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Export Standards and Export Losses in Global Trade: Need for Harmonization of Standards

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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. Export standards and regulations adopted by different countries have 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. Imposing export standards is often looked upon as a means of restricting trade and classified under non-tariff barrier. As norms and standards usually apply to national and foreign production, they do not correspond to the classical form of protectionism. 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 of trade and sometimes welfare and how the difference in standards in different export markets prevent the exporting firms to accrue the benefits of economies of scale. Differences in product standards and conformity assessment procedures can greatly influence trade volumes and patterns. Regional integration can be beneficial and existing Regional Trading Agreements should be revisited, reviewed and amended to include stronger provisions for standard harmonization. This can have a positive impact on trade within the region and with third countries.

Key words: Export standards, Export losses, Global trade, Globalization of standards

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, labour 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 defence 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.

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This paper has singled out export standards[1] (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. 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. [2] 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 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.

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.

Section II of the paper provides brief review of existing literature on export standards and export losses and effects of standard harmonization .Section III describes the model showing the export losses associated with export standards. Section IV focuses on harmonization of standards including its methods and effects as well as compares between Mutual Recognition Agreements (MRAs) and Harmonization. Section V concludes.

II. Literature Review

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 behaviour. 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 & Otsuki, 2004). Seventy 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

[1] By "standard" here we mean mandatory "standard" which is a part of TBT of WTO
[2] Baldwin (2001)

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 labour for production, additional labour 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), Vancauteren & Weiserbs (2003), and Mantovani & Vancauteren (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 modelling 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 behaviour 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 endeavoured to formally model TBTs (yet not their liberalization) and showing the need to overcome them is Ganslandt & Markusen (2001). Baldwin (2000) as well as Mattoo & Chen (2004) takes the analysis a step further by modelling both TBTs and their liberalization, cautioning against the discriminatory effects that the latter may entail. Mattoo & 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 9 per cent and 3 per cent respectively and standards reduce the likelihood of exporting to more than three markets by 7 per cent.

III. The Model

For simplicity, let us suppose the world consists of **2 countries, labelled as $j = A, B$, *where A is the importing country and country and B is the exporting country.*** The importing country imposes varied standards[3] and technical requirements on the good that is marketed in its market. The standard is quality related and not negative externality linked. [4]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 $\boldsymbol{F_{ij} \equiv F_j + D_i}$.[5] The first component of this fixed cost, $\boldsymbol{F_j}$, is the common cost to comply with the technical regulations imposed in country j (here, country A) which is identical across exporters.

[3] By "standard" here we mean mandatory "standard" which is a part of TBT of WTO

[4] or it can be linked with some "imposed" negative externality which has no actual implication for welfare.

[5] Chen,.Otsuki & Wilson (2006)

The second component, *Di*, represents the firm-wise deviation from F_j due to the varied impact each firm receives from standards and technical regulations. *Di 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,

$$p_A = a - b(Q_{1A} + Q_{2A}) \quad (3.1.1)$$
$$p_B = a - bQ_{2B} \quad (3.1.2)$$

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

$$\pi_1 = [a - b(Q_{1A} + Q_{2A})]Q_{1A} \quad (3.1.3)$$
$$\pi_2 = [a - b(Q_{1A} + Q_{2A})]Q_{2A} + [a - bQ_{2B}]Q_{2B} - (F_A + D_{2A})Q_{2A} \quad (3.1.4)$$

The equilibrium outputs are:[6]

$$Q_{1A} = (a + F_A + D_{2A})/3b \quad (3.1.5)$$
$$Q_{2A} = (a - 2F_A - 2D_{2A})/3b \quad (3.1.6)$$
$$Q_{2B} = a/2b \quad (3.1.7)$$

3.2.1. 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.

3.2.1. (A) Prohibitive Standard

These solution to equation3.1.6 is valid for $F_{ij} + D_{ij} \in [-a, 1/2a]$, (*i = 2; j = A)*. If $F_{ij} + D_{ij} \geq$ ½ 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 $F_{ij} + D_{ij} = ½a$). Here the Standard is Prohibitive in nature.[7]

3.2.1. (B) 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

$$(2F_A + 2D_{2A})/3b \quad (3.2.1)$$

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

$$\frac{\partial Q_{1A}}{\partial F_A} > 0 \; and \frac{\partial Q_{1A}}{\partial D_{2A}} > 0 \quad (3.2.2)$$

[6] Appendix 1

[7] 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.

$$\frac{\partial Q_{2A}}{\partial F_A} < 0 \; and \frac{\partial Q_{2A}}{\partial D_{2A}} < 0 \qquad (3.2.3)$$

