Mutual Recognition and the Strategic Use of International Standards

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August 19, 1998

Abstract

This paper considers domestic product standards that do not raise the willingness to pay by consumers but increase the costs for foreign suppliers of serving the market. It is shown in a Cournot triopoly model that such standards can be used as strategic tool to raise domestic welfare by creating asymmetry between local and foreign producers. A country can raise its welfare by concluding mutual recognition agreements with a strict subset of its trading partners. In that case exclusively the largest countries agree on mutual recognition of their home standards, to the detriment of the country with the smaller home market.

JEL Classification Numbers: F13, F15

Keywords: Product standards, non-tariff barriers, mutual recognition

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1 Introduction

The issue of diverse environmental, technical and social standards among trading partners has taken centerstage in recent trade liberalization agreements. For example, NAFTA could only pass the 'quality control' by the US congress after US lobbying groups successfully pushed for inclusion of demands that Mexico upheld certain labor and environmental standards. The completion of the European Common Market included harmonization of a wide range of safety, environmental and labor regulations, which already suggests that consumer protection was not the main function of these differences.[1] The EU is demanding of applicants for membership the domestic adoption of virtually all significant technical, environmental and labor standards established through past and present practice among EU memberstates.[2] Countries not only deal with standards via multilateral trade agreements, but increasingly resort to bilateral mutual recognition (MR) of their respective domestic standards.[3]

Several EU member states have banned British beef claiming that it

[1] '... European standards for products ranging from household appliances to bread, beer, and pasta long functioned as import barriers within western Europe as well as internationally.' ([14], p. 9)

[2] The so-called Copenhagen criteria require, in addition to a number of political and economic criteria, the unconditional acceptance of the *acquis communautaire* (the body of legal and regulatory rules governing trade among EU members) before a country can be deemed eligible for admission into the EU.

[3] It may be interesting to note a similar arrangement in public international law. The 'comity of nations' principle gives recognition to the laws of one country within the territory of another. Like the product standards analyzed in this paper, applications of the comity of nations principle have often been among only a few, large countries.

presents health hazards to consumers related to the so-called mad cow disease; the EU has in 1986 banned US beef on the grounds that the practice of feeding it hormones is deemed unsafe. The US has repeatedly linked trade concessions to China to demands that it upheld human rights deemed infringed by the allegedly widespread use of prisoner- and child labor in the production of export goods. Germany has prohibited all domestic sales of beer not brewed in strict conformity with the 'Reinheitsgebot' of 1516 stipulating water, yiest, hop and barley as the sole ingredients in the production process. All these examples generated heated debates over whether the concerns leveled against the products in question are legitimate (either morally or according to GATT/WTO rules) or whether they are protectionist in nature.

This paper considers product standards that do not raise the willingness to pay by consumers.[4] They merely raise the costs of foreign producers of serving the local market. By creating asymmetry between local and foreign producers, the standards can be used as strategic tool to raise domestic welfare. In the context of a Cournot triopoly model, I show that countries have a direct interest in the standards in all markets. A country can raise its welfare by concluding mutual recognition agreements with a strict subset of its trading partners. In that case mutual recognition will always be between the largest countries, excluding the smaller ones.

For several reasons, the use of standards as a tool for a country to affect the outcome of international exchange has gained increasing importance in

[4] 'Many environmental and consumer regulations contribute little or nothing to enhancing consumer or environmental protection.' ([14], p. 7)

recent years. First, the steep increase in volume, variety and technical sophistication of internationally traded goods required imposition of standards to protect consumers and the environment from adverse effects of consumption. For the same reason, more was to be gained through cooperative international standards in terms of more efficient exploitation of the potential gains from trade. Countries are increasingly affected by domestic standards of trading partners. However, [3] and [12] conclude that international standards constitute only second best tools to serve those interests; good examples are 'green barriers' and transfrontier pollution or safety risks, where the first best interventions are direct payments to correct incentives at the foreign source without introducing further trade distortions. Second, since tariffs have been dramatically reduced under successive GATT treaties, non-tariff barriers served to 'fill the void'. This phenomenon has been dubbed a 'law of constant protection', referring to perfect substitutability between tariff and non-tariff barriers in maintaining a degree of desired domestic protection. A 1991 OECD report [11] notes that '...technical barriers to trade constitute a potential for protectionist trade policies, which could gain further importance in the future.' Hence the positive analysis of standards in international trade centers on their role in either protecting consumers, workers or the environment and lubricating trade, or that in manipulating relative costs of rivals to shift profits from foreign firms to domestic producers.

