

# Export Standards and Export Losses: The Need for Harmonization of Standards with Special Reference to RTAS

Atraeyee Sinha Chakraborty

Gokhale Institute of Politics and Economics  
Pune 411 004  
Maharashtra, India

## Abstract

*This paper looks into the effects of quality related export standards imposed by importing country which is an inevitable feature of global trade today. The number of export standards and regulations adopted by different countries has risen significantly over the years. This may be attributed to rising awareness among people towards safer and hygienic products which should be environmentally sound also. But in spite of their necessity, imposing export standards is often looked upon as a means of restricting trade and classified under non-tariff barrier or NTB. As norms and standards usually apply to national and foreign production, they do not correspond to the classical form of protectionism which openly discriminates against imports. But the governments of importing countries have the ability to set standards based on domestic firms' product characteristics or technology capacity. This paper develops a simple model to show how export standards can lead to substantial increase in cost for exporters which leads to substantial loss in volume of trade and sometimes welfare and how the difference in standards in different export markets prevents the exporting firms to accrue the benefits of economies of scale. Differences in product standards and conformity assessment procedures across countries can greatly influence trade volumes and patterns. In this context regional integration can be beneficial and if required the existing Regional Trading Agreements (RTAS) like SAFTA, AFTA should be revisited, reviewed and amended to include stronger provisions for standard harmonization. For SAARC to emerge as a single market and to strengthen the trade position of the region with reference to the global supply chain South Asian Regional Standards Organization SARSO (established in 2011) and Conformity Assessment Board (CAB) should work for speedy harmonization of standards. Harmonization and mutual recognition of standard can be beneficial and can have a significant positive impact on trade within the region and with third countries. Harmonization of standards in RTAS can work as a stimulator for the intra as well as interregional trade.*

## I Introduction

Robert Baldwin points out as early as in 1970, “The lowering of tariffs has, in effect, been like draining a swamp. The lower water level has revealed all the snags and stumps of non-tariff barriers that still have to be cleared away.” With tariff barriers becoming increasingly less important, differences in national regulatory regimes are becoming ever more visible. These regulatory regimes include areas as varied as government procurement rules, inward foreign investment, competition policy, labor standards and environmental norms as well as product standards and technical regulations. Although traditional trade policies such as tariffs and quotas no longer have a significant impact on restricting market access as they have been progressively liberalized, first under the auspices of the General Agreement on Tariffs and Trade (GATT)/World Trade Organization (WTO) and subsequently in the context of regional and bilateral preferential trade agreements but the fact that tariff liberalization alone has generally proven unsuccessful in providing genuine market access has drawn further attention to non-tariff measures (NTMs) as major determinants in restricting market access. Non-tariff measures include a very diverse array of policies that countries apply to imported and exported goods. Some NTMs are manifestly employed as instruments of commercial policy (e.g. quotas, subsidies, trade defense measures and export restrictions), while others stem from non-trade policy objectives to address some market failures. (e.g. technical measures). The latter often serve a legitimate purpose as they are put in place for valid concerns such as food safety and environmental protection. Regardless of whether NTMs are imposed (or implemented) with protectionist intent or to address legitimate market failures, NTMs are thought to have important restrictive and distortionary effects on international trade and this is particularly true for firms in developing countries.

This paper has singled out export standards (termed as Technical Barriers to Trade or TBTs and Sanitary and Phytosanitary measure SPS in the WTO context) as one particular domestic regulatory regime and will analyze its effects on global trade. The World Bank Technical Barriers to Trade Survey (2002) enables such analysis by eliciting systematically firm-level information on their production and export activities, cost structures, impediments to domestic sales and exports, and compliance with standards and technical regulations. The surveys were administered to 619 firms in 17 developing countries from five regions, including Eastern Europe, Latin America, Middle East, South Asia, and Sub-Saharan Africa. The 619 firms in the survey vary significantly in characteristics such as the value of sales, the size of employment, age and ownership structure. This survey collects firms’ responses to a series of questions on topics including mandatory standards, conformity assessment (testing, certification, labeling requirements and inspection) and their effect on cost of production and ability to export. Standards across markets can simply differ in the content of the norm (referred as horizontal standards such as a standard on permissible electric plug) as well as strictness of the norm (referred as vertical standards such as the nutrition standard). So a Fixed compliance cost  $F_j$  is inevitable to enter in the new export market.<sup>1</sup> Standards and technical regulations affect both dimensions of export performance for a number of reasons. First, governments have the ability to set standards based on domestic firms’ product characteristics or technology capacity. This can raise foreign exporters’ costs to accommodate these

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<sup>1</sup> Baldwin (2001)

requirements. Second, there often exists a great difference in standards across markets each of which requires an individual compliance cost such as the redesign cost. Hence, the difference in regulations across markets can severely limit a firm's scale production capacity and affect a firm's decision to export.

Regional trade agreements (RTAs) present opportunities for controlling technical barriers to trade (TBTs) as the same region shares the similar geo-climatic and cultural practices the precondition for harmonization might be already present. But export standards are most often not an important issue in some RTAs including South Asian Free Trade Agreement.( SAFTA).

