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WELFARE ANALYSIS OF A PROHIBITIVE NTM IN A SOCIETY WITH A PROPORTION OF CONCERNED CONSUMERS

Welfare Analysis of a Prohibitive NTM in a Society with a Proportion of Concerned Consumers

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Abstract

The aim of this contribution is to provide a cost-benefit analysis in a partial equilibrium framework to investigate the welfare consequences of a non-tariff measure (NTM). The important issue of the analysis is having two groups of indifferent and concerned consumers. The ultimate aim of the paper is to investigate whether or not the paternalistic behavior of government is in line with the willingness of the consumers for demand. The existence of information about the origin of goods is the leading issue of the analysis that provides two different scenarios. The model is calibrated with data on consumption of shrimps. The findings suggest that in the existence of such information, NTM policy has the lowest international losses and highest domestic gains. The policy implication of these results suggests that governments should try to increase the information in the market when they are following good faith for imposition of NTM.

Keywords:
welfare, trade policy, non-tariff measures, technical barriers to trade

JEL:
D61, F13

1. Introduction:

Since General Agreement on Tariffs and Trade (GATT) in 1948, tariffs on trade between the World Trade Organization (WTO) members have fallen. However, non-tariff measures (NTMs) have received worldwide/global attention. Multi- Agency Support Team (MAST)[2] described NTMs as follows:

"Non-tariff measures (NTMs) are policy measures, other than ordinary customs tariffs, that can potentially have an economic effect on international trade in goods, changing quantities traded, or prices or both." (MAST, 2008)

According to the classification of World Integrated Trade Solution (WITS) in February 2012, NTMs include 16 categories of which the first and second are most frequently used for notification by WTO members. The Sanitary and phytosanitary (SPS) measures, and Technical Barriers to Trade (TBT) are respectively the first and second categories described in WITS. According to WITS, SPSs are measures that are applied for the aim of: protecting human or animal life from risks arising from additives, contaminants, toxins or disease-causing organisms in their food; protecting human life from plant- or animal-carried diseases; protecting animal or plant life from pests, diseases, or disease-causing organisms; preventing or limiting other damage to a country from the entry, establishment or spread of pests; and protecting bio-diversity. These include measures taken to protect the health of fish and wild fauna, as well as health of forests and wild flora. According to the same source, TBTs are "measures referring to technical regulations, and procedures for assessment of conformity with technical regulations and standards, excluding measures covered by the SPS Agreement."

These measures have attracted worldwide/global attention: The World Trade Report (2012) specifically discusses them and analyzes their impact on the international trade. They have been very effective instruments for the governments to follow different motivations. There can be three reasons for imposition of these regulatory measures. Firstly, NTM can serve as a public policy and not as an economic issue, which concerns protection of human health or safety, animal or plant life or health, or the environment. For instance, within a TBT or SPS measure, a foreign product with negative effects on the consumers is restricted from importation because consumers are not well informed about the harmful attributes of that product. Thus, the NTM policy mainly should increase consumer welfare of the domestic society.

Secondly, from economical aspect of view, NTM might focus on the increase of social welfare to correct market failures without implementation of discrimination in trade. It can be a case that both producer and consumer welfare will be improved by the imposition of new regulations. Since the government does not introduce import tariffs, there is no revenue for the government. However, WTO allows such NTM that also fulfills the first reasoning.

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[2] (MAST) as of July 2008 comprise institutional members: Food and Agriculture Organization of the United Nations (FAO), International Monetary Fund (IMF), International Trade Centre UNCTAD/WTO (ITC), Organization for Economic Cooperation and Development (OECD/TAD), United Nations Conference on Trade and Development (UNCTAD), United Nations Industrial Development Organization (UNIDO), World Bank (WB), World Trade Organization (WTO). Observers: European Commission (EC), and United States International Trade Commission (USITC), United States Department of Agriculture (USDA). UNCTAD and World Bank jointly coordinate MAST. MAST reports to the Group of Eminent Persons, which is convened by the director general of UNCTAD.

Thirdly, it can be caused by a pure political economy that aims to intervene free trade to support special interest groups without even increasing consumer welfare, which leads to the protectionism of the domestic industry. This motivation is addressed as protection for sale in the literature (Grossman and Helpman, 1992; Goldbe and Maggi, 1997). In fact, social welfare is changed by the summation of domestic producer surplus increase and government utility improvement induced by the support of lobbying industry.

The first two reasons show good faith by the governments and are supported in the agreements of WTO. While the last one can unnecessarily hamper trade and violate the articles related to NTMs. In other words, special interest groups who are lobbying with corrupted governments might persuade them to break international rules and provide some protectionism measures for them. However, in an empirical research on all countries in the world, Ghodsi (2013) found no statistically significant linkages between corruption and level of protectionism or level of trade. TBT, SPS, and other agreements of WTO cover logical frameworks for impositions of NTMs. They give justifiable authority to members for implementation of their own standards that are not discriminatory. Governments might claim protection of their population using NTM while they might truly protecting their own economy or industry at the expense of economies and trade of other countries.

In general, new standards and new regulations that are imposed in the context of NTMs have quite effective impacts on international trade. When a government imposes a new standard, foreign industries should adopt themselves to these standards in order to get permission to export to that country. However, the new standards are mostly in line with the domestic industries' productions. In the beginning, if the standards are not in line with foreign industries, their export will be halted until they comply themselves to these new regulations. If the modification of production procedure is not affordable by those foreign industries, they will simply lose one of their markets and they often ask their own governments to take the legitimate actions within international regulations and WTO agreements. Sometimes, it takes a long time to convince the imposing government to eliminate the policy or even comply with the current agreements if violated.

Governments pursuing good faith mostly provide scientific and justifiable reasons for the implementation of TBTs and SPSs. Paternalistic behavior of the governments consider the protection of their own nation against outdated standards that allowed importation of some products with negative characteristics. The new standards and regulations in the focus of the NTMs try to faithfully increase the quality of life of the consumers. However, it is very rare that governments follow the true requests from their own consumers. In fact, the paternalistic attitude does not allow consumers to intentionally choose their own characteristics of the product while decisions are made on their behalf. Some consumers do not care about bad properties of products and some are not even informed about them. Nevertheless, governments take the decisions of imposition of new standards for higher qualities whether or not the policy is in line with international agreements.

When the new NTMs are imposed to increase the safety of products, pattern of trade and importation will dramatically change. Foreign competitive rivals that could not afford the new standards are then out of the domestic market, and only those firms producing in line with new regulations remain in the market. It takes a definite period of time that foreign industries keep up with new standards and modify their own production procedures. During this period the market structure becomes less

competitive and consumers indifferent or unaware of negative characteristics of products in line with outdated standards will bear a cost.