International standard setting has been complicated by a heated debate around the normative question whether standards should be harmonized between trading partners. Support for international harmonization comes mainly from producers in high standard countries. They claim that a com-

petitive advantage of importers based on lower foreign standards is 'unfair'; the vague notion of fairness invoked appears to rest on the philosophical issue of the universality of certain standards. On the other hand, assuming that the demand for domestic standards like that for other public goods merely reflects tastes and incomes of the population, academic observers have found little merit in arguments that higher standards necessarily disadvantage a country. While such differences often lead to discrepancies in absolute production costs, this need not ipse facto constitute an 'unfair' advantage; in fact it needs neither be an advantage nor unfair. The argument is that gains from trade are derived from exploitation of comparative advantage, and relative prices need not be altered by lower standards. Mainstream international trade theory considers harmonization as detrimental, as it masks natural patterns of comparative advantage and prevents maximum exploitation thereof.[5]

High-income countries are often accused of setting high standards to protect their lucrative home markets from foreign producers, while poorer countries tend to maintain socially suboptimal standards to lower production costs for domestic exporters and to attract FDI. Such strategic motivations for product standards have recently been analyzed in models of vertical product differentiation ([9], [10]). For example, [1] demonstrates that inefficient

[5] Casella [5] considers standards, defined as the provision of public goods, as a function of the income level. If standards are financed by general taxation in such a way that relative prices are unchanged, then the gains from trade between nations with different income levels (and hence domestic standards) are uncorrelated with diversity of standards. If free trade causes convergence of international income levels, standards tend to converge automatically, making harmonization a result of rather than a prerequisite for gains from trade.

environmental standards may raise domestic welfare of a country with an industry involved in international competition, but that in general this constitutes a second-best tool only. As shown in [6] in a situation of dynamic R&D competition, standards have welfare implications by affecting the private incentives to innovate. In the international context, [8] employ this insight in analyzing the use of standards as a tool for a government to improve the competitive position of its home firm involved in an R&D-race with foreign rivals.

Independently, Gandal and Shy [7] have recently reached similar conclusions as the present research. In a circular model of horizontal product differentiation, they show that mutual recognition of all domestic standards is the unique equilibrium for low standard conversion costs, while for higher costs large countries can raise their welfare by forming an exclusive standardization union at the expense of smaller trading partners.

2 The Model

2.1 Setup

Demand for a single good in the home markets of three countries $j = A, B, C$ is given by $Q^j = d^j - P^j$. Each country has a single home firm whose nationality is denoted with subscripts $i = a, b, c$. All firms face each other in all three markets. The firms compete in output, and the equilibrium concept used is the usual Cournot-Nash solution in quantities. Total production in a market is Q^j given by the sum of the output of all three firms in the country. It is assumed that no pair of countries has identical standards. Furthermore

home standards are entrenched in the sense that it is prohibitively expensive to alter them. This excludes the harmonization of standards across countries by assumption.[6] The constant marginal cost of production of a firm in a particular market, δ_i^j, is then a function of the presence of an MR:

$$\delta_i^j = \begin{cases} \delta \text{ if } i \neq j \text{ and there is no MR,} \\ 0 \text{ if } i = j \text{ or there is an MR,} \end{cases} \tag{1}$$

for some $\delta \in \mathbb{R}_+$.

Superscripts are omitted when the focus is on a single market.