The paper develops a simple model to show the effects of export standard on the volume of trade and welfare and shows the effect of harmonization of standard on trade volume .The paper also suggests the need for standard harmonization and Mutual recognition of conformity assessment through Regional Trading Agreements (RTAs) as that ensures opportunities to handle TBTS. After discussing the scope and progress of standard "harmonization" in SAFTA under Section I,

Section II of the paper provides brief review of existing literature on export standards and export losses and effects of standard harmonization .The existing literature on this topic are not very extensive .Section III describes the model showing the export losses associated with export standards. Section IV focuses on harmonization of standards including methods and effects as well as compares between Mutual Recognition Agreements (MRAs) and Harmonization. Section V concludes.

### ***TBT provisions in SAFTA***

Historically South Asian countries have followed inward looking trade policy both in terms of trade within the region and in terms of trade with rest of the world (outside South Asia). Though these countries sometime faced the situation of availability of cheap food in international market, but trade was not considered reliable source to meet the needs of principal food of domestic population. There have been apprehensions about the effect of trade liberalization on domestic agriculture and long run sustainability of food security. Moreover, unlike other regions like South East Asia, EU, and North America, regional integration in South Asia has remained low and, strong barriers exists for trade between the neighboring countries. Except Sri Lanka -India free trade agreement, other trade pacts in the region did not succeed in promoting free movement of goods between these geographically contiguous nations. Thus, both intra regional and inter regional trade has remained below potential. Non-tariff barriers have been a highly contentious issue though most of the quantitative restrictions (the major form of NTBs) have already been phased out in most of the SAARC countries. The only major NTBs that need to be tackled now are the ones relating to standards on health and consumer safety grounds. Mutual recognition of standards and/or their harmonization at the regional level could help to reduce this problem.<sup>2</sup>Unfortunately, the treaty SAFTA has hardly any provisions relating to antidumping, subsidies and countervailing measures, technical barrier to trade, and sanitary and phyto-sanitary measures. out of which the last two deals with export

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<sup>2</sup> "Agreement on SAFTA Is it win-win for all SAARC countries?"-published by CUTS Centre for International Trade, Economics & Environment: CUTS (2004)

standards. These issues are pertinent when a region moves into a free trade arrangement.

Table 1: Products on Which Standards are Being Harmonized

SARSO Sectoral Technical Committees (STCs)	Identified Products on which standards are being harmonized	Meetings held/to be held
STC on Food and Agricultural Products	<ol style="list-style-type: none"> <li>1. Refined Sugar</li> <li>2. Biscuits</li> <li>3. Standards of on Microbiological requirements for cream portion of filled biscuits</li> <li>4. Instant Noodles</li> <li>5. Black tea</li> <li>6. Vanaspati/Banaspati (veg. ghee)</li> <li>7. Skimmed Milk Powder</li> <li>8. National/CODEX Standard for Hygienic condition</li> </ol>	<p>First Meeting at SAARC Secretariat on 24 August 2011</p> <p>Second Meeting at Dhaka, Bangladesh on 12-13 December 2011.</p> <p>Third Meeting at Karachi, Pakistan on 2-3 April 2012.</p> <p>Fourth Meeting was held in India on 21-22 Sept 2014.</p> <p>Fifth meeting was held in 27-28 May, 2015 at Colombo, Sri Lanka.</p> <p>Sixth meeting was held in 10-11 May, 2016 at Colombo, Sri Lanka</p>
STC on Jute, Textile and Leather	<ol style="list-style-type: none"> <li>1. Identified Hessian products</li> <li>2. Jute Tarpaulin Fabric</li> <li>2. Jute Bags for packing of various commodities</li> <li>3. Jute twine</li> <li>4. Jute Carpet backing Fabric</li> <li>5. Jute yarn</li> <li>6. Cotton Drill Fabric</li> <li>7. Cotton Twill Fabric</li> <li>8. Towels and Toweling Fabric</li> </ol>	<p>First Meeting at the SAARC Secretariat, Kathmandu on 23-24 November 2011</p> <p>Second Meeting in Dhaka on 17-18 April 2013.</p> <p>Third Meeting was held in Colombo on 18-19 Dec 2013.</p> <p>Fourth Meeting was held on 23-24 June, 2015 at Nodia, India</p>
STC on Building Materials	<ol style="list-style-type: none"> <li>1. Steel Tube for Structural purposes</li> <li>2. Ordinary Portland Cement</li> <li>3. Steel Bars for Concrete Reinforcement</li> <li>4. Structural Steel</li> <li>5. High strength deformed steel bars and wires for concrete reinforcement</li> <li>6. Steel wires used in pre-stressed concrete</li> <li>7. Method of testing of steel and steel tubes (such as tensile testing, flattening, bend test etc</li> <li>8. Ceramic Tiles</li> </ol>	<p>Four Meetings have been held at the SAARC Secretariat on</p> <p>21-22 November 2011 at Kathmandu, Nepal</p> <p>10-11 July 2012 at Kathmandu, Nepal</p> <p>4-5 June 2013 at Kathmandu, Nepal</p> <p>12-13 May, 2016 at Colombo, Sri Lanka</p>
STC on Chemicals and Chemical Products	<ol style="list-style-type: none"> <li>1. Toilet soap</li> <li>2. Liquid Toilet Soap</li> <li>3. Baby Toilet Soap</li> <li>4. Soft Soap</li> <li>5. Laundry Soap</li> <li>6. Detergent Powder</li> <li>7. Tooth Paste</li> <li>8. Shampoo (Hair Shampoo)</li> <li>9. Shampoo for Babies</li> </ol>	<p>First Meeting was held on 23-24 Sept 2014 at New Delhi, India</p> <p>Second meeting was held on 26-27 May, 2015 at Colombo, Sri Lanka</p>
STC on Electrical, Electronics, Telecom and IT	<ol style="list-style-type: none"> <li>1. Electric cable (PVC insulated/sheathed)</li> <li>2. Double capped fluorescent Lamp (Safety Requirements and Performance Requirements)</li> <li>3. New Products Identified: Switches, Sockets, MCBs, Solar photovoltaic systems, transformers</li> </ol>	<p>First Meeting was held in India on 25-26 Sept 2014</p> <p>Second Meeting is to be hosted by Afghanistan.</p>
STC ON Conformity Assessment	Established by the First Meeting of the SARSO Technical Management Board (Dhaka, 31 March – 1 April 2014)	First Meeting is to be held in India.