The aim of this paper is to provide a theoretical framework to analyze and quantify the welfare changes in a country imposing prohibitive NTMs, when consumers classified into indifferent and concerned ones. Paternalistic behavior of the government can be better judged after such analysis. Moreover, when majority of domestic consumers are concerned about the negative properties of the foreign product, government policies seem to be more justifiable in the context of international regulations and WTO agreements. In itself, it can be good technical evidence in addition to scientific proof behind imposition of NTMs. In the next section, a brief literature review on the issue accompanying an anecdotal fact will be provided. In the third section, the basic analysis of the theoretical model will be done. The effective welfare changes of the country imposing NTM will be elaborated in the fourth section. Finally, conclusions and the possible extensions of the model will be discussed in the fifth section.

2. Anecdotal fact and literature review

Figure 1- Export of swine from Canada to the USA during 1996-2012

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
020311	23115	20455	18598	19350	8281	2954	3915	5362	10016	10384	12234	13578	5124	4082	956	15	3
010310	275	420	69	163	790	4906	1344	1958	966	1006	839	824	940	415	298	259	334

Source: UN Comtrade

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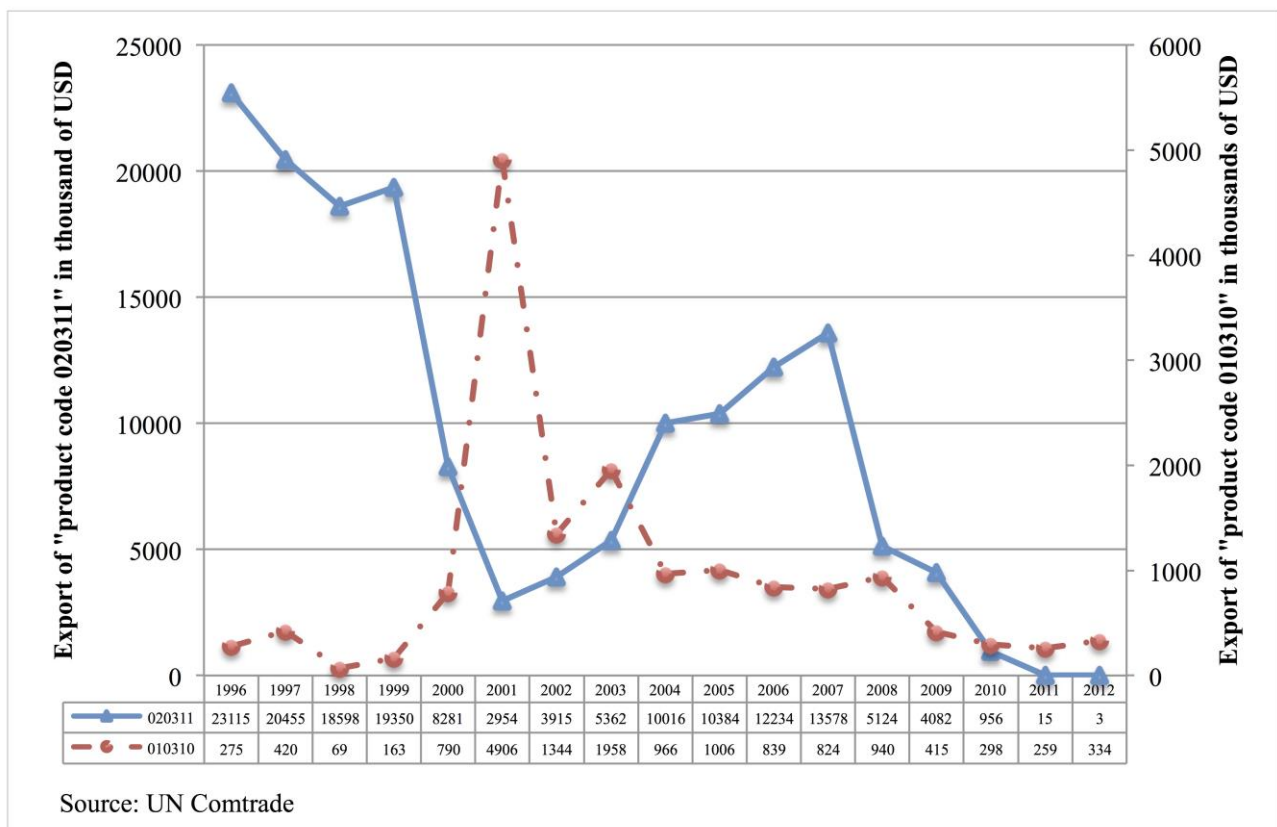
In September 1998, Canada requested for consultation (DS144) with the United States within Dispute Settlement Mechanism (DSM) with respect to certain measures, imposed by the US state of South Dakota and other states, prohibiting entry or transit to Canadian trucks carrying cattle, swine, and grain. Since then, this Dispute Settlement (DS) case had been pending according to the WTO website[3]. Canada and Mexico requested consultation with the United States of America concerning the mandatory Country Of Origin Labelling (COOL) within cases DS384 and DS386 respectively in December 2008. These two cases seem to be similar to the complaint by Canada in DS144. European Union countries (27 member states) with 12 other countries reserved their third party rights in these disputes. COOL was believed to be discriminatory within the framework of WTO agreements. After some years of analyses and investigation in the DSM, the Appellate body issued its findings in June 2012. The USA was proved to violate Article 2.1[4] of TBT agreement and promised to implement the rulings and recommendations of Dispute Settlement Body (DSB) until May 2013. Figure 1 can show the changes of swine export from Canada to the USA.

Figure 1 shows the export trends of "live swine, purebred and breeding" with Harmonized System (HS) code (revision 1996) 010310 in the right vertical axis (dashed line with round nodes); and "meat of swine, fresh or chilled" with HS-1996 020311 in the left vertical axis (solid line with triangular nodes) from Canada to the USA. As it is observed in the above example, export of meat of swine has dropped dramatically in 1999 (after DS144). Then in 2001 export of live swine has jumped dramatically, which seems to be a substitute for meat of swine. However, export of live swine dropped after one year and gradually decreased until 2012. After 2001 export of meat of swine has been gradually increased but in 2007 (before DS384) it dropped dramatically. As it is observed, the main reason for the decrease of swine export from Canada can be the prohibitive NTM imposed by US.

To the date of the writing of this paper, it will take two (2) more months for the rulings of DSB to be implemented by the US. The first significant effect of this policy was prohibition of the importation of some products from Canada. Even if the industries of Canada had tried to implement the regulations of the USA, it would have taken a long time to comply with them.

In order to quantify welfare implications of NTM policies, cost and benefit analysis are conducted within the framework of partial equilibrium. Paarlberg and Lee (1998) used a numerical partial equilibrium approach to find the linkages between the Foot-and-Mouth Disease (FMD) risky products imported to the US and the level of protectionism. They simply modeled the surplus changes of consumers and producers, and a government maximizing welfare by assigning the optimal tariff. Then they calculated the output losses after the outbreak by assigning a probability to its risk.