2.2 Cournot Oligopoly Solution

Since the markets are independent, each firms maximizes its profits in each market separately. The optimand of a firm in a representative market is given by

$$\pi_i = (d - Q - \delta_i)\, q_i \tag{2}$$

$$= dq_i - q_i^2 - q_i \sum_{-i} q_{-i} - \delta_i q_i. \tag{3}$$

The first order condition from maximizing this expression with respect to q_i is

$$d - 2q_i - \sum_{-i} q_{-i} = \delta_i. \tag{4}$$

The first order conditions for the three firms are solved for the three reaction functions of the firms:

$$R_i\left(\delta_i, \sum_{-i} q_{-i}\right) = \frac{1}{2}\left(d - \delta_i - \sum_{-i} q_{-i}\right). \tag{5}$$

[6] In a vertical product differentiation model, [10] obtains harmonization as optimal policy if development costs are sufficiently different.

The intersection of the reaction functions determines the optimal quantity choice of each firm:

$$q_i^* = \frac{1}{4}\left(d - 3\delta_i + \sum_{-i}\delta_{-i}\right). \tag{6}$$

It is assumed that the cost of meeting a foreign country's standard is so small that it cannot serve to foreclose the market:[7]

A1: $\delta < \frac{\min d^j}{3}$.

Under assumption A1, it follows from (6) that $q_i^* > 0$ in all patterns of domestic standard requirements. Equation (6) gives an aggregate market production

$$\begin{aligned} Q^* &= \sum_i q_i^* \\ &= \frac{1}{4}\left(3d - \sum_i \delta_i\right) \end{aligned} \tag{7}$$

and a market price

$$P = \frac{1}{4}\left(d + \sum_i \delta_i\right). \tag{8}$$

In equilibrium each firm makes profits

$$\begin{aligned} \pi_i &= P(Q^*)q_i^* - \delta_i q_i^* \\ &= \left[\frac{1}{4}\left(d + \sum_i \delta_i\right) - \delta_i\right]\left[\frac{1}{4}\left(d - 3\delta_i + \sum_{-i}\delta_{-i}\right)\right] \\ &= \frac{1}{16}\left(d - 3\delta_i + \sum_{-i}\delta_{-i}\right)^2 \\ &= \frac{1}{16}\left(d^2 + 2d\sum_{-i}\delta_{-i} - 6d\delta_i - 6\delta_i\sum_{-i}\delta_{-i} + \left(\sum_{-i}\delta_{-i}\right)^2 + 9\delta_i^2\right). \end{aligned} \tag{9}$$

[7] See [10] for an analysis of entry deterrence with quality standards in a vertical product differentiation model with segmented markets.

Expressions 7, 8 and 9 show the well known result that in Cournot models, for aggregate quantities the sum but not the distribution of costs among firms matters, while for each firm's quantity and profit only the sum but not the distribution of its rivals' costs matter.

2.3 Mutual Recognition Cases

The following constellations of bilateral MR agreements are considered: No MR (case I), only an MR between A and B (II), MR agreements between A and B and between A and C (III), all possible MR agreements (IV), an MR between A and C (V) and MR's between A and C and B and C (VI). The following table summarizes the profits of each firm from operation in the respective market as a function of two arguments, its own costs and the sum of the costs of its rivals:

