

Economic Aspects of the Consistency Requirement in the WTO Agreement on the Application of Sanitary and Phytosanitary Measures

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Abstract: Article 5.5 (Consistency) of the WTO Agreement on the Application of SPS Measures requires Members to avoid arbitrary or unjustifiable distinctions in the levels of health protection they deem appropriate if such distinctions result in a disguised restriction on trade. In a two good, two-country model Consistency is interpreted as restraining the gap between the standards on imports and the domestic product. I show that Consistency increases efficiency but does not attain the Pareto frontier. While its purpose is to secure the gains from tariff liberalization the optimal constraint (gap) increases in liberalization and in the sensitivity of the domestic standard to Consistency.

Introduction

Trade may be associated with a risk to the health of a country's plant, animal or human populations. Diseases, pests, toxins and harmful chemicals are just some of the hazards that might accompany products being exchanged across borders. With recent technological advances in mass food production and scares such as the BSE and foot-

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and-mouth crises, concern, alleged or real, regarding the safety of imported products are being increasingly voiced and governments are under pressure from consumer or producer lobbies to regulate trade-related health risks.

Health regulation such as product standards, labels and import bans may be legitimate tools against verifiable health risks, but there is a concern that as tariffs are liberalized under the World Trade Organization (WTO) that health regulations as non-tariff barriers will proliferate and eliminate the potential gains from lower tariff rates.

Health regulations can disguise non-tariff barriers because governments can shield protectionist intent behind the *veil of uncertainty*, citing the lack of information about expected damages to health, as a valid reason to regulate imports. Non-discriminatory regulation applied equally to both domestic and foreign production may still favor domestic firms because of asymmetry in costs of compliance and negative international externalities encourage higher levels of protection than what would prevail if all firms were domestic.

While theory shows that cross-country bargaining over domestic regulation can eliminate some of the inefficiencies associated with its misuse, it is also generally accepted that international agreements on product standards are incomplete contracts because governments are unable or unwilling to bargain over all existing and future standards. Governments are highly resistant to ceding control of their domestic regulation to international organizations. Moreover agreements covering standards, especially those designed to manage risk, cannot possibly include all future contingencies embodying new products, new scientific evidence or new types of regulation.

The Agreement on Agriculture, which was negotiated under the GATT in the 1986-1994 Uruguay Round, and which includes commitments by Members to improve market access and reduce trade-distorting subsidies, was considered a significant first-step towards serious trade liberalization in agriculture. Yet the subsequent proliferation of food safety regulations, labeling requirements and quality standards means that agriculture remains one of the most protected sectors globally and many trade disputes between WTO Members regarding the legitimacy of such measures have arisen.¹

The WTO Agreement on the Application of Sanitary and Phytosanitary Measures² (SPS Agreement) entered into force with the establishment of the World Trade Organization on 1 January 1995 as a further attempt to stem disruptions in agricultural trade.³ The Agreement's multilateral framework of rules recognizes a country's right to protect its plant, animal and human populations but also aims to prevent the illegitimate use of health measures as non-tariff barriers.

Under the Agreement, Members can implement an SPS measure to achieve the level of health protection that they deem appropriate, as long as the measure is based on scientific evidence of the risks, is transparent and is the least trade-restrictive measure available. Members should also base their measures on international standards where possible and should recognize as equivalent the different measures of their trading partners if the latter have demonstrated that their measures meet the required level of

¹ For a discussion of the trade impacts of SPS measures refer to Henson and Loader (2001).

² In the Agreement, SPS measures refers to any law, decree, regulation, requirement or procedure that aims to protect plant, animal or human life from the risks arising from entry, establishment or spread of pests, diseases, disease-carrying organisms or disease-causing organisms, additives, contaminants, toxins or disease-causing organisms in foods, beverages or feedstuffs or which aims to protect human life or health from risks arising from diseases carried by animals, plants or products thereof.

³ The WTO Agreement on Technical Barriers to Trade (TBT) also provides specific disciplines on national technical regulations but applies only to those technical regulations not covered by the SPS Agreement.

protection. Furthermore, Article 5.5 (Consistency) of the SPS Agreement, which is the focus of this paper, reads:

each Member shall avoid arbitrary or unjustifiable distinctions in the levels it considers to be appropriate in different situations, if such distinctions result in discrimination or a disguised restriction on international trade.

This paper discusses the economic rationale of Consistency in terms of a two good, two-country symmetric model, where consumption of both goods is associated with a risk of getting a non-fatal disease.⁴ Each government chooses a tariff τ on the import good and product standards on both the import and domestically produced goods (γ and σ respectively) to maximize welfare. All three instruments lower the health risk by reducing consumption but the standards also reduce the level of the harmful substance in the good. Demand for each good and the costs of implementing each standard are identical. Each good's contribution to the risk per unit of consumption and for equal standard levels is also identical. The tariff and the import standard impose negative pecuniary externalities on trading partners and are strategic substitutes. Absent the tariff and negative international externalities efficiency demands $\sigma = \gamma$ or $\gamma < \sigma$ for $\tau > 0$.

I show that where tariffs are negotiated under a trade agreement but standards continue to be set unilaterally, for some bound tariff levels governments choose $\gamma > \sigma$ so as to transfer the costs of domestic health policy onto the Foreign monopoly which is not justifiable under Consistency. I go on to show that Consistency, interpreted as limiting the size of the gap between γ and σ , does lead to Pareto improvements for some tariff

⁴ While food borne diseases are estimated to cause as many as 9,000 deaths per year in the United States, they are also estimated to cause 6.5 to 33 million cases of diarrheal disease with annual economic losses of between \$5 and \$6 billion (Brynjolfsson *et al*, 1996).

levels but the first-best remains unattainable because the domestic standard is forced away from its efficient level.

Next I discuss related literature. The literature on domestic policy regulation in the context of international agreements is extensive. The model in this paper is not new in recognizing the inefficiencies associated with unilateral standard setting, but does add some new features in its discussion of Consistency. Also, by linking the provision of health regulation to the provision of government health insurance, I provide a plausible explanation for possible differences in health policies across countries.

Two important papers that discuss how domestic policy should be treated in the context of international agreements are Bagwell and Staiger (BS, 2001) and Battigalli and Maggi (BM, 2003).

BM show that because international agreements on standards are incomplete contracts, *ex-post* bargaining over standards is efficient but is inefficient from an *ex-ante* perspective. A Dispute Settlement Mechanism and a non-discrimination (ND) rule provide *ex-ante* efficiency gains.