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

$$\left(\frac{\partial Q_{2A}}{\partial F_A}\right)\left(\frac{F_A}{Q_{2A}}\right) < 1 \; and \left(\frac{\partial Q_{2A}}{\partial D_{2A}}\right)\left(\frac{D_{2A}}{Q_{2A}}\right) < 1 \qquad (3.2.4)$$

3.3. Effect on Welfare

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, consumer surplus under free trade is: $4a^2 / 18b$ (3.3.1)
The consumer surplus after it imposes standard on imports is: $(2a – F_A – D_{2A})^2 / 18b$ (3.3.2)
Loss in Consumer Surplus: $(4a – 2 F_A – 2 D_{2A}) (F_A + D_{2A}) / 18b$ (3.3.3)
Producer Surplus for firm 1 i.e. firm in Country A under free trade is: $a^2 / 9b$ (3.3.4)
Producer surplus after the country imposes the standard on imports is: $(a + F_A + D_{2A})^2 / 9b$ (3.3.5)
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:
$(F_A^2 + D_{2A}^2 + 2aF_A + 2F_AD_{2A} + 2aD_{2A}) / 9b$ (3.3.6)
Welfare gain: $(F_A + D_{2A}) / 3b$ (3.3.7)

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: $a^2 / 4b + (a – 2 F_A – 2D_{2A})^2 / 9b$ (3.3.8)
Loss in P.S: $(2a – 2F_A – 2D_{2A})(2F_A + 2 D_{2A}) / 9b$ (3.3.9)
Loss in welfare: $(2a – 2F_A – 2D_{2A})(2F_A + 2 D_{2A}) / 9b$ (3.3.10)

3.4. 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:
$u = \theta s – p$
$= 0$, if he buys a good with quality s at price p (3.4.1)

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. θ, a positive real number is a taste parameter. All consumers prefer high quality for a given price; however a consumer with a high θ is more willing to pay to obtain high quality and a high income consumer is having a high θ.

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 $\theta_c = (p_A - p_B) / (s_A - s_B) \ldots\ldots\ldots (3.4.2)$ will buy high quality good and those with a taste parameter lower than θc 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 θ 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:

$$p'_A = a' - b(Q_{1A} + Q_{2A}), where\ a' > a \quad (3.4.3)$$

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

$$\pi_1 = [a' - b(Q_{1A} + Q_{2A})]Q_{1A} \quad (3.4.4)$$

$$\pi_2 = [a' - b(Q_{1A} + Q_{2A})]Q_{2A} + [a - bQ_{2B}]Q_{2B} - (F_A + D_{2A})Q_{2A} \quad (3.4.5)$$

The equilibrium outputs are:

$$Q_{1A} = (a' + F_A + D_{2A}) / 3b \quad (3.4.6)$$

$$Q_{2A} = (a' - 2F_A - 2D_{2A}) / 3b \quad (3.4.7)$$

$$Q_{2B} = a / 2b \quad (3.4.8)$$

3.4.1. Effect on Trade

The exporting country may benefit from expansion of demand if

$$(a' - a) > 2F_{ij} \quad (3.4.9)$$

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.

3.4.2. 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

$$2(a' - a) > F_{ij} \quad (3.4.10)$$

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 3.4.10 is fulfilled. Even if the imposition of standard changes the willingness to pay; it will be more beneficial for the importing country. Condition 3.4.11 is less stringent than the condition 3.4.10.

IV. Harmonization and Mutual Recognition of standard

The exporting country may target more than one export market in a region *R*. [8]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

[8] 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.

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.

4.1. Model with multiple export markets

Suppose Dij shows the variable compliance cost for the ith firm to export to jth 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 Dij 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: $E_{ij} = D_{ij} + F_j$.... (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)

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

The profit of importing country firm:

$$\pi_B = \{a - b(Q_{1B} + Q_{2B})\}Q_{2B} \quad (4.1.3)$$

$$\pi_C = \{a - b(Q_{1C} + Q_{3C})\}Q_{3C} \quad (4.1.4)$$

The equilibrium exports are:

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

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

Total export:

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

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

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

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

Total export:

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

4.2. 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 [9] we can assume harmonization at the average rate of standard that leads to the compliance cost common to both the markets:

$$E = \frac{E_{1B}+E_{1C}}{2} \tag{4.2.1}$$

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,

$$Q_{1B} + Q_{1C} = \{2a - (2E_{1B} + 2E_{1c})\}/3b \tag{4.2.2}$$

The equilibrium exports under IRS,

$$Q_{1B} + Q_{1C} = \left\{2a + \sqrt{a^2 - 6b * E\ } + \sqrt{a^2 - 6b * E\ }\right\}/6b \tag{4.2.3}$$

4.2.1. 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 it can get the benefit of only integrated market.