	Market A	Market B	Market C
I	$\pi_a(0,2\delta)\ \pi_b(\delta,\delta)\ \pi_c(\delta,\delta)$	$\pi_a(\delta,\delta)\ \pi_b(0,2\delta)\ \pi_c(\delta,\delta)$	$\pi_a(\delta,\delta)\ \pi_b(\delta,\delta)\ \pi_c(0,2\delta)$
II	$\pi_a(0,\delta)\ \pi_b(0,\delta)\ \pi_c(\delta,0)$	$\pi_a(0,\delta)\ \pi_b(0,\delta)\ \pi_c(\delta,0)$	$\pi_a(\delta,\delta)\ \pi_b(\delta,\delta)\ \pi_c(0,2\delta)$
III	$\pi_a(0,0)\ \pi_b(0,0)\ \pi_c(0,0)$	$\pi_a(0,\delta)\ \pi_b(0,\delta)\ \pi_c(\delta,0)$	$\pi_a(0,\delta)\ \pi_b(\delta,0)\ \pi_c(0,\delta)$
IV	$\pi_a(0,0)\ \pi_b(0,0)\ \pi_c(0,0)$	$\pi_a(0,0)\ \pi_b(0,0)\ \pi_c(0,0)$	$\pi_a(0,0)\ \pi_b(0,0)\ \pi_c(0,0)$
V	$\pi_a(0,\delta)\ \pi_b(\delta,0)\ \pi_c(0,\delta)$	$\pi_a(\delta,\delta)\ \pi_b(0,2\delta)\ \pi_c(\delta,\delta)$	$\pi_a(0,\delta)\ \pi_b(\delta,0)\ \pi_c(0,\delta)$
VI	$\pi_a(0,\delta)\ \pi_b(\delta,0)\ \pi_c(0,\delta)$	$\pi_a(\delta,0)\ \pi_b(0,\delta)\ \pi_c(0,\delta)$	$\pi_a(0,0)\ \pi_b(0,0)\ \pi_c(0,0)$

Table 1: Individual Profits in Each Market

The values of the entries $\pi_i(\cdot,\cdot)$ in Table 1 are, using equation (9), as follows: $\pi_i(0,0) = \frac{d^2}{16}$; $\pi_i(0,\delta) = \frac{1}{16}\left(d^2 + 2d\delta + \delta^2\right)$; $\pi_i(0,2\delta) = \frac{1}{16}\left(d^2 + 4d\delta + 4\delta^2\right)$; $\pi_i(\delta,0) = \frac{1}{16}\left(d^2 - 6d\delta + 9\delta^2\right)$; $\pi_i(\delta,\delta) = \frac{1}{16}\left(d^2 - 4d\delta + 4\delta^2\right)$.

To analyze the effect of different market sizes on the incentives to use

domestic standards as strategic tool, let markets A and B have identical demand that is large relative to market C, i.e. $d^A = d^B \equiv d > d^C$.[8] Let α denote the sum of the squared market inverse demand curve intercepts: $\alpha = \sum_j (d^j)^2$. Then the total profits for each firm from operating in all three markets, for each constellation of MR agreements, are as follows (the common factor of proportionality $\frac{1}{16}$ and the constant term $\frac{1}{16}\alpha$ are suppressed in the table):

	Firm a	Firm b	Firm c
I	$-4\delta\left(d^C - 3\delta\right)$	$-4\delta\left(d^C - 3\delta\right)$	$4\delta\left(d^C - 2d + 3\delta\right)$
II	$2\delta\left(2d - 2d^C + 3\delta\right)$	$2\delta\left(2d - 2d^C + 3\delta\right)$	$2\delta\left(2d^C - 6d + 11\delta\right)$
III	$2\delta\left(d + d^C + \delta\right)$	$2\delta\left(d - 3d^C + 5\delta\right)$	$2\delta\left(d^C - 3d\right) + 19\delta^2$
IV	0	0	0
V	$-2\delta\left(d - d^C - 5\delta\right)$	$-2\delta\left(d + 3d^C - 11\delta\right)$	$-2\delta\left(d - d^C - 3\delta\right)$
VI	$-2\delta\left(2d - 5\delta\right)$	$-2\delta\left(2d - 5\delta\right)$	$2\delta\left(2d + \delta\right)$

Table 2: Total Profits of Each Firm

2.4 Rankings

In order to be able to establish the private ranking of the possible MR constellations and to solve the game, we need to constrain the relative market sizes.

Case i:

A2: $d > 3d^C$

[8] The advantage of letting markets A and B have identical demand is that the cases of MR's between A and B and between B and C and of an MR only between B and C need not be considered separately, since they are equivalent to III and V, respectively.