Source: www.sarso.org.bd

Of Late (2011) the Governments of SAARC Member States appreciating the importance of Standardization with reference to trade within and outside the Member States; recognizing the need to improve cooperation and coordination amongst member states in implementation of SAARC Standards in respect of products and/or processes; aspiring to facilitate intra-Regional trade within member States; and desiring to enhance their access to the Global markets have agreed on the

Establishment of South Asian Regional Standards Organization (SARSO). The following is the current status of harmonization of identified products by the respective Sectoral Technical Committees under SARSO.

Dr. Syed Humayun Kabir, Director-General of SARSO made a presentation on the activities of SARSO during the Forty-first Session of Standing Committee held in Kathmandu on 23-24 November 2014. The Standing Committee also took note of the critical importance of SARSO in eliminating all forms of barriers to regional trade and urged for all possible support from all Member States for effective functioning of the Organization. This shows the member states have realized the need for harmonization and mutual recognition of conformity assessment to boost interregional as well as intraregional trade though still there is provision in SARSO agreement (like WTO'S provision in TBT agreement) that to fulfill legitimate objectives which may include *inter alia* national security requirements, prevention of deceptive practices, protection of human health and safety, animal or plant life or health, or the environment. The South Asian Regional Standards Organization (SARSO) and International Electro technical Commission (IEC) signed Cooperation Agreement on 09 October, 2016 in Frankfurt, Germany. Mr. Frans Vreeswijk General Secretary and CEO of IEC and Dr. Syed Humayun Kabir, Director General of SARSO has signed the agreement on behalf of their organization. This agreement will be helpful to strengthen the cooperation between IEC and SARSO in a number of areas, covering especially cross representation and exchange of information. The main purpose of the cooperation agreement between two organizations is to promote the development, use and adoption of IEC International Standards as well as the use of IEC Conformity Assessment Systems in response to market demands, and thus to facilitate world trade.

## **II Existing Literature**

Research that has examined firms' export decisions, including Dixit (1989a,b), Krugman (1989) and others, suggests that these decisions are driven in part by sunk costs in entering a particular export market. A number of studies have focused on firms in developing Countries, including Roberts and Tybout (1997) and Bernard and Jensen (2004), and examine empirically factors affecting decision-making such as entry costs that influence a firm's export behavior. Roberts and Tybout (1997) test for the presence and magnitude of sunk costs using a sample of Colombian plants, while Bernard and Jensen (2004) test for the possible existence of entry costs by looking at the effects of exporting yesterday on exporting today. Both papers find entry cost significant in explaining firms' export decisions. Roberts and Unnevehr (2005) state that the additional costs of reduced trade caused by sanitary and technical requirements must be balanced against the public health benefits of safer food. The need for balance between costs and benefits among countries is what makes these measures so controversial in international trade. Sanitary or technical requirements (barriers) may be socially desirable. Calvin and Krissoff (1998) support this idea by affirming that unlike a tariff, this kind of requirement may increase national social welfare if it corrects a market failure by incorporating important product externalities in the product price.

Firm level surveys have been conducted, attempting to gauge the direct impact of standards and technical regulations on firms' production costs and hence export

performance. The World Bank TBT survey looks at 689 firms in over 20 industries in 17 developing countries (Wilson and Otsuki 2004). 70 per cent of these firms report that they face technical regulations in their export markets, whereby EU and US regulations are generally considered the most important by the firms surveyed. The study shows that in order to meet standards, firms invest in additional plant or equipment, one-time product redesign, product redesign for each export market, additional labor for production, additional labor for testing and certification, or lay off workers instead of making these types of investment in order to keep the costs from increasing.