Maskus et al. (2000) described briefly DS requests during 1995-2000 citing TBT and SPS agreements. They shortly reviewed the literature on the role and effects of standards on trade. They stated that surveys, econometric studies, partial equilibrium studies, and computable general equilibrium studies are the general frameworks of the research on the issue.

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[3] Can be found at: http://www.wto.org/english/tratop_e/dispu_e/cases_e/ds144_e.htm
[4] Article 2.1 of the TBT agreement is "Members shall ensure that in respect of technical regulations, products imported from the territory of any Member shall be accorded treatment no less favourable than that accorded to like products of national origin and to like products originating in any other country."

Thilmany and Barret (1997) studied the effects of technical regulations on the export of food products from US to other North American Free Trade Agreement (NAFTA) countries. They assumed in their model that both demand and supply curves are shifting upwards after the imposition of new standards. In fact, the costs of producers increase to comply with new standards and supply curve shifts up. Moreover, new standards increase the quality of the products, and all consumers become more certain about the new good characteristics of the product. Therefore, consumers' utility increases and the demand curve shifts up. This assumption is simply on the basis of homogenous consumers that are all concerned about the negative characteristics of products.

Van Tongeren et al. (2009) conduct a modular partial equilibrium model that focuses on demand and supply relationships. Changes in social welfare were analyzed in three different scenarios; Prohibitive standard that completely brings the market into autarky (NTM), free trade, and mandatory labeling that provides complete information of the goods to the consumers. These three scenarios were considered for the effects on consumers, producers, and for global commons externalities. Although, they stated that they also modeled the externalities of the products, it seems that they only modeled negative direct characteristics of the product, and not the indirect externalities.

Aisbett and Pearson (2013) suggested that governments are following good motivations for imposition of SPS and it is mainly due to the importance of healthcare and environmental qualities in those imposing countries. However, it is still necessary to analyze if the governments are pursuing the requests of their nations and not their own paternalistic decisions.

Beghin et al. (2012) provided a framework similar to van Tongeren et al. (2009). They considered only two scenarios of informed consumers and uninformed consumers about the negative characteristics of foreign products. They assumed that informed consumers are also concerned consumers. They found that the prohibitive standards increase the international welfare. When consumers are unaware of negative attributes of products, only foreign producer's welfare decreases slightly, while domestic producer and consumers gain from the regulation. When consumers are completely informed, all of these agents gain from the new standards. The important weaknesses about their theoretical approach are: Firstly, addressing informed consumers as also concerned ones because preferences do not imply information; Secondly, negative externalities of consumption are not clearly identified, and only negative direct characteristics of the foreign product are introduced in their model. Negative externalities can be discussed when consumption or production of a product by an agent that gives her positive utility or profit decreases utility or profit of another agent indirectly; Thirdly, they assumed that consumers could not distinguish between foreign and domestic products, yet they are assumed to consider a share of foreign products on total products of the market in their utility functions; Fourthly, when they cannot distinguish between the two products, consumers can rationally assign probabilities to the share of foreign products in the market and then make decisions.

This paper is a similar contribution to Beghin et al. (2012) and van Tongeren et al. (2009) with some modifications. Here, it is assumed that consumers are aware of negative characteristics of the products but they can be indifferent or concerned about them. However, in two different scenarios existence of the information for consumers to distinguish the origin of products will be altered. NTM policies are strictly prohibitive and they halt the import of foreign products with damaging attributes,

which is the situation before the improvement of foreign production procedures. The market structure in this model differs from those two references, meaning that here, under free trade, the home country has an oligopolistic market. Oligopolistic competition instead of perfect competition can provide a clearer situation in which the government uses consumers' safety as an excuse to impose NTM even though the real reason is to increase domestic industry's welfare. The findings of this paper can clarify the motivation of the government behind the imposition of NTMs. In fact the analytical framework discussed in the following can show whether the government is actually increasing consumers' welfare by the restrictive measure.

3. Basic analyses of the model

For simplicity, I assume there are two countries, Home country (H) and Foreign country (F). Domestic consumers and producers and foreign producers are addressed as the main agents of this model. It is assumed that the foreign product contains some negative characteristics that might cause damages to human health, animal life, and environmental qualities. Some domestic consumers might be concerned about these negative attributes and internalize them in their preferences. A domestic government that tries to protect its own population against the harms of foreign product imposes a prohibitive NTM that increases the standard of the product. Domestic industry has been producing in line with new standards. Foreign producers need to comply with the new regulations, in order to be able to export to the home market, and it takes a period of time. In this model it is tried to analyze the domestic welfare changes after imposition of an NTM during the time that the foreign product is not imported to the home market because of lower qualities before the foreign industry complies with the new standards.

The domestic country has a population of N_H. Demand of each consumer, $i = \{1, \dots, N\}$, from a quasi-linear utility function of a good can be easily derived. Considering quadratic preferences of the good and an additive numeraire, the utility function of each domestic consumer for a product is as follows:

$$U_i(q_i, w_i) = aq_i - \overline{b} \, q_i^2/2 - Ir_iq_i + w_i \tag{1}$$

Where w_i is the utility of the numeraire good, term $aq_i - \overline{b} \, q_i^2/2$ is the satisfaction of consumer i from consuming quantity q_i of a good. r_iq_i is the supposed damage of the product, which might be focused by the technical policy or new regulations. In order for concerned consumers to demand the product with negative characteristics, it is simply assumed that $r_i < a$. Term I represents the concerned knowledge of the consumer regarding the damage of the product. Therefore, if the good is not accounted harmful for the consumer, this term will equal to zero. Conversely, if $I = 1$, it will mean that the consumer will be concerned about the negative properties of the good. Overall, term Ir_iq_i captures the impacts of concerned harm about a good for the representative consumer. Even if the product is potentially harmful for human consumption, it is assumed for indifferent consumers that the internalized positive satisfaction of that product compensates for the expected potential harm in the future completely. Cigarette smoking can be an example of that. Therefore, preferences are only subjective and they are capturing only the perception of satisfaction. A concerned consumer (decision maker or social planner) might think that indifferent consumer's preferences are subjective, but indifferent people themselves think of it as

an objective utility function. Harm of a person in the society is unrelated to others (no indirect externalities of products assumed), and only satisfaction of consumption is the only factor in preferences of indifferent consumers. They simply do not think about harm, diseases, or death; and that is why they are labeled indifferent.

There are two types of people in the society. $\eta = N_1/N$ is the proportion of the population who are indifferent to the negative characteristics of the good. It means that $Ir_iq_i = 0$ for $i = 1, \ldots, N_1$. The rest of the society is concerned about the damaging effect of the product, which comprises $1 - \eta = 1 - (N_1/N)$ proportion of the population. Thus, for $i = N_1, \ldots, N$, $Ir_iq_i = Irq_i > 0$, where "r" is the average of "r_i" in the group of concerned consumers.