Assumption A2 defines a situation where one market is significantly smaller than the other two. It follows from Table 2 that in this case the firms rank the constellations of MR agreements as follows:

Firm a:	II$\succ$III$\succ$IV$\succ$I$\succ$V$\succ$VI.[9]
Firm b:	II$\succ$III$\succ$IV$\succ$I$\succ$V$\succ$VI if $d + 6\delta > 3d^C$,
	II$\succ$III$\succ$IV$\succ$I$\succ$VI$\succ$V if $d + 6\delta < 3d^C$
Firm c:	VI$\succ$V$\succ$IV$\succ$III$\succ$I$\succ$II

Table 3: Private Rankings

Now we can establish the solution of the game where the firms determine the standards in their home market. This situation is realistic in many cases, since often widely dispersed consumer surplus recipients are unable to represent their collective interests as effectively as the few large producers in an industry. The OECD states that 'the need for increased consumer impact on the development of safety standards is regularly stressed in national and international fora. ... However, in the highly competitive area of technical standards, consumers will always be in a relatively weak position.' ([11], p. 11)

Proposition 1 *If the firms can set the standards, the unique equilibrium outcome satisfying A1 and A2 has only the larger two countries enter into a bilateral MR agreement (case II). The firm from the smaller country is worse off compared to I.*

Proof. From Table 3 it is privately optimal for firms a and b to move to II, which dominates all other outcomes for them. Firm c makes strictly lower

[9] This ranking uses A1. If A1 does not hold, the rankings of I and IV are reversed, but the main results are unaffected.

profits in this case. ■

Three characteristics of this unique Nash equilibrium are worth noting. First, the joint profit maximizing outcome for the firms is not achieved despite the fact that they are free to choose among all possible configurations of MR.[10] This is of course a result of the assumption of non-cooperative conduct and the absence of side payments between the rivals. Second, the equilibrium is not a Pareto improvement over the point of departure of no MR (case I), since firm c is hurt by the MR between countries A and B. The reason why in such a strategic setting not all firms are better off is that by introducing a cost asymmetry, a strict subset of countries can transfer profits from the third party to themselves. The party that is discriminated against (left out of the MR) is made worse off but by less than the combined gain of the other two firms.[11]

Third, the 'big guys' gang up on the 'little guy'. Among the available 'coalition partners' the firm with the larger home market is always strictly more attractive in terms of offering the larger benefit from a MR agreement. The threat that the excluded party is capable of making, i.e. not recognizing the other firms' standards in its home market, is less potent the smaller its home market is. Compared with case II, in V firm a loses the same amount

[10] The total sum of profits in each case is as follows: (I) $3\alpha - 4\delta d^C - 8\delta d + 36\delta^2$; (II) $3\alpha - 4\delta d^C - 4\delta d + 34\delta^2$; (III) $3\alpha - 2\delta d^C - 2\delta d + 31\delta^2$; (IV) 3α; (V) $3\alpha - 2\delta d^C - 6\delta d + 38\delta^2$; (VI) $3\alpha - 4\delta d + 22\delta^2$. The highest total is achieved in case III if $15.5\delta > d + d^C$, and in case IV otherwise. In any event, the total sum of profits is always larger in case III than in II.

[11] In the classic prisoners' dilemma payoff matrix this corresponds to a move to (fink, not fink), where the non-availability of another firm makes a corresponding move between C and another partner impossible.

in its home market by allowing a rival to sell at the lower costs; yet it gains less than the equivalent amount from getting itself free access to the smaller market C. In addition, it loses more from being relatively disadvantaged in market B (which is larger than market C). Hence a strictly prefers MR with the firm with the larger home market among the available partners. Firm c of course prefers being a's partner to the outcome in case II, but without sidepayments it cannot prevent a's entering into an MR with b.

Case ii:

A2': $3d^c > d > d^c$.

Under A2', if follows from Table 2 that the private ranking of firm a changes to III$\succ$II$\succ$IV$\succ$I$\succ$V$\succ$VI. To determine firm b's ranking a further assumption is needed, distinguishing two sub-cases.