Quantitative analysis deriving the trade effect of diverging standards directly from costs of standards has generally proven challenging due to the large number of standards in existence. Additionally, the wealth and idiosyncrasy of legal documents recording them makes it difficult to match standards across countries. Studies conducted in this vein are those by Moenius, 1999; Swann, Temple and Shurmer, 1996; Vancauteran and Weiserbs, 2003; Mantovani and Vancauteran, 2003. A general weakness of these attempts to estimate the impact of standards on trade is that they are generally not based on a sound theoretical framework.

The attempts of modeling standards barriers and their remedies theoretically are also very limited in number and have been undertaken only very recently. All of them use Krugman's (1980) framework as the basis to model trade between countries, but are very different in the way they are being implemented. Fischer and Serra (1999) examine the behavior of a country that imposes a Minimum standard on a good produced by a domestic firm and shows that when there is consumption externality the MS chosen by the domestic social planner is a non-increasing function of size of the foreign market and is always protectionist.

One paper that has endeavored to formally model TBTs (yet not their liberalization) and showing the need to overcome them is Ganslandt and Markusen (2001). Baldwin (2000) as well as Mattoo and Chen (2004) take the analysis a step further by modeling both TBTs and their liberalization, cautioning against the discriminatory effects that the latter may entail. Mattoo and Chen (2004) find that harmonization in the EU raises both intra-regional trade as well as trade with excluded developed countries; at the same time their results indicate that it diverts trade away from developing countries. The paper also shows that MRAs have a more powerful impact on both types of trade, but if they contain rules of origin, then intra-regional trade increases at the expense of imports from the rest of the world, especially developing countries. Baller (2007) looks at trade effects from TBT liberalization for members of the liberalizing region as well as two separate groups of excluded countries, industrialized and developing respectively. The study finds compelling evidence that Mutual Recognition Agreements for testing procedures have a strong impact on both export probabilities and bilateral trade volumes. In a firm level analysis Chen, Wilson and Otsuki (2004) show that testing procedures and lengthy inspection reduce exports of developing countries by nine per cent and three per cent respectively and standards reduce the likelihood of exporting to more than three markets by seven per cent.

### III The Model

#### *Description of the Model*

For simplicity, let us suppose the world consists of two countries, labeled as  $j=A, B$ , where A is the importing country and country B is the exporting country. The importing country imposes varied standards<sup>3</sup> and technical requirements on the good that is marketed in its market. The standard is quality related and not negative externality linked.<sup>4</sup> Firstly we assume complying with standards has no effect on consumers' demand for the regulated product. Firm 1 is domiciled in country A, in which it sells  $Q_{1A}$  units of output, while it imports  $Q_{2A}$  from country B. Firm 2, domiciled in B, exports  $Q_{2A}$  in A and sells  $Q_{2B}$  in B. For supplying in domestic market either no cost of production or cost of production is fixed. The compliance with importing country's technical requirements implies a differentiated unit cost to the firm, in general denoted by  $F_{ij} \equiv F_j + D_i$ .<sup>5</sup> The first component of this fixed cost,  $F_j$ , is the common cost to comply with the technical regulations imposed in country  $j$  (here, country A) which is identical across exporters. The second component,  $D_i$ , represents the firm-wise deviation from  $F_j$  due to the varied impact each firm receives from standards and technical regulations.  $D_i$  varies across exporters (here, only country B) due to their difference in factors such as technology endowment and hence the ability to meet standards. Country A's product also has to comply with the specific standard but no extra cost has to be borne by the producers for complying with that standard. Country B and C produce for their local market at "null Standard" and there is no fixed set up cost to produce at "null standard" and the standard stipulated by importing country.

Further we assume constant returns to scale to production and we assume away any role of exchange rate. We deal with purely the volume of trade.

The inverse demands in market A and B are, respectively

$$\begin{aligned} p_A &= a \\ &- b(Q_{1A} \\ &+ Q_{2A}) \end{aligned} \quad \dots (3.1.1)$$

$$\begin{aligned} p_B &= a \\ &- bQ_{2B} \end{aligned} \quad \dots (3.1.2)$$

The profit functions of firm 1 and firm 2 are respectively,

$$\begin{aligned} \pi_1 &= \\ &[a - \\ &b(Q_{1A} + Q_{2A})]Q_{1A} \end{aligned} \quad \dots (3.1.3)$$

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<sup>3</sup> By "standard" here we mandatory "standard" which is a part of TBT of WTO

<sup>4</sup> or it can be linked with some "imposed" negative externality which has no actual implication for welfare.

<sup>5</sup> Chen, Otsuki & Wilson (2006)

$$\pi_2 = [a - b(Q_{1A} + Q_{2A})]Q_{2A} + [a - bQ_{2B}]Q_{2B} - (F_A + D_{2A})Q_{2A} \quad \dots (3.1.4)$$

The equilibrium outputs are:-<sup>6</sup>

$$Q_{1A} = \frac{(a + F_A + D_{2A})}{3b} \quad \dots (3.1.5)$$

$$Q_{2A} = \frac{(a - 2F_A - 2D_{2A})}{3b} \quad \dots (3.1.6)$$

$$Q_{2B} = \frac{a}{2b} \quad \dots (3.1.7)$$

### ***Effect on Trade***

The imposition of standard by importing country will affect the volume of trade. As in this section we have assumed away any change in demand, we can infer the volume of trade will shrink as the exporting country has to incur the extra cost to comply with the standard specified by the importing country, which will reduce the supply of exports.