Demand functions can easily be derived after maximizing the above utility function with respect to a budget constraint: $pq_i + w_i = y_i$. Where p presents the price of the respected good, y_i stands for the income of the representative agent i, and price of the numeraire is equal to 1. Consumers do not know the true (subjective) probability of getting the product with bad characteristics; they simply act as if the probability of consuming foreign good is equal to 1. Therefore, the demand function for the consumer is: $q_i(p) = (a - p - Ir_i)/\overline{b}$. Considering aggregate demand of all consumers as $Q = \sum_{i=1}^{N} q_i(p)$, and assuming $b = \overline{b}/N$, the inverse aggregate demand for each group of people in the society will be of the form:

$$p_1^D(Q) = a - (b/\eta)Q \qquad \text{indifferent consumers}$$

(2)

$$p_2^D(Q, I) = a - Ir - [b/(1-\eta)]Q \qquad \text{concerned consumers}$$

Equation two suggests that when these two groups of society are equally distributed ($\eta = 0.5$) and they demand and consume the same amount of products, concerned consumers are willing to pay a lower price than indifferent consumers. The disutility from the harmful attributes in the products induces a lower willingness to pay for the second group of consumers than for the indifferent ones. In other words, when the market has only one segment for both groups with a unique price, concerned consumers demand and consume less products than indifferent ones.

The supply side of the market is an oligopolistic competition between the two industries of both countries[5]. It is assumed that the foreign industry produces a product with lower quality and less costs than the domestic firm. However, since there are transportation costs for the exportation of foreign products, it is simply assumed that each firm has similar cost functions. In other words, cost of transportation is included in the cost of the final good imported from the foreign supplier. Industries are maximizing their outputs with respect to a quadratic cost function in output. Considering $Q = \sum_{i=1}^{N} q_i(p)$, the profit for each industry is:

$$\pi_j = p(Q)q_j - \frac{1}{2}cq_j^2 - K, \text{ for } j = \{H, F\}$$

(3)

Where c is the variable cost parameter, and K is the sunk cost related to the market entry. Since symmetry in both countries is assumed, this equation is equivalent for both. Considering Cournot oligopoly game, production strategies of the producers can be calculated in two scenarios. The difference between the two scenarios is the existence of information. In the first scenario it is assumed that consumers have

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[5]It is simply assumed that there exists one industry in each country; each industry acts as a monopoly in autarky even if it comprises various firms (think of a cartel).

incomplete information about the origin of the products, while in the second scenario consumers can distinguish the origin of the products. In fact, in the first scenario government does not try to provide a situation in which consumers can distinguish the two products. Even after imposition of the NTM government does not inform them about the new regulations. In the second scenario, government tries to implement a policy like mandatory labeling of products, which is assumed to be costless for industries, in order to induce consumers to choose the products rationally. However, in both scenarios the media and scientists inform all people that the foreign product has some negative characteristics.

3.1. Scenario 1.

3.1.1. Benchmark

In the beginning, there is free trade in the market. Products are not differentiated and consumers have incomplete information, thus they cannot recognize the origin of the product in order to figure out which of the products have the damaging effect. Besides, as explained earlier they assign probability 1 for getting products with negative characteristics. Total demand of the home country can be derived from (2) as follows:

$$Q^D(p) = \begin{cases} \dfrac{\eta}{b}(a - p), & a - r < p \leq a \\ \dfrac{a - (1 - \eta)r}{b} - \dfrac{1}{b}p, & p \leq a - r \end{cases} \tag{4}$$

When damaging effect of the good perceived by the concerned individual is so big such that $r \geq a$, then only η of the total population demand for goods. This means that concerned consumers do not risk themselves by buying the goods that are mixed with the harmful products. If we assume that $r < a$, then concerned consumers also demand products even with negative characteristics; thus the producers maximize their profits with respect to 4. After calculating their best strategies for production and Nash equilibrium strategies in this game, total output of this oligopoly with price p_{O1A}^S is:

$$Q_{O1A}^S = \begin{cases} \dfrac{2a\eta}{3b + c\eta}, & a - r < p \leq a \\ \dfrac{2(a - (1 - \eta)r)}{3b + c}, & p \leq a - r \end{cases} \tag{5}$$

Now consider an NTM policy that prohibits the import of goods from abroad. Simply assume that it as a high sunk cost imposed to the foreign firm that induces exit from the home market. The market goes to autarky and a single monopoly supplies the product domestically[6]. In this case, it is assumed that consumers are not informed about the imposition of NTMs and the new standards, and they still think that there exists one product from two different producers. The reason behind this is that from the beginning they did not have complete information to even distinguish between the

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[6]Previously there has been an example that led to the dispute settlement in the WTO.

two products' origins [7]. Hence, after maximization of profit, the output of the monopolist with price p_{M1A}^S is as follows:

$$Q_{M1A}^S = \begin{cases} \dfrac{a\eta}{2b + c\eta}, & a - r < p \leq a \\[2ex] \dfrac{a - (1-\eta)r}{2b + c}, & p \leq a - r \end{cases} \tag{6}$$

Figure 2 shows this case using demand and supply curves. D_1 shows the demand curve for indifferent individuals and D_2 represents the demand curve for concerned

Figure 2- Equilibrium in Scenario 1
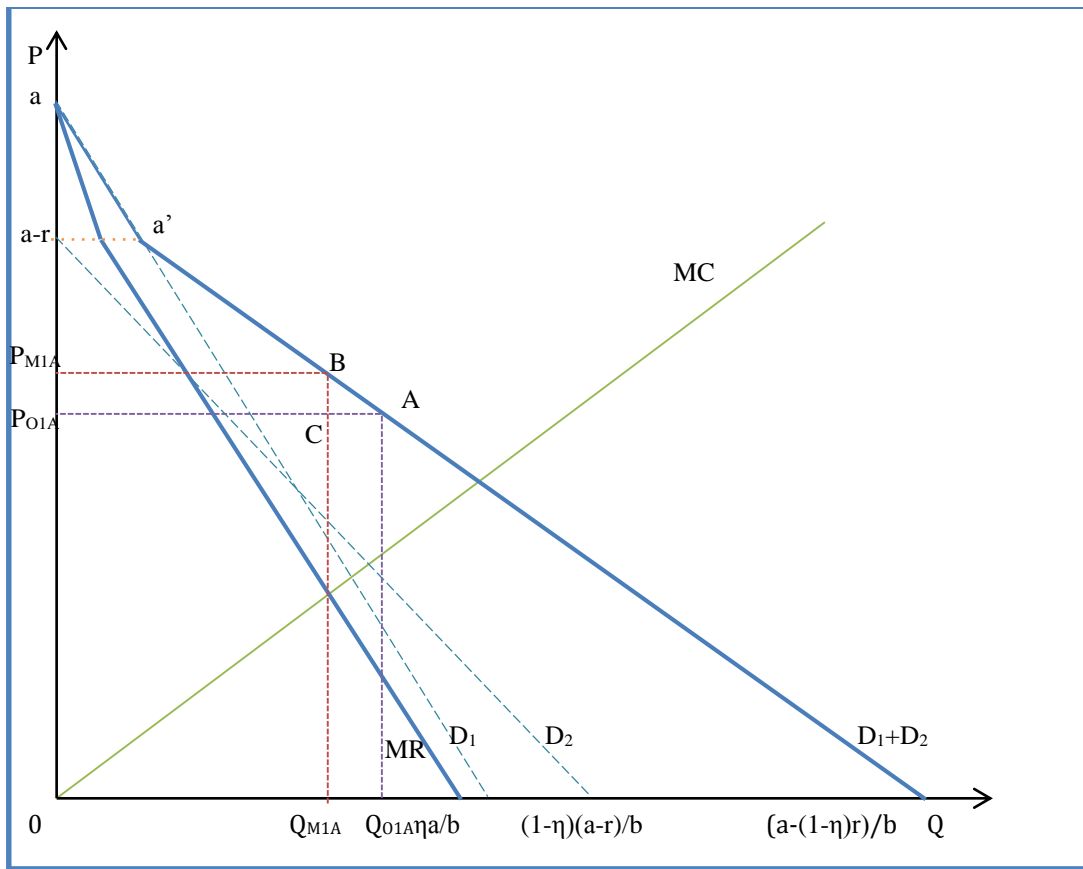
consumers. Here it is assumed that $\eta < 0.5$ and D_1 has a sharper slope, meaning that concerned consumers are majorities. However, the opposite situation does not alter/affect the outcomes of the analysis. This simply means that indifferent consumers' demand is less elastic in changes of prices in comparison with concerned consumers' demand. The only winner with such policy is the domestic producer and government does not gain any revenue from such policy.