Nevertheless the import in Country C will increase iff,[10]

$$E_{1B} < 3E_{1C} \tag{4.2.4}$$

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.

4.2.2. 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[11].the revenue from the market

[9] Chen and Mattoo (2004)
[10] Comparing values of q_{1c} before and after harmonization.
[11] As there will be fall in price in the importing country due to increase quantity from exporting country

with upward adjustment will also increase if condition 4.2.4. 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.[12]

4.3. Effect of MRA

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[13], 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. Conclusion

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. Many developing countries are yet to install the necessary infrastructure to help their exporters to meet market requirements. 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; (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

[12] see Appendix 2
[13] Chen and Mattoo (2004)

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; and (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. Unfortunately some of the Regional Trading Agreements do not have enough provision for liberalizing TBT by harmonization and Mutual Recognition Agreements though there is enough scope of that. Our present analysis suggests the same can improve the volume of both intraregional and interregional trade.

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References

CUTS, (2004). *Agreement on SAFTA: Is it win-win for all SAARC countries?* CUTS Centre for International Trade, Economics & Environment.

Baldwin, R. E. (1970). *Non-tariff distortions of international trade.* Washington: The Brookings Institution.

Baldwin, R. E. (2000). Regulatory protectionism, developing nations and a two-tier world trade system. Brookings Trade Forum, Washington D.C. Reprinted in Maskus and Wilson (eds.). (2001). *Quantifying trade effects of technical barriers: Can it be done?* Ann Arbor: University of Michigan Press.

Baller, S. (2007). Trade effects of regional standards liberalization: a heterogeneous firms approach. *World Bank Policy Research Working Paper 4124*. Washington: World Bank

Beghin, John & Jean-Christophe Bureau (2001). Quantitative policy analysis of sanitary, phytosanitary and technical barriers to trade. *Economie Internationale,* 87: 107-130.

Calvin, L., & Krissoff, B. (1988). Technical barriers to trade: A case study of phytosanitary barriers and U.S. Japanese apple trade. *Journal of Agricultural and Resource Economics,* 23(2):351-366.

Chand, R. (2012). International trade, regional integration and food security in South Asia with specific focus on LDCs. *Background Paper No. RVC4.* New Delhi: National Centre for Agricultural Economics and Policy Research.

Chen, M. X., & Mattoo, A. (2004). Regionalism in standards: Good or bad for trade?, *World Bank Policy Research Working Paper*. Washington: World Bank.

Chen, M.X., Otsuki, T., & Wilson, J.S. (2006). Do standard matters for export success? *World Bank Policy Research Working Paper, No. 280.* Washington: World Bank.

Deardorff, A. V., & Stern, R. M. (1998). *Measurement of nontariff barriers studies in international economics.* Ann Arbor: The University of Michigan Press.

Feenstra, R. (2004). *Advanced international trade: Theory and evidence,* New Jersey: Princeton University Press, 496 p.

Fisher, R., & Serra, P. (2000). Standards and protection. *Journal of International Economics* , 52: 377-400.

Ganslandt, M. & Markusen, J. R. (2001). Standards and related regulations in international trade: A modelling approach. In Maskus and Wilson (eds.), q*uantifying trade effects of technical barriers: can it be done?* Ann Arbor: University of Michigan Press.

Henson, S. & John S. W. (2005). The WTO and technical barriers to trade. In: *Critical perspectives on the global trading system and the WTO series.* Northampton: MA Edward Elgar Publishing Ltd.

Karki, T. B. (2002), Sanitary and phytosanitary (SPS) measures in SAARC countries, *Discussion Paper, v+43. SAWTEE*. Kathmandu and CUTS, Jaipur

Krugman, P. R. (1980). Scale economies, product differentiation and the pattern of trade. *American Economic Review*, 70: 950-959

Mantovani & Vancauteren, M. (2003). *The harmonization of technical barriers to trade, innovation and export behaviour: Theory with an application to EU environmental data.*

Moenius (1999). Three Essays on Trade Barriers and Trade Volumes, Ph.D. Dissertation. San Diego: University of California.

Roberts, D., & Unnevehr, L. (2005). Resolving trade disputes arising from trends in food safety regulation: The role of the multilateral governance framework. *World Trade Review*, 4(3): 469-497.

Swann, P., Temple, P. & Shurmer, M. (1996). Standards and trade performance: The UK Experience. *Economic Journal*, 106.

Vancauteren, M. & Weiserbs (2003), *The impact of the removal of technical barriers to trade on border effects and intra-trade in the European Union*. Université Catholique de Louvain.

Wilson, J. S., & Otsuki, T. (2004). *Standards and technical regulations and firms in developing countries: New evidence from a World Bank technical barriers to trade survey.* Washington: World Bank.

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 the 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

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,

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