#### *Prohibitive Standard*

These solution to equation 3.1.6 is valid for  $F_{ij}+D_{ij} \in [-a, 1/2a]$ , ( $i = 2; j = A$ ). If  $F_{ij}+D_{ij} \geq 1/2 a$  there is a domestic monopoly in country  $j$  with the rival firm excluded by too high export cost (and thus the solution is that of  $F_{ij}+D_{ij} = 1/2a$ ). Here the Standard is Prohibitive in nature.<sup>7</sup>

#### *Export Loss*

Compared to free trade(i,e null standard in the importing country) there will be a loss in export (as well the volume of trade by

$$(2F_A + 2 D_{2A}) / 3b \quad \dots (3.2.8)$$

*Proposition 3.2.1:* Higher the compliance cost (both fixed and variable) for exporting firm, higher will be the output of the importing firm.

$$\frac{\partial Q_{1A}}{\partial F_A} > 0 \text{ and } \frac{\partial Q_{1A}}{\partial D_{2A}} > 0 \quad \dots (3.2.9)$$

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<sup>6</sup> Appendix 1

<sup>7</sup> If  $F_{ij}+D_{ij} \leq -a$ , the exporting firm is a monopolist in the importing country's market.



*Proposition 3.2.2:* Higher the compliance cost to meet the standard in export market's, lower will be the amount of export.

$$\frac{\partial Q_{2A}}{\partial F_A} < 0 \text{ and } \frac{\partial Q_{2A}}{\partial D_{2A}} < 0 \quad \dots (3.2.10)$$

*Proposition 3.2.3:* The elasticity of export quantity with respect to fixed and variable compliance cost will be less than 1.

$$\left(\frac{\partial Q_{2A}}{\partial F_A}\right)\left(\frac{F_A}{Q_{2A}}\right) < 1 \text{ and } \left(\frac{\partial Q_{2A}}{\partial D_{2A}}\right)\left(\frac{D_{2A}}{Q_{2A}}\right) < 1 \quad \dots (3.2.10)$$

### ***Effect on Welfare***<sup>8</sup>

As we have assumed away the presence of any externality, the social welfare function will be summation of consumer and producer surplus. For the importing country, i.e. country A there will be a resulting loss in consumer surplus by the following amount

$$(4a - 2 F_A - 2 D_{2A}) (F_A + D_{2A}) / 18b \quad \dots(3.3.11)$$

Producer surplus for the importing country will increase as expected due to increase in the local firm's market share. The gain in producer's surplus is

$$(F_A^2 + D_{2A}^2 + 2aF_A + 2F_AD_{2A} + 2aD_{2A}) / 9b \quad \dots(3.3.12)$$

$$\text{Welfare gain: } - (F_A + D_{2A}) / 3b \quad \dots(3.3.13)$$

*Proposition 3.3.1:* Higher the compliance cost of the trading partner, (i.e., the exporting country) higher will be the welfare gain of the importing country.

For country B as there is no change in  $p_B$  and  $Q_{2B}$ , there will be no change in consumer surplus. Producer Surplus under free trade is  $13a^2 / 36b$ . Producer surplus after complying with international standard:

$$a^2 / 4b + (a - 2 F_A - 2D_{2A})^2 / 9b \quad \dots(3.3.14)$$

For country B as there is no change in  $p_B$  and  $Q_{2B}$ , there will be no change in consumer surplus. Loss in Producer's Surplus as well as welfare is as follows:

$$(2a - 2F_A - 2D_{2A})(2F_A + 2 D_{2A}) / 9b \quad \dots(3.3.15)$$

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<sup>8</sup> see Appendix 2

### ***Standards which Affect Willingness to Pay***

In many situations, it is surely not the case that standards are simply cost raising measure with no offsetting positive value. Standard may increase the willingness to pay of the consumers and in that way it may have a positive impact on welfare.

In a vertically differentiated product space, all consumers agree over the most preferred mix of characteristics and more generally, over preferences ordering. A typical example is quality. Most agree that high quality is preferable but the consumers' income and prices of the product determine the consumers' ultimate choice.

Suppose the utility function of the consumer is like following,

$$u = \theta s - p$$

$$= 0, \text{ if he buys a good with quality } s \text{ at price } p \quad \dots(3.4.16)$$

If he does not buy  $u$  can be thought of as a surplus derived from the consumption of the good. 's' is a positive real number that describes the quality of the good. The utility is separable in quality and price.  $\theta$ , a positive real number is a taste parameter. All consumers prefer high quality for a given price; however a consumer with a high  $\theta$  is more willing to pay to obtain high quality and a high income consumer is having a high  $\theta$ .