The ND rule in BM can be interpreted as a Consistency constraint, but the model in this paper differs from theirs in two important ways. First, in BM, the standard on domestic and import production are not independent and in the unilateral case are inefficiently lax and strict respectively. To capture the feature that Consistency applies to products that are not directly competitive or substitutable, in this paper domestic production is independent of foreign production. As a result I show that even though Consistency links the level of the domestic standard to the level of the inefficiently high

import standard and forces it away from its globally efficient level, Consistency still generates efficiency gains.

Second, BM provide a normative theory of how international agreements on standards should be designed, given that they are incomplete contracts. They ignore tariffs. Since the SPS Agreement was a response to the proliferation of SPS measures subsequent to tariff liberalization in agriculture, including tariffs in the analysis of this paper is important. Consequently I am able to show that Consistency dampens the substitution towards import standards as tariffs are liberalized and that the optimal Consistency rule (the gap in standards) decreases in the bound tariff level.

BS ask how domestic standards should be treated in the GATT/WTO. In a model where governments choose tariffs, domestic production standards and consumption standards on imports, all of which exert international externalities through the terms of trade, they show that efficient policy outcomes cannot be achieved when a trade agreement covers tariffs alone and not standards. If tariffs are bound and standards are subsequently set subject to the constraint that market access levels do not change, the efficiency locus can be achieved under certain conditions. I show that while Consistency generates welfare improvements, unlike the *market access rule* in BS, the Pareto frontier is never attainable under Consistency because the domestic standard is forced away from its efficient level.

Fischer and Serra (2000) present a model of oligopolistic competition where the minimum standard chosen by the Home local social planner is higher than what it would be if all firms were domestic. Yet they also ignore tariffs and do not explicitly discuss international agreements or the imposition of a rule on standards.

Sturm (2000) constructs a model where political-economy factors lead to inefficient standards resulting in trade disputes between countries. He examines *mutual recognition* and *harmonization* of standards as a means to reduce the number of disputes. This model ignores political-economy forces and instead focuses on the negative international externalities implied by import instruments. While *mutual recognition* and *harmonization* imply that countries can negotiate over standards, the very nature of Consistency suggests that countries cannot negotiate and that unilateral standard setting must be subject to a rigid rule. Hence this paper focuses on unilateral standard setting in the context of an international tariff agreement. Of course, in reality, whether countries can negotiate or not will depend on many factors such as the types of products or the countries involved.

Few papers formally address Consistency and the SPS Agreement. Some notable exceptions are Anderson, McRae, and Wilson (2001) and James (2000). Anderson, McRae, and Wilson (2001) is a collection of papers dealing with the challenges of SPS interpretation as well as the application of economic principles to phytosanitary regulation and risk assessment. James provides an economic analysis of the *Hormones Case* (refer Section 2). She constructs a model of heterogeneous consumers and imperfect information and shows that if an imported product is *perceived* by consumers to be unsafe, despite a lack of (credible) scientific evidence to the contrary, the *first-best* solution is government mandated labeling so that consumers can distinguish between the safe and perceived-risky good. Several other authors have quantified the impact of sanitary measures on trade such as Otsuki and Wilson (2001 and 2002) and Otsuki, Sewadeh and Wilson (2001).

Section 2 discusses the interpretation of Consistency in two important WTO cases. Section 3 sets up the basic model and examines the competitive equilibrium with exogenous instruments. In section 4 I reintroduce the government and endogenous instruments and compare the Nash Equilibrium (NE) in tariffs and standards to the globally efficient Nash bargaining solution. I show that the first-best is not attainable if tariffs but not standards are negotiable. Section 5 introduces Consistency and welfare implications are evaluated.

The Three-Prong Test of Consistency in WTO Case Law

Article 5.5 (Consistency) of the SPS Agreement has been addressed in two important WTO cases. The *Hormones Case*⁵ provided the Appellate Body with its first opportunity to consider the SPS Agreement. It deals with a risk to human life from the consumption of beef treated with growth hormones. The *Salmon Case*⁶ deals with a risk to indigenous fish life from the introduction of exotic diseases from fish imports.

The first case arose out of a 1988 European Community (EC) ban on the use in beef production of three natural and three synthetic hormones for growth promotion, which led to a sales ban on meat and meat products that had been treated with the prohibited hormones, because of the possible link between hormones and carcinogenicity. In 1996 two separate panels were established to explore the United States' and Canadian claims

⁵ *Hormones*: European Communities - Measures Affecting Meat and Meat Products, AB-1997-4, WT/DS26/AB/R adopted by the Dispute Settlement Body, 13 February 1998

⁶ *Australia* - Measures Affecting Importation of Salmon, AB-1998-5, WT/DS18/AB/R adopted by the Dispute Settlement Body on 6 November 1998.

that the EC was violating several articles of the SPS Agreement, including Article 5.5. Later that year it was agreed that the two Panels would merge.

The second case was a response to the 1975 Australian prohibition on imports of fresh, chilled and frozen salmon for human consumption to prevent the introduction of exotic fish diseases. Upon Canada's request, Australia carried out a risk assessment as described in the 1996 Final Report and which concluded that the probability of introduction of 20 exotic fish diseases from imports of salmon was very small, but the economic consequences were great, and thus maintained its import ban. A panel was established to evaluate the Canadian claim that the ban was inconsistent and violated other articles of the SPS Agreement.

A country's health measures are deemed inconsistent when they simultaneously meet three conditions, as identified by the Appellate Body⁷ of the *Hormones* case. First, the Member must have adopted different appropriate levels of protection in "different situations". Second, the difference must be arbitrary or unjustifiable and third, the difference must lead to discrimination or a disguised restriction on trade.

The First Condition: different levels of protection?

Two questions arise. First, what is meant by a difference in "appropriate levels of protection" (ALOP) and second, what is meant by "different situations"? Annex A of the SPS Agreement states that ALOP and "acceptable level of risk" can be used interchangeably, but other than that no clear definition of ALOP is provided. It is clear

⁷ The Panel first identified the three conditions. Once a Panel decision has been rendered, both parties to a dispute have the right to appeal to the Appellate Body.

from Article 5.3 that the ALOP and the measure chosen to achieve that ALOP are two distinct concepts. Article 5.3 reads,

In assessing the risk to animal or plant life or health and determining the measure to be applied for achieving the appropriate level of sanitary or phytosanitary protection from such risk...