A3: $d^C + \delta > d$.

Under assumption A3 firm b ranks the outcomes II$\succ$IV$\succ$I$\succ$III$\succ$V$\succ$VI.

A3': $d^C + \delta < d$.

Now B's ranking changes to II$\succ$III$\succ$IV$\succ$I$\succ$V$\succ$VI. Both under A3 and A3' II no longer constitutes an equilibrium since both firms A and C prefer to conclude an MR and hence move to III. Intuitively, country C then is sufficiently attractive as partner for an MR given the size of its market; it is indeterminate which of the (identical) bigger countries concludes an MR with the smaller partner. However, based on the above reasoning, if the size of all three markets differs it will be the firm with the largest home market.

Clearly firm c ranks outcome VI over V and both above all other possibilities. Will b under these circumstances be willing to enter into the first MR with firm a? A refusal to do so could lead to either V or VI, and b would in both cases be strictly worse off than in III. We have the following Proposition.

Proposition 2 *If the firms can set the standards, the unique equilibrium satisfying A1, A2' and A3 is outcome III. The unique equilibrium satisfying A1, A2' and A3' is III if* $3d^C > 3\delta + d$, *and I if* $3d^C < 3\delta + d$.

Proof. The preferences of the players are based on the information in Table 2. Firm b prefers II to III, but it knows that once in II, its two rivals will then conclude an MR, resulting in case III. Firm a can only get b to move to II if it is able to credibly threaten with an outcome that makes b even worse off than III. Since a always prefers I to VI, case VI cannot be credible threat. However, if $3d^C > 3\delta + d$, a prefers V to I and case V is therefore a credible threat if b refuses to move to II. Assumption A3 implies that this condition holds, and case III is then the equilibrium outcome. If A3 does not hold, two cases can arise. First, $3d^C > 3\delta + d$, and the outcome is again III following the same argument as above. Second, if $3d^C < 3\delta + d$, a prefers I to V. It can hence not credibly threaten to make b worse off if it refuses to go to II, and I is then the equilibrium outcome. ■

The smaller country is an attractive partner for an MR under A2'. However, country B can block outcome III by refusing to enter into an MR with A. This is optimal from its private point of view if remaining at the status quo (I) without any MR agreements yields higher welfare than outcome III.

The condition for this to happen requires A to have a large market, so that the disadvantage to firm b from having another low cost rival in that market is larger than the benefit it derives from its own MR with A. However, if A can credibly threaten to make B worse off by concluding an MR with the smaller country C, it can use this threat to get B not to block outcome III.

In the following I will focus on the solution in case i (i.e. outcome II) to investigate whether a pattern of MR between a strict subset of countries is a possible outcome if society (rather than producers) determines the national standard policy.

3 Social Welfare

In the previous section the firms were in control of the standards in their home markets. This resulted in equilibria where consumer prices are higher than necessary, since outcome IV with MR's between all countries was never an equilibrium. Each successive MR agreement lowers the market price by $\frac{\delta}{4}$ (from (8))and hence raises consumer surplus. To arrive at an assessment of the impact of MR agreements on social welfare, defined as the sum of consumer surplus and the domestic firm's profit, it is necessary to incorporate changes in consumer surplus in the calculations. What is the outcome if social interests prevail in the determination of MR decisions?

First let us consider the case where the cost δ incurred by firm c in meeting the standard in market A accrues to outside agents (maybe in market C), i.e. does not benefit the home country.[12] Define social preferences in a country

[12]The analysis is the same if the cost of meeting a standard is interpreted as a real

as the sum of producer surplus (the profits of the domestic firm from all three markets) and consumer surplus in the home market. The following proposition gives the result in this case.