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[7]However, we can in addition think of an NTM in addition to mandatory labeling of the product, then, consumers will get the complete information and they exclude the disutility from their preferences. They simply know that there will be no more foreign product and this case will change to a new case.

3.1.2. Extreme case A

Assume that all consumers of the home country are indifferent about the negative characteristics of the product, thus, $\eta = 1, Ir = 0$. Therefore, industries face the inverse demand function $p^D(Q) = a - bQ$. After profit maximization and considering best response functions for the industries, Nash equilibrium solution to this strategic game is $q_H = q_F = a/(3b + c)$. Total supply of the two industries will be $Q^S_{O1B} = q_H + q_F$ with p_{O1B} as the equilibrium price.

Now consider a new regulation imposed as an NTM to trade that halts the import from the foreign producer completely. In this case, domestic firm acts as a monopoly and maximization of its profit yields new output $Q^S_{M1B} = q_H = a/(2b + c)$ and price p_{M1B}. Points A and B are showing the equilibrium prices and quantities for, respectively, oligopoly before imposition of NTM and monopoly after imposition of NTM.

Figure 3- Equilibrium in Scenario 1, extreme case 1
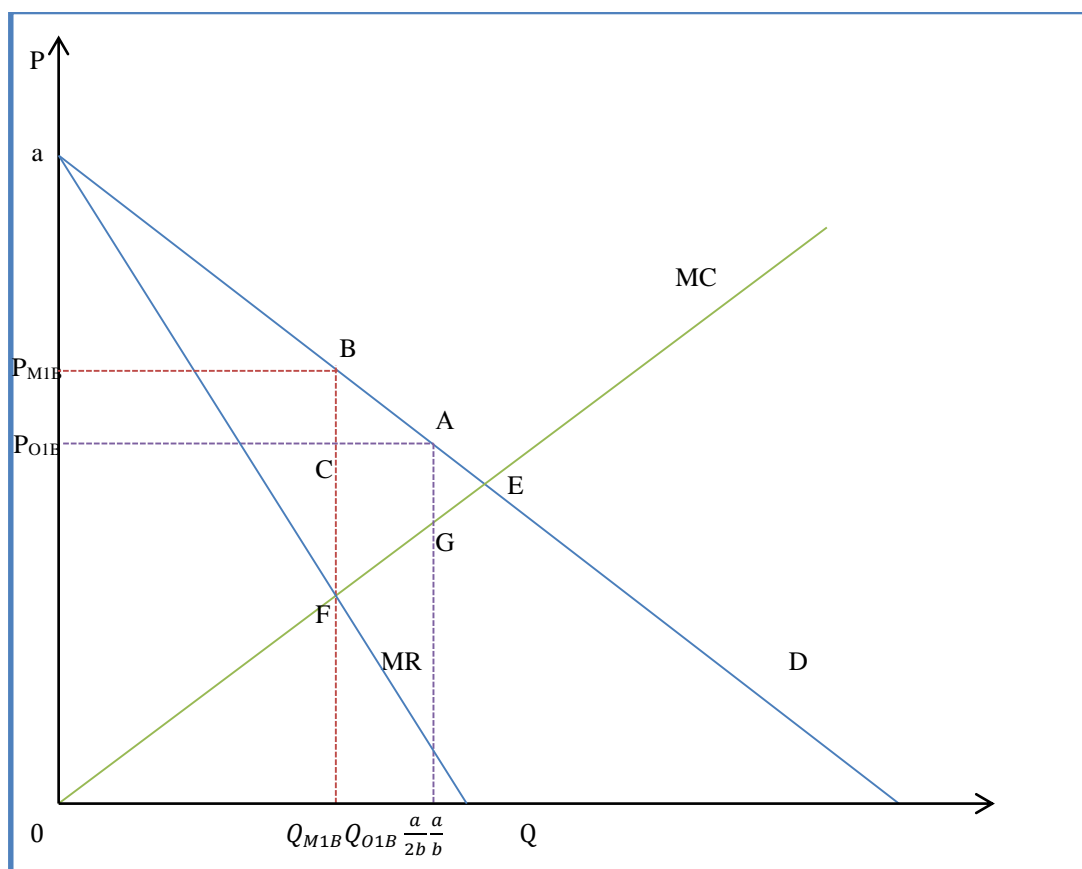
3.1.3. Extreme case B

In this case assume that all consumers of the home country are concerned about the negative characteristics of the product, thus, $\eta = 0; Ir > 0$. Domestic consumers know that the foreign product has the damaging effect while the domestic product is not harmful at all. Products are not differentiated and consumers think that the products with different characteristics are mixed. Hence, they demand both products,

but not at the same level as the previous case. The total demand from the previous case is decreased and the demand schedule is shifted downward by r. If consumers are very concerned and consider a huge amount of disutility from the consumption of the good, meaning that $r \geq a$, then the shift of the curve is so big that they do not demand anything. Nevertheless, here it is assumed that in spite of the disutility endured by consumers, there is still demand for the product in the market $(a > r)$.