In *Hormones* and *Salmon*, the distinction between the ALOP and the measure used to achieve the ALOP was maintained. In *Hormones*, the ALOP was described in terms of Acceptable Daily Intakes (ADI) and Maximum Intake Levels (MIL) of the toxin (hormones). An ADI provides an estimate of the amount of the toxin, which may be ingested over a lifetime without appreciable health risk, and the MIL sets a limit on the amount of toxin residue permitted in food such that the ADI is not exceeded. Given the EC measure, which was the sales ban, the ALOP was inferred to be "zero residual" that is, the ban aimed to eliminate the risk.

In *Salmon*, the ALOP was described in terms of the acceptable economic/biological consequences, which is the product of the probability that the event occurs and the damages associated with the event occurring.⁸ The measure used by Australia was an import ban and the ALOP was inferred to also be a "zero risk" level.

This distinction between the measure and the ALOP means that for the first condition of the Consistency test to be violated, levels of protection, and not the measure, must differ in "different situations". In *Hormones* "different situations" was interpreted as

⁸ Damages might include loss of life, extinction of an indigenous species, domestic industry profit losses, costs of controlling and eradicating the disease etc. A possible reason for the different descriptions of the ALOP in each case might be that defining human life in terms of economic consequences is considered morally reprehensible. It might be considered more ethical to define ALOP in terms of toxin levels required for good health rather than in terms of the acceptable number of deaths per year. Also, the Panel in *Hormones* based its description of ALOP on that used by the Codex Alimentarius, the international organization responsible for developing international food standards.

"comparable situations", where the *same substance or adverse health effect* is involved.

The "zero residual" level of the banned hormones was compared with the level of natural hormones occurring endogenously in plant and animal food products (such as broccoli, milk and eggs), with natural hormones administered for veterinarian purposes and with growth hormones used in swine production.

The Panel concluded that since all types of hormones are associated with the same adverse health effect, namely cancer, that the EC sales ban had violated the first part of the three-prong test because there were fewer controls on the hormones occurring endogenously, on those administered for veterinarian purposes or on those in swine production, compared with those on growth promotion in beef production.

Salmon based its definition of "different situations" on the *Hormones* definition but added that since they were not dealing with a risk to human life, that "comparable" would include situations where either a risk of "entry, establishment or spread" of the same or a similar disease exists or where the same or similar "associated biological and economic consequences" occur, and this irrespective of whether they arose from the same product or other products. Herring, live ornamental finfish and salmon all have at least one disease in common and the Panel compared the different ALOP chosen by Australia across those products. That is, the import prohibition on salmon was compared to the few controls on the admission of herring in whole, frozen form used as bait and to the allowed importation of live ornamental finfish. The import ban on salmon was deemed in violation of the first condition.

Article III:2 of the GATT 1994 requires that imported products "shall not be subject, directly or indirectly, to internal taxes or other internal charges of any kind in excess of

those applied, directly or indirectly, to like domestic products." Factors that seem to be important in the determination of "like" under III:2 are whether the goods share similar characteristics in terms of their functionality to the consumer, whether they are directly competitive or whether they are substitutable. In comparison, goods that ought to be treated consistently need not share functionality or be substitutable. They need share similar characteristics only in terms of the same harmful substance or adverse health effect. Ornamental finfish is clearly no substitute for smoked salmon, yet they are comparable under 5.5 because they have at least one disease in common which can lead to the same economic/biological consequences.

"Comparability" under 5.5, especially if it is interpreted in terms of *adverse health effect*, can lead to an unrealistic test in the sense that products as unsubstitutable as raw honey and manure-compost be treated equally if they share the same disease. But the reason for the differences in "comparability" under 5.5 and "like" under III:2 can be explained by the purpose behind each of the articles.

Article III:2 is designed to prevent governments from using discriminatory regulation to give import-competing industries a competitive advantage. Consistency shares the same aim as III:2 but also recognizes that health regulation can restrict trade even if the regulation is non-discriminatory. While discriminatory regulation is good- or sector-specific, SPS measures target a particular adverse health or biological impact and so can be applied to a broader range of goods, whether substitutable or not. SPS measures are costly for firms to implement. If domestic and foreign goods are associated with the same disease, governments can lower the costs of their *non-discriminatory* health regulation by raising the relative level of regulation on sectors with a larger import-penetration ratio,

thereby transferring more of the costs onto foreign firms. This will result in higher levels of regulation than what would occur if all production were domestic. By grouping goods together in terms of health qualities, 5.5 provides a mechanism whereby protectionist measures, whether discriminatory or not, are distinguished from legitimate sanitary tools.

Assume two goods that are associated with the same disease because they both contain the same harmful substance. The goods are comparable as defined by the Appellate Body in *Hormones*. Each good is subject to a quality standard. Both standards are measurable in equal units, for example degrees Celsius, and are equally costly to implement. Assume also the levels of the toxin in each good and their contributions to poor health are equal if the standards are equal, because consumers demand each good in equal quantities. Thus, if the standards are equal, then the ALOP on each good are equal. The first condition of the three-prong test is violated if the standard on the import good is higher than that on the domestically produced good because the levels of protection differ in comparable situations. But does this mean that Consistency is violated? Not necessarily if the differences are not arbitrary or unjustified, or do not lead to disguised restrictions on trade or discrimination.

Consider the case when production costs, prices or demand are more sensitive to an increase in one of the standards. If demand for the import good exceeds that for the domestic good when standards are equal and consequently the probability of illness is higher for the import good, does Consistency still require equal standards? Assume that the domestic good is healthier, for example the way in which humans metabolize its toxin means that they are less prone to fall ill. A higher standard on the import good seems

justified because of the risk differences, but does this violate Consistency?⁹ Whether risk, demand and cost differences are valid reasons for different ALOP in different situations is the focus of the second condition, which I discuss below.

The Second Condition: Arbitrary or Unjustifiable?

For Consistency to be violated, it is insufficient that a Member's measures lead to differences in ALOP in different situations, but the differences must also be arbitrary or unjustifiable. In *Hormones* the Panel found that the "no residue" levels for beef production were arbitrary because scientific experts had shown that all hormones, whether occurring naturally, those used in swine production or those administered for veterinarian purposes, are all associated with cancer in humans. Moreover, the EC could not show that the risks were significantly higher for growth hormones. The Panel also concluded that while detecting residue levels of natural hormones in treated meat is difficult, this does not justify different levels of protection because the same problem is associated with hormones occurring naturally.