Proposition 3 *If the costs of meeting a standard do not accrue to domestic agents, then social preferences determine standards in such a way as to produce the unique outcome IV if* $4d^C \geq d + 7\delta$ *and II otherwise.*

Proof. From the results in the previous section we know that if there is an MR at all then it is first among the larger countries before inclusion of the smaller country is considered. This result carries over to the case of social preferences determining the MR policy since the size of the home market of a trading partner does not affect domestic consumer surplus.

Note that the outcome in market A is the same in cases III and IV. Since firm a makes higher profits in case III, social preferences rank III over IV as well. However, in III consumer surplus is larger than in II since the lower costs of firm c lower the market price by $\frac{\delta}{4}$ and raise the aggregate supply by the same amount. Hence the increase in consumer surplus tends to offset the lower profits of the domestic firm. To be precise, consumer surplus rises by two areas. First, the recovered dead-weight loss triangle of magnitude $\frac{\delta^2}{32}$, and second the gain from lower prices on the quantity sold in the market in case II: $\frac{1}{4}(3d - \delta)\frac{1}{4}\delta$. The sum of these two terms must be larger than the loss of total profits in all markets for firm a in III relative to II, $\frac{1}{8}\delta\left(d - 3d^C + 2\delta\right)$ for social surplus to be higher in III. In other words, if the loss in profits exceeds the gain in consumer surplus, than social and producer preferences coincide

resource cost; in both situations the cost does not accrue as rent to domestic agents.

and society imposes the standards that the firm desires. The condition for this to occur is

$$\frac{1}{8}\delta\left(d-3d^C+2\delta\right) > \frac{1}{4}\left(3d-\delta\right)\frac{1}{4}\delta+\frac{\delta^2}{32}, \text{ or} \tag{10}$$

$$d+6d^C < 4.5\delta. \tag{11}$$

This condition, however, can never hold under A1. Hence country A prefers III over II.

However III is not an equilibrium outcome since a simple argument shows that both B and C prefer to conclude an MR agreement once they are in situation III, leading to IV. In country C both producers and consumers prefer IV over III. In B consumers gain $\frac{3}{16}\delta d-\frac{1}{16}\delta^2$ (from the right hand side of (10) while producers lose $\frac{1}{8}\delta d-\frac{3}{8}\delta d^C+\frac{5}{8}\delta^2$ (from Table 2). By A1 social surplus is hence always higher in B in IV than in III.

Note also that A has the ability to stop the MR process at outcome II since if it does not want to conclude a further MR with C then B will also not want to do that (the incentives of A and B are idential in this respect). A comparison of social welfare in II and IV determines then which outcome results. The change in consumer surplus between III and IV is zero in country A, and so the change between II and IV is given by the right hand side in (10) and the change in profits is given (from Table 2) as $4\delta d-4\delta d^C+6\delta^2$. Assuming that if indifferent a country takes the MR, social preferences in A therefore rank II over IV if $4d^C < d+7\delta$ and IV over II otherwise. ■

This result establishes the condition under which the trade restricting interests of the producer lobby dominates social preferences if domestic agents

do not obtain the revenue from the additional costs of δ imposed on foreign producers under a regime of non-recognition of their standards. Society prefers the efficient outcome IV if the smaller market is closer in size to the larger ones, and if the cost δ is small, i.e. if free access to the smaller market is attractive and it costs little in terms of granting a cost advantage for the foreign firm as part of the MR agreement.

If however society prefers II over IV in the larger countries, the credible threat of moving to IV if A moves to an MR with the smaller partner as well gives B the power to keep A from moving to III (which per se is preferred by A but makes B worse off).

On the other hand, if the revenue from the additional costs to foreign producers under non-recognition accrues to domestic agents in country A, it tends to relax the condition under which society prefers II. The revenue is given by the quantity produced by firm c in case II, multiplied by the cost per unit: $\frac{1}{4}(d-3\delta)\delta$. Including this additional benefit of II relative to III in the calculation of social preferences gives the following condition for II to be preferred:

$$\frac{1}{8}\delta\left(d-3d^C+2\delta\right)+\frac{1}{4}(d-3\delta)\delta>\frac{1}{4}(3d-\delta)\frac{1}{4}\delta+\frac{\delta^2}{32}, \tag{12}$$

or

$$d>2d^C+\frac{5}{2}\delta. \tag{13}$$

Assumptions A1 and A2 imply that this condition is always satisfied. This establishes the following proposition.