Therefore, industries face the inverse demand function $p^D(Q) = a - r - bQ$. After profit maximization and considering the best response functions for the industries, the Nash equilibrium solution of this strategic game is $q_H = q_F = (a - r)/(3b + c)$. Total supply of the two firms will be $Q_{O1C}^S = q_H + q_F$ with equilibrium price p_{O1C}.

Now consider a new regulation imposed as a non-tariff measure to trade that halts importation from the foreign producer completely. If the government informs them about the new regulations, this case after imposition of NTM will become equivalent to the previous case of this scenario, where $Ir = 0$. Since the consumers are not informed about this new policy, the demand function schedule will not change. Hence the domestic firm acts as a monopoly and maximization of its profit yields a new output, $Q_{M1C}^S = q_H = (a - r)/(2b + c)$ with price p_{M1C}.

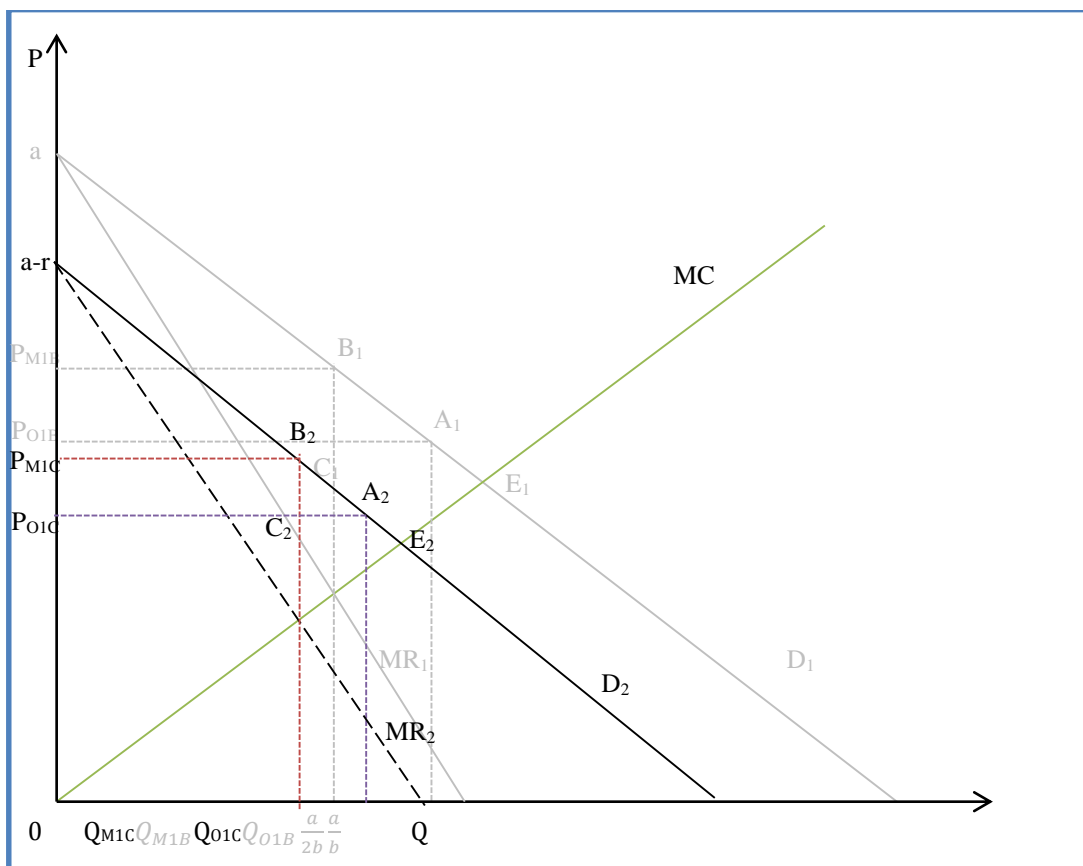## Figure 4- Equilibrium in scenario 1, extreme case 2

Figure 4 depicts the new curves and points for this scenario with index 2, while the ones related to the previous case are with subscript 1 and they are in gray color. The demand curve D_2 has shifted downward from D_1 by the amount r. The oligopoly supply in this case is more than the oligopoly supply in the first extreme case, but less

than the oligopoly in the benchmark of this scenario. However, the rest of the explanations are similar to those mentioned for the first scenario.

It is crucial to pay attention to the changes of social welfare in this case and compare it to the ones obtained in previous case. The increased profit of the domestic producer after imposition of NTM here is smaller than the one in figure 3. Volatilities of the social welfare are decreased because: Firstly consumers do not have complete information about the product supplied in the market; Secondly, they have fear for being affected by the foreign product that is mixed with the safe product in their bundle of goods. Welfare in this extreme case is decreased from the previous case before imposition of the NTM because the whole demand has been decreased due to lack of information, which is a market imperfection. As it was mentioned earlier, this case happens when consumers cannot distinguish between the two products. If they are informed about this, they will assuredly demand only the domestic product in a monopolistic market while their demand will be similar to the one in the previous case.

## 3.2. Scenario 2

3.2.1. Benchmark

There are both types of individuals in this scenario; a proportion of people that are indifferent about the negative characteristics of the foreign good and the rest of the population that are concerned about that ($\eta \in (0,1)$). Since the demand is segmented as shown in (2), it is important to know which of the two types of population is larger.

There is free trade in the market and people have complete information about the characteristics of the goods including the place of origin. In this case, concerned people that include "$1 - \eta$" share of the population consume and demand only domestic products. Indifferent individuals demand goods with any characteristics. As mentioned earlier, for simplicity it was assumed that the two industries have similar costs ($c_H = c_F$), and there is no cost of transportation. Therefore, if both industries want to compete in the market, they should have the same prices for both segments. Domestic producer will act as a monopoly in response to the demand of concerned consumers in (2). On the other hand, the demand of indifferent consumers is responded to by a supply from both industries. Since monopoly imposes higher prices than oligopoly, the concerned consumers should pay more as they want to reject negative characteristics of foreign product.

It might seem impractical that a firm supplies the exact same product with two different prices within one market. Nevertheless, this happens in reality as a marketing strategy of a firm. For instance, a dairy producer sells its own products in its own shops while selling its products under the marketing brand of a wholesaler or retailer in another big shop, in which different brands of dairy are also sold. In order to compete with other firms, the company does not like to lose the market share in huge international retailers and is forced to show its existence. This may suggest that this marketing strategy might result in lower profits but greater turnover and customer satisfactions. Since it was mentioned that there is complete information of the product, it can be assumed that this information is delivered to consumers via a mandatory labeling of the good's characteristics. However, industries are not obliged to mention positive characteristics of their products but negative properties. They can even describe the properties of the product including the place of origin, but within a

new trademark. For further simplicity, it is assumed that the home producer has the same cost function for both marketing strategies and bears no cost for creating a new trademark for concerned consumers.