By considering cost differences, as well as the frequency of use of each type of hormone, the Appellate Body overturned the Panel decision and argued that the "no residue" levels were arbitrary with respect to swine production only. They based their decision on the EC argument that growth hormones are administered continuously whilst veterinarian hormones are used less frequently and that the costs of regulating naturally occurring hormones would be infinitely high.

⁹ Of course it is arguable that the goods are no longer comparable if consumers metabolize the toxin in each product differently. This issue was not addressed in *Hormones*.

The Panel in *Salmon* concluded that the second condition had been violated with respect to Herring bait and ornamental finfish. Since bait is directly introduced into the aquatic system and ornamental finfish are often released into the wild, while the salmon imports would be consumed, Australia could not show that the risks were significantly higher for salmon.

It appears that the second condition of the three-prong test is aimed at preventing Consistency from being applied too strictly. But the different conclusions reached by the Panel and the Appellate Body in *Hormones*, reflect the subjective nature of this second condition. Many of the Panel's arguments for a finding of unjustified measures with regard to hormones administered for veterinarian purposes were meritorious, as were some of the EC arguments justifying the differences in treatment across beef and swine production. For example, overdosing is less likely in swine production because the hormones are administered in feed. (Hurst, ?).

The Third Condition: Disguised Restriction on Trade?

The third part of the three-prong test is a thorny issue as it goes to the intent of the government adopting the SPS measure and is difficult for a complaining country to prove. While the Panel in *Hormones* concluded that the import ban was a disguised restriction on trade and failed Consistency, the Appellate Body disagreed. It found that although the ALOP on beef was arbitrary when compared with ALOP on swine production, the differences did not lead to discrimination or disguised restrictions on trade and so did not violate Consistency. The Appellate Body considered in its decision the following factors: the depth and extent of the anxieties experienced within the EC concerning the results of the general scientific studies, the dangers of abuse of hormones

and other substances used for growth promotion (highlighted by scandals relating to black-marketing and smuggling of prohibited veterinary drugs in the EC), the intense concern of consumers within the EC over the quality and drug-free character of the meat available in its internal market and the economic effects of the import ban on EC farmers, both hormone and non-hormone using.

The economic effects of the ban considered by the Appellate Body are of particular interest because compared with the Panel, they placed entirely different emphasis on relevant evidence. The Panel concluded that because a larger proportion of US than EC meat supply used growth hormones that the sales ban *de facto* discriminated against US imports. They also concluded that the differences in treatment between beef and pork production might be explained by the lack of pork surpluses in the EC market compared with the beef surpluses, which had occurred as a result of the reduction in intra-community barriers to trade. The Appellate Body placed less emphasis on this evidence than the Panel and chose to focus on consumer anxieties and concluded that the sales ban was enacted in "good faith".

The Panel and AB in *Salmon* concluded that Australia's import ban was a disguised restriction on trade because of the lack of restrictions on the internal movement of fish and the lack of sanitary measures to control the spread of disease in the internal market. Also the sudden change in conclusions between the 1995 Draft and 1996 Final versions of Australia's risk assessment was taken into consideration. The Draft Report recommended that the ban be removed, whereas the final report recommended that it remain and Australia was unable to provide reasons as to why the sudden change had occurred.

There is a clear distinction in the way the Appellate Body approached the third condition in each case. While a case concerning human, rather than animal life, might justify more caution, that is oversupply of health protection might be preferred to undersupply when human lives are at stake, the AB decision in *Hormones* is worrying.

Given that even non-discriminatory measures can hamper trade and that Consistency is designed to weed out those measures that restrict trade unnecessarily, the Appellate Body decision of "good faith" watered the Consistency constraint down. The Appellate Body rejected the Panel finding that the ban *de facto* discriminated against US producers because some EC beef producers were also affected by the ban. This suggests that measures must be discriminatory before they can be deemed inconsistent. But 5.5 clearly states that measures must be "discriminatory" *or* "a disguised restriction on trade". The inclusion of the word "disguised" suggests that where countries claim to be protecting health, but have additional motives in terms of restricting trade, that the measures must violate the third condition.

There was plenty of evidence available to suggest that this was in fact the case with regards to the EC ban. But as with the first condition, this third condition of the test is a subjective one and it is difficult to always determine a country's intent. The Panel or Appellate Body must rely on its instincts.

Also, while the EC ban was deemed to violate the SPS Agreement because it was not based on scientific evidence of the risks, the Appellate Body's interpretation of the third condition, suggests that governments held hostage to consumer anxieties would not be required to bring their measures in line with Consistency. This seems to "fly in the face" of the purpose behind Article 5.5., which seems to demand that differences in ALOP be

based on something more objective and concrete than merely the noise made by consumer lobbies.¹⁰

Summary

The main points to be garnered from the Case Law can be summarized as follows:

1. There must be a difference in ALOP across comparable goods.
2. ALOP is defined either in terms of the allowed levels of the toxin (humans) or the acceptable levels of the economic/biological consequences (plants, animals).
3. Comparable goods need not be substitutable, but must share the same pest/disease/toxin or must be associated with a similar adverse health event or economic/biological consequences.
4. Differences in ALOP are arbitrary if demand, cost and risk dissimilarities do not account for the differences.
5. Whether a difference in ALOP is a disguised restriction on trade goes to the intent of the Member and economic factors seem less important in the case of human rather than animal/plant life

In the next section I introduce the two-country symmetric model. In each country there is an import good and a good that is produced domestically. Both goods cause the same disease in consumers and a standard on each good (γ and σ on the import and domestic good respectively) lowers the harmful substance present in the good. I assume

¹⁰ James (2000) provides an economic analysis of *Hormones*. She constructs a model of heterogeneous consumers and imperfect information and shows that if an imported product is *perceived* by consumers to be unsafe, despite a lack of (credible) scientific evidence to the contrary, the *first-best* solution is government mandated labeling so that consumers can distinguish between the safe and perceived-risky good.

that each standard is measurable in equal units¹¹ and both lower the level of the harmful substance and the risk of falling ill by equal amounts. The costs of implementing each standard are identical. Demand is identical across both products and consumers are fully informed of the risk that is, they do not possess erroneous perceptions.

