
Materials and Methods
Figs. S1 to S3
Table S1
References
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2)
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