Figure 5- Equilibrium in Scenario 2
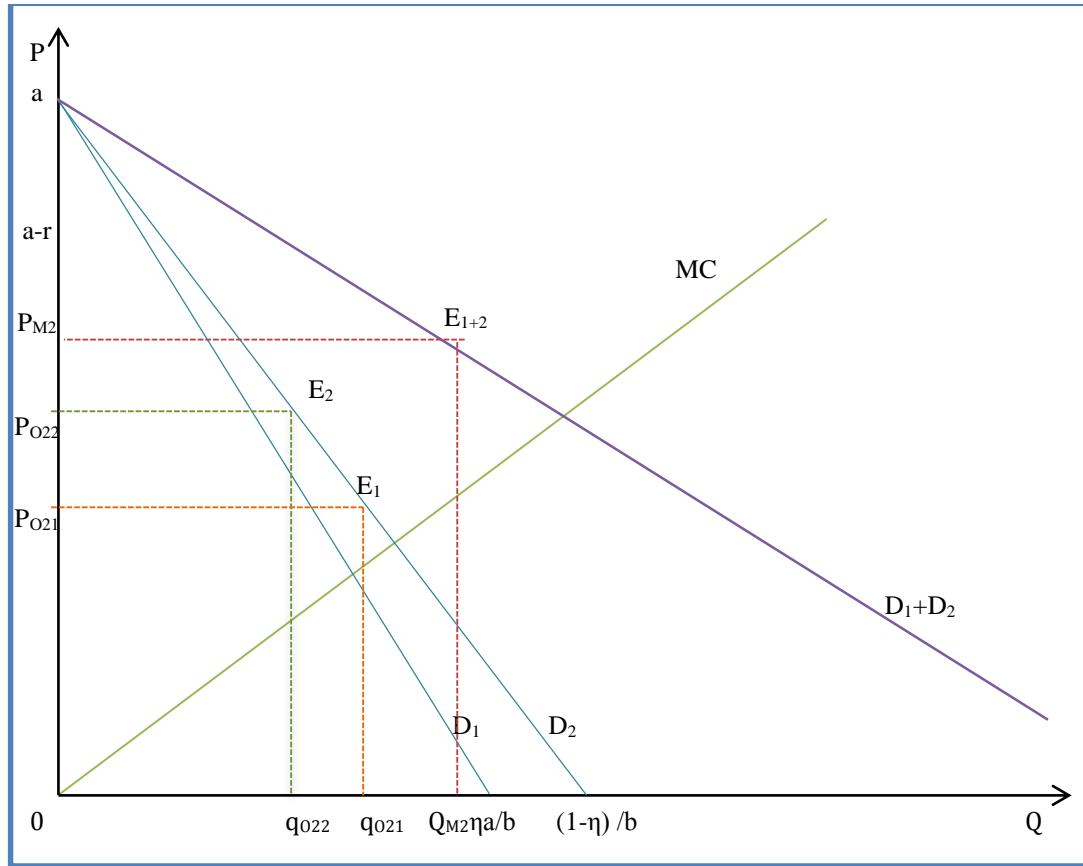
Domestic industry's profit is the summation of profit from both segments of the market. Assume that; p_{O21} is the price of good for indifferent consumers, p_{O22} is the price of good for concerned consumers, q_{H1} is the supply of good of the home producers for the indifferent individuals, q_{H2} represents the supply of good of the domestic firm for concerned consumers, and q_{F1} indicates the supply of good for indifferent consumers imported from abroad. Since concerned consumers have perfect information due to the labeling of the product, they feel no disutility in consuming the domestic product. Thus, damaging characteristics from (1) can be excluded and $Ir = 0$. For simplicity in the calculations it is simply assumed that both groups have the same population ($\eta = 0.5$). After calculation of best strategies of both industries, a Nash equilibrium leads to the following supply of industries:

$$q_{H1} = \frac{\eta ab}{3b^2 + 2c^2\eta^2 + 4bc\eta}$$

$$q_{F1} = \frac{2\eta ab^2 + 2ac^2\eta^3 + 4abc\eta^2}{(2b + c\eta)(3b^2 + 2c^2\eta^2 + 4bc\eta)} \tag{7}$$

$$q_{H2} = \frac{3\eta ab^2 + 2ac^2\eta^3 + 3abc\eta^2}{(2b + c\eta)(3b^2 + 2c^2\eta^2 + 4bc\eta)}$$

As it is observed in equations (7), quantities supplied by the two industries are different from each other. The total supply for indifferent consumers is $q_{O21} = q_{H1} + q_{F1}$.

Now consider an NTM that prohibits the import of goods from the industry abroad. Again, the home country acts as a monopolist in response to total demand of the consumers. As mentioned earlier, since consumers have complete information, they will also be informed about the exit of the foreign firm from the domestic market (think of the lack of foreign labels of products). Consequently, individuals are not exposed to the negative characteristics of foreign goods and $Ir = 0$. Therefore, the home industry maximizes its production function and supplies output, $q_{M2}^S = \frac{a}{2b+c}$, with price, p_{M2}^S.

Figure 5 illustrates this case with demand curves. In this figure it is assumed that the population of concerned consumers is higher than that of the indifferent consumers, in order that their demands do not coincide for better observation. As depicted, E_1, E_2 are the equilibrium for, respectively, the indifferent individuals and the concerned consumers before policy implementation. E_{1+2} is the equilibrium point after the imposition of NTM. It is observed that consumer surplus for the first group of people was very big before policy and after that, total consumer surplus of the population seems to be relatively smaller. Detailed changes of welfare will be studied in the next section.

3.2.2. Extreme case A

When all consumers are indifferent about the negative characteristics of the foreign product, this scenario is simply reduced to a one demand function where $Ir = 0$, similar to the extreme case A of the first scenario.

3.2.3. Extreme case B

Since consumers know that the foreign product is harmful and they are all concerned about the negative impacts of that good, they simply do not buy the foreign product because they can easily distinguish the origin of products. In other words, there is no demand for the good produced abroad. The foreign firm cannot compete in the home market. The home industry acts as a monopolist in the market and chooses point B in Figure 3 as the equilibrium price and output. However, in this case there is no difference between the time before the imposition of new regulations and after it. Because all of the domestic consumers prefer only the product produced domestically and this policy cannot change their behavior. It can be assumed that preferences for the domestic good is presented by equation (1) when $Ir = 0$.

4. Welfare changes analysis

In this section, I will investigate detailed changes of welfare for each case and scenario described above. Assuming that the consumers own the domestic industry, total social welfare is the sum of individuals' utilities and firms' profits. Consumer welfare is actually defined by an individual's assessment of her own satisfaction given prices and income. Since the demand curve captures such assessment, with

quasi-linear utility, consumer welfare can be calculated as consumer surplus, which is the area below the demand curve and above the price.