In this set up, and absent any other instruments, the ALOP across goods, whether measured in terms of toxin levels or economic/biological consequences, is equal if the standard levels are equal. Consistency is reasonably violated when $\gamma > \sigma$. A tariff on imports in the model does not alter this result because even though for some tariff levels $\gamma < \sigma$ but the ALOP is still higher on the import good than on the domestic good, this can not be considered a violation of Consistency for two reasons. First, if one accepts the view that Consistency is designed to prevent the use of SPS measures on imports as non-tariff barriers as tariffs are lowered, then including tariffs as one of the measures determining ALOP seems unjustified. Consistency is a restraint on standards not on tariffs. Second, treating $\gamma < \sigma$ as a disguised restriction on trade seems implausible.

The Model

In a two period, partial equilibrium model two symmetric countries, Home and Foreign, trade goods x and y . A monopoly in Home produces a quantity x for the Home market and exports a quantity x^* to Foreign. Likewise a monopoly in Foreign produces quantities y and y^* for both Home and Foreign markets. Markets are segmented. The

¹¹ For example, shell fish and some cheeses contain histamine-producing bacteria associated with Scombroid poisoning. A standard might prescribe the minimum level of MPN (Most Probable Number), a statistical estimate of the number of bacteria per unit volume. Or it might prescribe the minimum level of histamine units in parts per million (ppm). It could also specify the minimum temperatures that fish or cheeses must be stored under to prevent growth of bacteria.

numeraire good, m and m^* is non-tradable. Home only will be described, but Foreign variables that need to be indicated shall be denoted with an asterisk.

Production is subject to a government standard in each market the monopoly sells to. There are no fixed set-up costs of producing subject to two standards. Standards improve the quality of the product by reducing the level of a harmful substance present in the good. Standards in Home (Foreign) on the domestic and import good are represented by 0

$\leq \sigma(\sigma^*)$ and σ^* respectively and imports are also subject to a tariff τ (τ^*). I assume that the standards can be measured in equal units. An increase in the standard increases unit costs of production, which I assume to be equal across sectors for equal standard levels. Monopolies maximize per-period profits (Π_t) in both domestic and export markets:

$$\Pi_t = (p_t - c_t) x_t - \sigma_t x_t$$


where $t = \{1,2\}$, p_t is the producer price of good x in Home and p_t^* is the taxed price

of good x in Foreign. c are constant marginal costs where c_t and c_t^*

c_t^* . Letting p_t^* denote the producer price of good y in Foreign and p_t the taxed price of good y in Home, profits for the Foreign monopoly can be similarly defined:

$$\Pi_t^* = (p_t^* - c_t^*) x_t^* - \sigma_t^* x_t^*$$

Define p_y and p_x as the untaxed (producer) prices of goods y and x respectively. I assume that quality is not observable by consumers at the time purchasing decisions are made and since standards lower monopoly profits, in the absence of government regulation, firms choose $\gamma = \sigma = 0$. Each country is populated by a representative consumer with per-period utility function

 MATH

where u_x , u_y , u_{x^2} , u_{y^2} for all θ and θ respectively.

First-period consumption of x and y is associated with a risk of getting a non-fatal disease in period 2 where θ is the probability of getting sick. Define

V which is increasing in first period consumption of both products

and is decreasing and convex in the level of each standard. θ (for given levels of θ)

and θ is identical for all consumers and consumers have full information over how θ is

determined by θ and the standards. θ is separable across sectors.


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Absent any other instruments, if $x = y$ and $\sigma = \gamma$, both goods contribute equally to the


risk. Income Z in the second period is higher when the consumer is well (L^w) than when

ill (L^i). If $\frac{L^w}{L^i} > 1$ or $\frac{L^w}{L^i} < 1$ and $\frac{L^w}{L^i} > 1$, $\frac{L^w}{L^i} < 1$ and $\frac{L^w}{L^i} < 1$. The consumer

maximizes the sum of first period and expected second period utility

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where

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and the problem simplifies to a static optimization problem.¹² Consumers are risk neutral

so I ignore savings as a consumption smoothing tool and the consumer suffers no direct disutility from illness. Quality is not verifiable by consumers and they fall ill only after

purchases have been made. Consequently, consumers are aware that firms have no

incentive to provide quality and that, absent government intervention, $\sigma = \gamma = 0$. First-

period demand is a function of prices and $\frac{L^w}{L^i}$.

While a case for government intervention can be made given the firm moral hazard

problem, I ignore this possibility and instead simplify the model by assuming a

government that cares about the distribution of income between the healthy and the sick.

The healthy are taxed k to equalize income across states. By the law of large numbers, θ

represents the proportion of the population that falls ill (the government faces no risk)

and income under insurance equals expected second period income

¹² I assume Z^w sufficiently large such that Z^w is always consumed in positive amounts.

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and $\frac{\partial v_x}{\partial p_1}$, $\frac{\partial v_x}{\partial p_2}$ and $\frac{\partial v_x}{\partial Z}$ and $\frac{\partial v_x}{\partial \theta}$. First period consumption choices

are altered by the expectation of insurance in the second period. Although

$\frac{\partial v_x}{\partial \theta}$, θ here represents the proportion of the population that falls ill, so the effect that an individual's consumption has on θ is so small that consumers disregard it and take Z as fixed. First-period demand is now a function of prices only and is consequently higher.¹³ Welfare is lower.¹⁴

I assume the government cares about regulating the consumer moral hazard problem that occurs under full insurance. The government has three instruments available to it: the standards, σ and γ and a specific tariff on imports τ . The government uses instruments in the first period only. Taking government instruments and demand curves as given, a

monopoly maximizes profits in each period by setting $\frac{\partial \pi}{\partial p_1}$ and $\frac{\partial \pi}{\partial p_2}$ respectively.

¹³ Moral hazard will still result if disutility from illness (not only lower second period income) is introduced. Assume

$$E[u_2] = Z^w - \theta(Z^w - Z^u) - p_2x_2 - q_2y_2 + v(x_2) + v(y_2) - \theta\omega$$

where ω is a constant reflecting the disutility of illness and is not so large that it chokes off demand. Demand without insurance is defined by

$$v_x = p_1 + \theta_x(\hat{Z} + \omega)$$

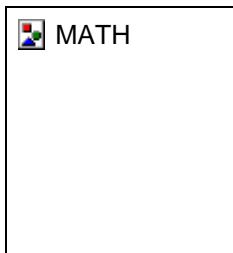
where $Z = Z^w - Z^u$. Demand with insurance is defined by

$$v_x = p_1 + \theta_x\omega$$

Demand increases with insurance and moral hazard persists despite disutility from illness.