Under the above condition suppose the exporting firm produces 2 qualities, one for own market, ( $s_B$ ) another for export market. ( $s_A$ ), are sold at prices ( $p_B$ ) and  $p_A$ . "Quality per unit of money" is higher for quality A, i.e., low quality good is not dominated. (otherwise, the problem will become trivial, all the consumers will go for high quality). The consumers with a taste parameter exceeding

$$\theta_c = (p_A - p_B) / (s_A - s_B) \quad \dots(3.4.17)$$

will buy high quality good and those with a taste parameter lower than  $\theta_c$  but exceeding  $p_B/s_B$  will buy low quality good and others do not buy at all.

When the standard has been imposed by importing country it is more likely that consumers of the importing country are having higher  $\theta$  and if we incorporate that assumption in the model described in section 3.2 then for country A,  $\theta > \theta_c$  and country B,  $\theta < \theta_c$ . So the high quality affects the willingness to pay for the consumers of Country A and the consumers become more willing to pay for higher quality. The new demand curve faced by the exporter in export market is:

$$p'_A = a' - b(Q_{1A} + Q_{2A}), \text{ where } a' > a \quad \dots(3.4.18)$$

$\Rightarrow$  With the improvement in the quality the willingness to pay at each price has increased. The new profit functions are as follows;

$$\begin{aligned} \pi_1 &= [a' - b(Q_{1A} + Q_{2A})]Q_{1A} \end{aligned} \quad \dots (3.4.19)$$

$$\pi_2 = [a' - b(Q_{1A} + Q_{2A})]Q_{2A} + [a - bQ_{2B}]Q_{2B} - (F_A + D_{2A})Q_{2A} \quad \dots (3.4.20)$$

The equilibrium outputs are:

$$Q_{1A} = (a' + F_A + D_{2A}) / 3b \quad \dots (3.4.21)$$

$$Q_{2A} = (a' - 2F_A - 2D_{2A}) / 3b \quad \dots (3.4.22)$$

$$Q_{2B} = a / 2b \quad \dots (3.4.23)$$

*Effect on Trade*

The exporting country may benefit from expansion of demand if

$$(a' - a) > 2 F_{ij} \quad \dots (3.4.24)$$

If the above condition is fulfilled then the standard will work as trade enhancing tool. It will depend on the magnitude of the shift of demand as well as the supply curve.

*Effect on Welfare*

The effect on consumer surplus of the importing country will be ambiguous because of demand shift. In particular consumer surplus will increase if

$$2(a' - a) > F_{ij} \quad \dots (3.4.25)$$

Producer surplus will also increase more due to shift in demand. So there will be larger gain of welfare.

For exporting country the consumer surplus remains unchanged as before and the producer surplus as well as welfare increases if condition 3.4.28 is fulfilled. Even if the imposition of standard changes the willingness to pay; it will be more beneficial for the importing country. Condition 3.4.25 is less stringent than the condition 3.4.24.

#### IV Harmonization and Mutual Recognition of Standard

The exporting country may target more than one export market in a region  $R$ .<sup>9</sup> In that case the standard in different export markets may be different which may lead to difference in both the fixed and variable part of the compliance cost. If production technology shows constant returns to scale then difference in standard will lead to the same result as the harmonized standards as long as only harmonization is there. (not Mutual Recognition Agreement). If the production technology shows increasing returns to scale then there will be remarkable difference in the consequences of trade under differentiated standard and harmonized standard both in terms of volume and welfare.

##### *The Model with Multiple Export Markets*

Suppose  $D_{ij}$  shows the variable compliance cost for the  $i$ th firm to export to  $j$ th country market. Initially we assume the production technology shows constant returns to scale. We take a 3x3 framework where country A exports to Country B and Country C. The exporting country has to bear a fixed set up cost  $F_j$  to enter into any export market  $j$  and the variable cost  $D_{ij}$  and we assume  $F_j$  and  $D_{ij}$  varies across markets. Firm 1 is situated in country A, 2 in country B and 3 in country C. Let us take the total cost of compliance with foreign standard as:-

$$E_{ij} = D_{ij} + F_j \quad \dots(4.1.1)$$

$E_{ij}$  varies across markets. Initially we assume the production technology shows constant returns to scale.

The Profit of firm1, (Exporting Firm)

$$\begin{aligned} \pi_1 &= (a - bq_{1A})q_{1A} + \{a - b(q_{1B} + q_{2B})\}q_{1B} + \{a - b(q_{1C} + q_{3C})\}q_{1C} - E_{1B}q_{1B} \\ &\quad - E_{1C}q_{1C} \quad \dots(4.1.2) \end{aligned}$$

The profit of importing country firm:

$$\begin{aligned} \pi_B &= \\ &\{a - \\ &b(Q_{1B} + Q_{2B})\}Q_{2B} \quad \dots(4.1.3) \end{aligned}$$

$$\begin{aligned} \pi_C &= \{a \\ &- b(Q_{1C} \\ &+ Q_{3C})\}Q_{3C} \quad \dots(4.1.4) \end{aligned}$$