Proposition 4 *If the costs of meeting a standard accrue to domestic agents, then social preferences determine standards in such a way as to produce the*

unique outcome II.

Hence it is sufficient that the additional costs imposed on the foreign competitors accrue to domestic agents for the trade-restricting interests to dominate. This is of course a result reminiscent of the optimal tariff literature for a large open economy. If the costs δ are a pure revenue to the domestic economy, then their domestic welfare effects are equivalent to that of setting a tariff rate in the same amount. The difference between considering MR agreements and tariffs is that in the former case the domestic recognition policy is automatically reciprocated in the foreign country. Equation 13 only holds for sufficiently small such 'tariff' rates as determined in Assumptions A1 and A2.

4 Conclusion

The results in this note contribute to the growing body of research on non-tariff barriers in international trade. I show that if firms can raise the costs of a foreign rival by imposing domestic standard requirements they have strategic incentives to use this tool. It is optimal for large countries to discriminate against exporters from smaller countries, resulting in a strict subset of possible MR agreements. The incentive to discriminate against foreign trading partners in terms of standard recognition results from a profit shifiting motive. It is the smaller country that is refused MR agreements by the larger trading partners and is thereby made worse off. The reason is that the firm with the smaller home market has less to offer to rivals who eye the foreign market, but it presents the same threat to their home market. Through an

MR the larger countries create a cost asymmetry in their markets that raises their profits at the expense of the rival bearing the standard cost; the asymmetry benefits them more in their large home markets than it hurts in the smaller third market.

Furthermore, if the cost of meeting a domestic standard requirement is paid to domestic agents, society prefers the restricted trade outcome despite the fact that the market price is higher and consumer surplus accordingly lower than under a complete set of international MR agreements between the trading partners. On the other hand, if the cost is borne abroad, or consists of real resource costs, and does therefore not benefit domestic agents directly, social preferences are in favour of the outcome with more widespread MR and stand against producer interests.

These findings suggest that the degree to which domestic agents can confiscate the costs imposed on foreign rivals is an important determinant of the use of standards as trade-restricting tool, as is the relative weight of producer and consumer interests in social decisions. Furthermore the fact that it is the larger countries that gang up to discriminate jointly against the smaller trading partner has testable implications. Casual observation does indeed suggest that exporters from smaller and less developed countries face higher standard barriers.[13] For example, the EU members require the transition

[13] [14], p. 6 notes that 'the California effect refers to the critical role of powerful and wealthy "greeń" political jurisdiction in promoting a regulatory "race to the top" among their trading partners. Thus, just as California's relative size and wealth within the American economy has helped drive many American environmental regulations upward, so has Germany's relative size and wealth contributed to the strengthening of the European Union's regulatory standards.'

economies in central and eastern Europe that are economically much smaller to meet all standards contained in the *acquis communautaire*. And it is a frequently heard complaint of developing countries that rich countries shut their products out of their home markets using different standards, despite any simultaneous MR agreements in force among themselves.

Finally, the so-called MFN (Most Favored Nation) clause, extended to trade-related regulations, effectively bans exclusive bilateral agreements by requiring the extension of the most favorable market access regulations to all trading partners alike. Such a clause eliminates cases II, III, V and VI, leaving only I and IV to choose from. If the firms have strong impact on the domestic standard policy, this can be a welfare-lowering arrangement: Under A1, outcome IV yields higher profits than I and then the social first best is achieved, while otherwise the most restrictive case I results even though II or III would be socially preferred. This suggests that in the latter situation, options to conclude exclusive agreements with selected trading partners should not be restricted; rather the policy should be to institute effective transfer payments to compensate the excluded partners for their welfare loss.

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