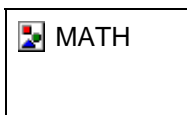
¹⁴ While characterizing the private insurance solution would be interesting it would render this paper too complicated. Private insurance would not be free of moral hazard and government intervention might continue to be justified. Likewise, while an argument for considering risk-averse consumers in the context of health insurance can be made, it would render this model, whose primary objective is the determination of quality standards in the context of tariff liberalization and Consistency, too complicated.

I assume $\frac{\partial c(\sigma)}{\partial \sigma} < 0$ and $\frac{\partial c(\gamma, \tau)}{\partial \tau} > 0$ and that equilibrium output is always positive. Since second period equilibrium prices and output are independent of government instruments I can drop time subscripts for simplicity. Define equilibrium prices in the first period as $p = p(\sigma)$ and $q = q(\gamma, \tau)$



Analogously $\frac{\partial c(\gamma)}{\partial \gamma} < 0$, $\frac{\partial c(\gamma, \tau)}{\partial \gamma} < 0$ and $\frac{\partial c(\gamma, \tau)}{\partial \tau} > 0$ and I assume that all the usual conditions hold

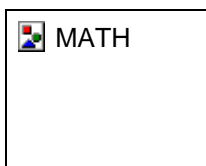
such that $\frac{\partial c(\gamma, \tau)}{\partial \tau} > 0$. All instruments lower demand but standards also change the quality of the product. Furthermore,



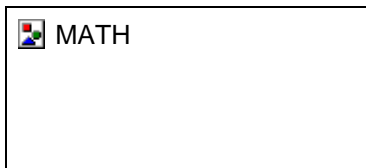
Demand and marginal cost curves are identical across sectors so if $c(\sigma) = c(\gamma) + \tau$, $x = y^*$ in equilibrium. Redefine profit and utility functions in terms of instruments



Profits are decreasing in government instruments



π^H is a function of σ only, while π^F and π^W are functions of both σ and γ . Assuming that tariff revenue is redistributed lump sum back to consumers marginal increases in instruments affect utility through lower consumer surplus, improved health and a change in tariff revenue.



where π^H . Home utility is independent of Foreign instruments. This result depends on the assumption of segmented markets. If the monopolist faced a non-

separable cost function $C(\sigma, \gamma)$ both π^H and π^F would depend on σ and γ in equilibrium. These cross-border health effects are likely to be secondary and so I ignore them.


The assumption of identical demand and production technologies across sectors

means that if α^H and α^F , β^H and β^F are identical. Monopolies are able to transfer some of the higher production costs of σ and γ onto Home consumers in the form of higher prices, which is reflected in the negative consumer surplus terms above. The important difference between the two standards is that the costs of σ (lower profits and consumer surplus) are completely internalized by Home, whereas the costs of γ are transferred partly onto Foreign in the form of lower profits. The costs of health policy in

sector y are distributed across both countries because $\tau^y = 1$ and prices do not increase by the full amount of the standard. This is a feature of this imperfect competition model. If firms were perfectly competitive with constant marginal costs, prices would increase by the full amount of the standard and the costs of Home health policy would be fully

internalized by Home. ΔU^H and ΔU^F include both the direct quality and indirect consumption

effects of each standard. ΔU^H includes indirect effects only because tariffs do not change quality. Finally note that in equilibrium,

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and τ and γ are strategic substitutes in health policy. By assumption, $\tau^y < 1$ so in

equilibrium $\tau^y < 1$.


In this section I have shown that government standards lower profits and may lower utility if the health gains (ΔU^H) are small. In the next section I treat instruments as endogenous taking into account the negative international externalities implied by import instruments.

Optimal Instrument Setting


Define welfare as the sum of utility and domestic producer profits over both periods, which is symmetric across countries.




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The Home government's objective function is

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and Foreign government's objective function can be defined analogously as

 MATH. I assume that all the conditions for a maximum of the objective functions are fulfilled and that

1.  , 
2. 

By Assumption 1 import instruments are strategic substitutes. I have already shown that import instruments are strategic *health* substitutes and so it seems natural to extend this. This assumption is important because the rules included in the SPS Agreement are justified on the grounds that countries substitute towards standards as tariffs are liberalized. The last assumption is required for a result in the sections on Consistency and is implied by Assumption 1. In the next section, I consider the globally efficient Nash bargaining solution in the symmetric case. Using the bargaining solution as the benchmark, I discuss the inefficiencies associated with unilateral instrument setting.

Nash Bargaining in the Symmetric Case

When governments can bargain over all instruments, the solution (

τ^*) is the solution to τ^* (τ^*). Since in the symmetric case

τ^* and τ^* I need characterize the solution in terms of Home

instruments (τ^*) only which are the solutions to the following first order conditions.

$$\frac{\partial \mathcal{L}}{\partial \tau} = 0 \quad (1)$$

$$\frac{\partial \mathcal{L}}{\partial \tau} = 0 \quad (2)$$

$$\frac{\partial \mathcal{L}}{\partial \tau} = 0 \quad (3)$$

where τ^* , τ^* and τ^* . All three conditions are independent of Foreign

instruments. τ^* is independent of import instruments but (2) and (1) define reaction

functions τ^* and τ^* such that τ^* and τ^* . As it does not add much to

the discussion on Consistency, I assume away subsidies, that is $\tau \geq 0$, and assume that τ^*

and τ^* (for all τ^*) are never binding. At τ^* , the conditions for both standards are

identical and $\sigma = \gamma$. Assumption 1 above ensures that $\frac{\partial \tau}{\partial \gamma} > 0$ and $\frac{\partial \tau}{\partial \gamma} < 0$. Both (1) and (2) cannot be met simultaneously because

$$\frac{\partial \tau}{\partial \gamma} > 0 \text{ and } \frac{\partial \tau}{\partial \gamma} < 0$$

and if $\frac{\partial \tau}{\partial \gamma} > 0$

$$\frac{\partial \tau}{\partial \gamma} > 0 \text{ and } \frac{\partial \tau}{\partial \gamma} < 0$$

(4)

which may be positive or negative. Note that $\frac{\partial \tau}{\partial \gamma}$ is the *direct* effect of γ on quality. I

assume that at $\gamma = 0$, $\tau > 0$ is always optimal and $\frac{\partial \tau}{\partial \gamma} > 0$ implies an equilibrium