The equilibrium exports are:

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<sup>9</sup> The reason as the same region shares same climatic and socio economic conditions it is comparatively easier for the countries to go for Harmonization of standards.

$$= \frac{Q_{1B}}{(a - 2E_{1B})} = \frac{Q_{1B}}{3b} \quad \dots (4.1.5)$$

$$= \frac{Q_{1C}}{(a - 2E_{1C})} = \frac{Q_{1C}}{3b} \quad \dots (4.1.6)$$

Total export

$$= \frac{Q_{1B} + Q_{1C}}{\{2a - (2E_{1B} + 2E_{1C})\}} = \frac{Q_{1B} + Q_{1C}}{3b} \quad \dots (4.1.7)$$

However assuming production technology shows Increasing Returns to Scale and the cost function showing the cost of exporting to country B & C be:  $E_{1B}.q_{1B}^{0.5}$  and  $E_{1C}.q_{1C}^{0.5}$  respectively. The equilibrium outputs are:

$$= \frac{Q_{1B}}{(a + \sqrt{a^2 - (12b * E_{1B})})} = \frac{Q_{1B}}{6b} \quad \dots (4.1.8)$$

$$= \frac{Q_{1C}}{(a + \sqrt{a^2 - (12b * E_{1C})})} = \frac{Q_{1C}}{6b} \quad \dots (4.1.9)$$

Total export:

$$= \frac{Q_{1B} + Q_{1C}}{\{2a + \sqrt{a^2 - 12b * E_{1B}} + \sqrt{a^2 - 12b * E_{1C}}\}} = \frac{Q_{1B} + Q_{1C}}{6b} \quad \dots (4.1.10)$$

### ***Effect of Harmonization of Standard***

In this section, we examine the impact on both intra-regional trade and trade with excluded countries of regional initiative like harmonization. Instead of straightforward assuming upward or downward harmonization<sup>10</sup> we can assume harmonization at the average rate of standard that leads to the compliance cost common to both the markets:

$$E = (E_{1B} + E_{1C})/2 \quad \dots(4.2.11)$$

Assuming initial standard in one of the countries (say country B) is more stringent than another (country C) it is upward harmonization for the later and downward harmonization for the former.

The equilibrium exports under C.R.S,

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<sup>10</sup> Chen and Mattoo (2004).

$$Q_{1B} + Q_{1C} = \{2a - (2E_{1B} + 2E_{1C})\}/3b \quad \dots(4.2.12)$$

The equilibrium exports under IRS,

$$Q_{1B} + Q_{1C} = \left\{2a + \sqrt{a^2 - 6b * E} + \sqrt{a^2 - 6b * E}\right\}/6b \quad \dots (4.2.13)$$

### *Effect on Trade*

Harmonization of standard will work as a trade booster when the production technology shows I.R.S as the firms can reap the benefits of economies of scale.

*Lemma 4.1:* Harmonization to average standard will lead to increase in the import and so as the volume of trade in the region when the production technology shows IRS whereas it will not affect the volume or trade if the production technology shows CRS.

Proof: Follows from (4.1.7)&(4.2.12);(4.1.10)&(4.2.13)

*Lemma 4.2:* Import in the harmonizing region increases unambiguously for the country with most stringent initial standard (Country B) as the exporting country can reap the benefits of both the integrated market as well as reduction in compliance cost, whereas for country C the effect on import is ambiguous as the exporting country can get the benefit of only the former.

Nevertheless the import in Country C will increase iff,<sup>11</sup>

$$E_{1B} < 3E_{1C} \quad \dots(4.2.14)$$

The above result predicts that if the difference between the initial standards is not sufficiently high then the import in the country can increase after harmonization even if it follows upward harmonization.

### *Effect on Welfare*

The welfare effect of standard harmonization on exporting country depends on the effect on producer's surplus as the consumer surplus of the exporting country remains unchanged with or without harmonization. The revenue from export market which has undergone downward adjustment will surely increase unless the demand is highly inelastic<sup>12</sup>.the revenue from the market with upward adjustment will also increase if condition 4.2.14 is fulfilled and demand is not very inelastic.

For the importing country there will be an increase in consumer surplus due to increase in price and larger flow of quantity. But there will be a reduction in profit.<sup>13</sup>

<sup>11</sup> Comparing values of  $q_{1c}$  before and after harmonization.

<sup>12</sup> As there will be fall in price in the importing country due to increase quantity from exporting country

<sup>13</sup> see Appendix 3

### ***Effect of Mutual Recognition Agreements (MRAs)***

One of the most powerful measures to boost trade is the mutual recognition of existing

Standards, whereby a country grants unrestricted access of its market to products that meet any participating country's standards. This was the approach taken in principle by the European Union, with the spur of the Cassis de Dijon judgment of the European Court of Justice. Mutual recognition agreements (MRAs) are, however, not likely to be an option if there is a significant divergence in the initial standards of the countries, as became evident in the context of the European Union. In such cases, a certain degree of harmonization is a precondition for countries to allow products of other countries to access their markets.