$\frac{\partial \tau}{\partial \gamma} > 0$ and $\frac{\partial \tau}{\partial \gamma} < 0$. Likewise I assume that at $\frac{\partial \tau}{\partial \gamma} > 0$, $\frac{\partial \tau}{\partial \gamma} < 0$ is always optimal and

$\frac{\partial \tau}{\partial \gamma} < 0$ implies an equilibrium $\frac{\partial \tau}{\partial \gamma} > 0$ and $\frac{\partial \tau}{\partial \gamma} < 0$.¹⁵ Import instruments are

alternative means of maximizing profit and one instrument is always sufficient. The possible equilibria can be summarized as follows

$$\frac{\partial \tau}{\partial \gamma} > 0 \text{ and } \frac{\partial \tau}{\partial \gamma} < 0$$

Whether a positive tariff is preferred to a positive standard depends on the cost-quality trade-off of γ . Both the tariff and the import standard improve health by reducing consumption and so it is always optimal to have at least one of the import instruments

¹⁵ I ignore the possibility of $-\theta_\gamma \hat{Z} = c_\gamma y$

non-zero if the health effects are sufficiently large. The import standard has two additional effects, which are reflected in (4) above - γ increases costs and improves

quality. If the cost effect dominates the quality effect $\frac{\partial W}{\partial \gamma} < 0$, and a positive tariff is preferred.

Proposition: 1) Nash bargaining in the symmetric case does not result in global free

trade. Either $\frac{\partial W}{\partial \tau} > 0$ and $\frac{\partial W}{\partial \gamma} < 0$ or $\frac{\partial W}{\partial \tau} < 0$ and $\frac{\partial W}{\partial \gamma} > 0$.

2) Consistency is not violated under Nash bargaining because for all τ, γ .

In the next subsection I consider a static game where the Home government

unilaterally selects its trade-health policy (τ, γ) to maximize W and Foreign

chooses (τ^*, γ^*) to maximize U^* . The purpose is to characterize the Nash tariff-standard policies and the inefficiencies associated with unilateral action.

Nash Equilibrium under Unilateral Action

By symmetry I need consider the Home case only.

$$\frac{\partial W}{\partial \tau} = 0 \quad (5)$$

$$\frac{\partial W}{\partial \gamma} = 0 \quad (6)$$

$$\frac{\partial U^*}{\partial \tau} = 0 \quad (7)$$

The conditions are identical to the Nash bargaining conditions except that (5) and (6)

include the additional terms $\frac{1}{1-\tau}$ and $\frac{1}{1-\tau}$ respectively. Governments acting unilaterally fail to internalize the negative externality that their import instruments impose on the export profits of their trading partner. Equations (5) and (6) define the reaction functions $\frac{1}{1-\tau}$

and $\frac{1}{1-\tau}$ respectively and as before

$$\frac{1}{1-\tau}$$

which, if $W_\tau = 0$, is identical to (4) under Nash bargaining. If the tariff is the preferred instrument under Nash bargaining this will continue to be the case under unilateralism.¹⁶

This is intuitive because bargaining allows countries to exchange market access and does not alter the relative costs of each instrument. The possible Home equilibria are

$$\frac{1}{1-\tau}$$


$\frac{1}{1-\tau}$ because the conditions for the domestic standard are identical under both regimes. In the first and second equilibria tariffs and import standards are inefficiently



high respectively. Evaluating $\frac{1}{1-\tau}$ at $(\frac{1}{1-\tau})$ and $\frac{1}{1-\tau}$ at $(\frac{1}{1-\tau})$ for the two types of equilibria


$$\frac{1}{1-\tau}$$

or

¹⁶ The tariff may no longer be sufficient if an import-competing sector exists.

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and by concavity  and  Foreign government instrument choices are identical and so the two types of Nash Equilibria in trade-health policies are

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Both countries can benefit by a reciprocal reduction in tariffs and import standards in the first and second equilibria respectively.

Proposition: 1) Unilateral instrument setting results in inefficiently high tariffs if τ is the preferred instrument or inefficiently high import standards if γ is the preferred instrument.
2) Health protection is too high under the Nash Equilibrium and global welfare is reduced relative to the Nash bargaining outcome.

Assume that governments can bargain over tariffs but not standards. It is apparent that no matter whether τ or γ is the preferred instrument, the first-best solution is never attainable.

Assume a two-stage game, where in the first stage countries bargain over tariffs and in the second stage, taking the first-stage tariff levels as given, they set standards unilaterally. It is clear that under NE2, bargaining will not result in any changes and instruments remain at their Nash levels.

While characterizing the full solution under NE1 is beyond the scope of this paper, it

can be shown that the first-stage tariff, τ , will lie in the interval $[\tau^*]$ where τ^* at

τ^* τ^* . That is, governments always liberalize tariffs up to the lowest possible tariff level where the import standard stays zero and may liberalize further if the substitution towards a positive import standard is not so high that the market access gains

from lower tariffs are completely eroded. In the second stage, τ^* and τ^* are the solution

to τ^* and τ^* respectively given τ^* . Tariff bargaining under NE1 cannot

achieve first-best. Even if tariffs are bound at τ^* , import standards remain inefficiently

high. Evaluating W_γ at (τ^*) where τ^* gives the result τ^* because



and τ^* . The efficiency frontier is not attainable when standards are set unilaterally.

In the following section I discuss Consistency as a rule regulating unilateral standard setting. Consistency makes health protection on the import good more expensive by linking its level to the level of health protection on the domestic good and shifts countries closer to the Pareto frontier.

Standards and Welfare under Consistency

From now I treat τ as exogenous and lying in the interval $[\underline{\tau}]$, which can be interpreted as the bound tariff rate under tariff bargaining. For a given τ , standards satisfy

s^1 and s^2 . Defining τ^* as the tariff where $s^1 = s^2$ it is clear that in the

interval $[\underline{\tau}, \tau^*)$, $s^1 > s^2$ and in the interval $(\tau^*, \bar{\tau}]$, $s^1 < s^2$. As discussed previously, a

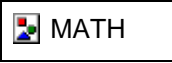
violation of Consistency would reasonably occur for every $\tau \in (\tau^*, \bar{\tau}]$. Requiring a country to bring the level of its instruments in line with Article 5.5 means narrowing the gap


between s^1 and s^2 . In the following sections I discuss the implications of a restriction on

s^1 for standard levels and welfare. I show that the efficient gap between standards is a decreasing function of τ and is increasing in the sensitivity of the domestic standard to the Consistency restraint.