Mutual recognition can be equivalent to downward harmonization<sup>14</sup>, i.e. products that comply with a standard set by any participating country can be freely sold in the entire region which will lead to choice of least strict standard. In the present model mutual recognition can be adoption of average standard with the cost of compliance consisting  $\min(F_A, F_B)$  instead of  $(F_A + F_B)$ .

The effect is very obvious. It will lead to a further increase in the volume of trade as it leads to further decrease in the cost of compliance and the exporting firm will reap the benefit of integrated market as well as reduction in cost

### **V Concluding Remarks**

Barriers related to product standards are the main concern of developing country's export today. Exporters from developing countries are increasingly feeling the pressure to conform to international standards if they are to enter successfully developed country markets. Much has been achieved in various developing countries to construct the requisite quality infrastructure, to enable exporters both to understand the nature and detail of the quality standards to be met and to take the steps to comply with them. The potential to use product standards as hidden trade barriers is immense. Even if a small part of this potential is allowed to be exploited, the implementation of the free trade regime could become dominated by protectionists and those who would welcome trade retaliation and counter retaliation. However, transparency and harmonization of standards could become trade facilitators in addition to providing technical quality and safety parameters. Exporting country has to incur significant cost to meet up the standard specified by their trading partner as the trading partner (importing country) has the advantage to set the "standard" nearer to the domestic standard if its intention is to protect the local producers. As mentioned earlier, this paper specifically deals with those standards which are purely related to quality and does not deal with externality. The simple model developed in the paper shows the following important things,

- a) In a bilateral trade the importing country will always benefit by the imposition of quality related standard as long as exporting country has positive compliance cost.

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<sup>14</sup> Chen and Mattoo(2004)

- b) Higher is the cost to comply with quality related standard , higher will be the loss in the volume of trade, provided standard does not change willingness to pay.
- c) Even if quality related standard changes the willingness to pay, importing country will be surely more benefitted from that and exporting country may or may not be benefitted from shift in demand.
- d) When the exporting country targets multiple export markets, difference in standards in export markets can be harmful as it restricts the exporting firm to accrue the benefit of economies of scale.
- e) if the production technology is showing IRS ,Standard harmonization at the average standard surely increases the revenue of exporting firm from the importing country which has done downward adjustment and also from the importing country which has done upward adjustment unless the initial difference between standards are very high.
- f) Mutual Recognition of standards can improve trade even under C.R.S and can aggravate the benefit of scale economies under I.R.S.

Agreements on standards raise issues that are both politically and analytically challenging. Unlike tariffs, standards cannot be simply negotiated away because the original reason for their existence is not trade protection but the enhancement of welfare by remedying sale of “low quality products”.( in the present model). If standard harmonization and mutual recognition agreement is feasible, then it will increase the total volume of trade. As mentioned in the introduction many Regional Trading Agreements do not have enough provision for liberalizing TBT by harmonization and Mutual Recognition Agreements though there is enough scope of that. For SAARC to emerge as a single market and to strengthen the trade position of the region with reference to the global supply chain SARSO and Conformity Assessment Board (CAB) should work for speedy harmonization of standards. Our present analysis suggests the same can improve the volume of both intraregional and interregional trade.

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## Appendix 1

$$\frac{\partial \pi_1}{\partial Q_{1A}} = a - 2bQ_{1A} = 0$$

$$\frac{\partial \pi_2}{\partial Q_{2A}} = a - bQ_{1A} - 2bQ_{2A} - F_A - D_{2A} = 0$$

$$\frac{\partial \pi_2}{\partial Q_{2B}} = a - 2bQ_{2B} = 0$$

From above equations:-

$$2bQ_{1A} + bQ_{2A} = a$$

$$bQ_{1A} + 2bQ_{2A} = a - F_A - D_{2A}$$

$$2bQ_{2B} = a$$

Solving by Cramer's rule one can get the quantities.

## Appendix 2

Country A, Consumer surplus under free trade is:  $-4a^2 / 18b$

The consumer surplus after it imposes standard on imports is:  $-(2a - F_A - D_{2A})^2 / 18b$

Producer Surplus for firm 1, i.e., firm in Country A under free trade is  $a^2 / 9b$

Producer surplus after the country imposes the standard on imports is:

$$(a + F_A + D_{2A})^2 / 9b \quad \dots(2.2.15)$$

Country B, Producer Surplus under free trade is  $13a^2 / 36b$ . Producer surplus after complying with international standard:-

$$a^2 / 4b + (a - 2F_A - 2D_{2A})^2 / 9b \quad \dots(2.2.1)$$

## Appendix 3

Firm i situated in importing country j,  
Before Harmonization,

$$Q_{ij} = \left( 5a - \sqrt{a^2 - (12b * E_{ij})} \right) / 12b$$

$$P_j = \left( 5a - \sqrt{a^2 - (12b * E_{ij})} \right) / 12$$

After Harmonization,

$$Q_{ij} = \left( 5a - \sqrt{a^2 - (6b * E_{ij})} \right) / 12b$$

$$P_j = \left( 5a - \sqrt{a^2 - (6b * E)} \right) / 12$$