Standards under Consistency

Defining standards under Consistency as s^1 and s^2 , Consistency implies

. Since s^1 is a decreasing function of τ , there will be some tariff levels for which s^1 is not binding and I focus only on the case where it is. Treating s^1 and τ as exogenous, the government's objective function is

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Substituting $\sigma = \gamma - s$ into the welfare function and redefining it as W^C the first-order condition with respect to γ is,

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because $\frac{\partial W^C}{\partial \gamma} = 0$. The solution to the first-order condition defines $\frac{\partial W^C}{\partial \sigma}$ and $\frac{\partial W^C}{\partial s}$.

Proposition: $\frac{\partial W^C}{\partial \sigma} = 0$ and $\frac{\partial W^C}{\partial s} = 0$ and $\frac{\partial W^C}{\partial \gamma} = 0$

The solution to $\frac{\partial W^C}{\partial \sigma} = 0$ requires that $\frac{\partial W^C}{\partial \sigma}$ and $\frac{\partial W^C}{\partial s}$ both be zero or that they be of

opposite sign, and since $\frac{\partial W^C}{\partial \sigma} > 0$ and $\frac{\partial W^C}{\partial s} < 0$ violate Consistency, the only solution is

$\frac{\partial W^C}{\partial \sigma} = 0$ and $\frac{\partial W^C}{\partial s} = 0$. Furthermore,

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It can be shown that $\frac{\partial W^C}{\partial \gamma} > 0$

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Proposition: Consistency dampens the substitution towards import standards as tariffs are


liberalized below τ^*

For every tariff level where Consistency is binding, Consistency increases health policy costs associated with the import good by linking the two standard levels together. Prior to Consistency the only cost associated with an increase in γ was a decrease in consumer surplus from higher prices, but under Consistency there are additional costs in the form of lower profits and consumer surplus with respect to sector x .


Welfare under Consistency

Substituting τ^* , τ^* and τ^* into τ^* defines τ^* as a function of τ^*

and τ^* .


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and

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which is a function of the exogenous tariffs τ and τ^* . The first two terms are positive and reflect the costs to Home associated with having its choice of standards constrained. The third term is negative and reflects the gain in welfare to Home from having Foreign's

import standard restrained. Using symmetry, the envelope theorem and τ^* ,

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(8)

and σ^* is the solution to (8) and is the efficient Consistency constraint that improves welfare relative to the situation where standards are set unilaterally for a given tariff.

Proposition: Even though the unilateral domestic standard is set at its globally efficient level prior to Consistency, Consistency still generates Pareto improvements.

Only the import standard is set inefficiently, but by linking the level of the inefficient standard to the efficient domestic standard, Consistency still leads to Pareto

improvements. Let σ^* is identical to the Nash bargaining condition for the

import standard which implies σ^* at σ^* and σ^* at σ^* . Let σ^* is

identical to the condition for the import standard when governments act unilaterally

which implies σ^* at σ^* .

Proposition: The optimal Consistency constraint σ^* is decreasing in σ^* and σ^* .

The intuition is straightforward. If the domestic standard is unchanged at σ^* (σ^*), and remains at its globally efficient levels, Consistency mimics the Nash bargaining

result because σ^* . The smaller is σ^* the more costly is Consistency by forcing σ^*

further away from σ^* . At σ^* , there are no offsetting gains in a country's export market for having its standards constrained and countries are worse off under

Consistency. However it can be shown that τ^* is never possible and there is always a τ^* that improves welfare relative to the unilateral case.

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How does τ^* change with τ ?

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By Assumption 1 above the sum of the first two terms is negative. By Assumption 2, the

third term is also negative and $\frac{\partial \tau^*}{\partial \tau} < 0$. The result is intuitive. First, the lower is τ , the

greater the need for γ to combat health risks and the smaller is τ^* . Second, if s is held

constant as tariffs are lowered, both standards must deviate from their Nash levels by a greater amount making Consistency more expensive.

Proposition: τ^* decreases in τ and s .

To conclude, Consistency can play an important role in moving countries closer to the Pareto frontier but is insufficient at achieving the global maximum because of the

constrained domestic standard (α never equals one). Furthermore, Consistency is relevant only for the interval $[\alpha^*]$ and if countries have not liberalized as far as α , no changes are made and the outcome remains inefficient.

Conclusions and Further Research

While a country's right to protect itself from health risks associated with trade is recognized by the WTO, the obscure nature of health regulation can facilitate the abuse of SPS measures as non-tariff barriers. This was made evident by the Agriculture Agreement's failure to stem disruptions in agriculture trade. Recognizing the difficulty of distinguishing legitimate health measures from those disguising non-tariff barriers, the SPS Agreement sets up a multilateral framework of rules governing the manner in which Member's can adopt SPS measures. Amongst these rules is Consistency, which, by limiting the difference in levels of health protection on goods that share the same adverse health impact, leads to Pareto improvements by dampening the substitution towards non-tariff barriers as tariffs are liberalized.

The symmetry in this model means that Consistency is reasonably violated when $\gamma > \sigma$ and leads to Pareto improvements. In reality, demand, cost and risk dissimilarities make the task of distinguishing legitimate from illegitimate SPS measures a difficult one and higher levels on an import good might reflect legitimate ways of managing health risks. The WTO Dispute Settlement Body (DS) is given the task of deciding, with incomplete information, whether the higher levels of protection on imported goods are arbitrary and lead to disguised restrictions on trade.

The DS can commit two types of errors: knocking down a legitimate measure or upholding a protectionist one. As argued above, the interpretation of the third condition of the three-prong test in the *Hormones* case favored too much over too little health protection making it more likely that the second type of error is committed. Consumer fears and perceptions of the risk weighed heavily on the Appellate Body decision, which concluded that the sales ban was not a disguised restriction on trade. This is a worrying consideration for developing countries, whose major exports are agricultural goods and whose major markets are developed countries with highly organized producer and consumer lobbies.

While I avoided the discussion of the relationship between Consistency and the intent to liberalize, this might be an interesting topic for further research. Many developing countries have put a stop to liberalization in agricultural sectors, using the argument that the lack of similar commitment in the developed countries, where agricultural sectors are highly organized and SPS measures are pervasive, destabilizes the playing field. Consistency, if interpreted strictly, might encourage further tariff liberalization, which might otherwise come to a standstill in the face of non-tariff barriers.

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