For Producer Surplus (PS), the famous definition in the literature is focused here, which is the excess of gross receipt (total revenue) over total variable costs. This is the area between price and the supply of the producer. Since I want to observe changes of Consumer Surplus (CS) and firm's surplus, I will analyze them separately and then study the total welfare changes. In fact, I want to study relative changes between the two sides of market and in proportion of the total welfare variations. For the next section, it is important to see if the imposition of NTM policy by the government was mostly in favor of consumers or the producer. This issue is very related to the share of concerned consumers of the population and the damaging properties of the foreign product.

It is quite important to mention that NTMs carry a higher dead-weight loss than tariffs do. Since government receives no taxes or tariffs from the policy, there is no gain for the government after NTM. In the following subsections, calculation of PS and CS will be discussed. Summation of producer and consumer surpluses is the total welfare change of the domestic society, which will be calibrated in the next section. Besides, PS, before imposition of NTM is equal to the foreign producer surplus in scenario 1, because two industries are symmetric. Therefore, the international welfare changes will simply be a deduction of the initial producer surplus in oligopoly from the total domestic welfare changes. In the second scenario, the two industries do not have the same surplus for the first segmentation of the market because their productions are different from each other. Hence, the international welfare changes will be a deduction of foreign industry surplus from the total domestic welfare changes.

4.1. Scenario 1

4.1.1. Benchmark

Consumer welfare changes:

Consumers' welfares before the imposition of NTM (CS_{O1A}) and after new regulations (CS_{M1A}) are respectively the area p_{01A} Aa'a and p_{M1} Ba'a in figure 2 (for simplicity it was assumed that $p \leq a - r$, i.e. what is depicted in that figure). Total consumer welfare changes in this case is as follows:

$$\Delta CS_{1A} = CS_{M1A} - CS_{O1A} = \left[\left(\frac{a - (1-\eta)r}{2b + c} \right)^2 - \left(\frac{2(a - (1-\eta)r)}{3b + c} \right)^2 \right] \frac{b}{2} \tag{8}$$

Equation (8) is always negative as the first term in the square brackets is always smaller than the second term. To check the effective changes of surplus in percentages it is better to calculate policy elasticity of CS. Policy elasticity of consumer surplus simply defines percentage changes in consumer surplus with respect to percentage changes of policy, in which the latter equals to one (imposition of a policy means changes from no policy to action, zero to one). For the rest of this paper, the equivalent definition holds for consumer and producer surplus. Policy elasticity of consumer surplus for this scenario is as follows:

$$\frac{\Delta CS}{CS_{O1A}} = \frac{CS_{M1A}}{CS_{O1A}} - 1$$

$$= \frac{(3b+c)^2 \left[b(a-(1-\eta)r)^2 + 2(2b+c)^2(1-\eta)\frac{\eta r^2}{2b} \right]}{2(2b+c)^2 \left[2b(a-(1-\eta)r)^2 + (3b+c)^2(1-\eta)\frac{\eta r^2}{2b} \right]} - 1 \qquad (9)$$

It is not easy to simplify equation (9). However, extreme cases can simplify it, which will be discussed in next cases. Moreover, the calibrated value will determine the value of (9) in the next section of this chapter.

Producer welfare changes:

Total producer welfare changes will simply be a deduction of PS before imposition of the regulations (PS_{O1A}) from the new PS after NTM (PS_{M1A}), which is as follows:

$$\Delta PS_{1A} = PS_{M1A} - PS_{O1A} = \frac{(5b^2 + 2bc)(a-(1-\eta)r)^2}{2(2b+c)(3b+c)^2} \qquad (10)$$

This value is positive if $a > (1-\eta)r$. According to the assumptions of this scenario (for calculation of eq. 5), if we want to have concerned consumers in the market, "a" should be strictly greater than "r". Since $r > (1-\eta)r$; therefore, $a > (1-\eta)r$ holds as long as concerned consumers have positive demand of products, and eq. (10) is positive.

Policy elasticity of producer surplus is also as follows:

$$\frac{\Delta PS_{1A}}{PS_{O1A}} = \frac{PS_{M1A}}{PS_{O1A}} - 1 = \left(\frac{3b+c}{2b+c} \right)^2 - 1 \qquad (11)$$

As it is observed, there is neither "η" nor "r" in the calculation of eq. (11), which suggests that policy elasticity of domestic producer depends neither on the negative characteristic of foreign product nor on the consumers concerns about that. Therefore, this equation also holds for extreme cases A and B.

4.2.2. Extreme case A

Consumer welfare changes:

Consumers' welfares before and after the imposition of NTM are, respectively, "CS_{O1B}" and "CS_{M1B}"equivalent with areas $p_{01B}Aa$ and p_{M1B} Ba in figure 2. Total consumer welfare changes will be:

$$\Delta CS_{1B} = CS_{M1B} - CS_{O1B} = \left[\left(\frac{a}{2b+c} \right)^2 - \left(\frac{2a}{3b+c} \right)^2 \right] * \frac{b}{2} \qquad (12)$$

Similarly to equation (8), equation (12) is always negative. Policy elasticity of consumer surplus is shown in the next equation:

$$\frac{\Delta CS}{CS_{O1}} = \frac{CS_{M1}}{CS_{O1}} - 1 = \frac{9b^2 + c^2 + 6bc}{16b^2 + 4c^2 + 16bc} - 1 \qquad (13)$$

Consumer surplus deviation to the initial consumer welfare ratio in (13) shows the percentages change of consumer surplus in response to the policy; and it is the simplified version of equation (9), in which $\eta = 1$. It is easily observable that this ratio is negative, and furthermore, it is perceived that the new regulations that prohibit the import of goods from abroad decrease the consumer welfare. This is mainly due to the change of the market structure from oligopoly to monopoly, where fewer quantity of the good is supplied with a higher price to the people who are indifferent about the characteristics of this good. In other words, in an oligopoly with two firms, the average variable cost is lower than in a monopoly with one firm.

Producer welfare changes:

Total producer welfare changes are simply the PS before the new regulations (PS_{O1B}) subtracted from the PS after these NTMs (PS_{M1B}):

$$\Delta PS_{1B} = PS_{M1B} - PS_{O1B} = \frac{5a^2b^2 + 2a^2bc}{2(2b+c)(3b+c)^2} \tag{14}$$

This is simplified version of equation (10) with $\eta = 1$ and is positive. As explained in the benchmark policy, elasticity of producer surplus is similar in all three cases of this scenario.

4.2.3. Extreme case B

Consumer welfare changes:

CSs before the imposition of NTM (CS_{O1C}) and after NTM (CS_{M1C}) are respectively the area $p_{01C} A_2a\text{-}r$ and $p_{M1C} B_2a\text{-}r$ in figure 4. Total changes of CS is as follows:

$$\Delta CS_{1C} = CS_{M1C} - CS_{O1C} = \left[\left(\frac{a-r}{2b+c}\right)^2 - \left(\frac{2(a-r)}{3b+c}\right)^2\right]\frac{b}{2} \tag{15}$$

Similarly to equation (8), equation (15) is always negative. CS changes in this case (eq. 15) are smaller than the changes in the previous case (eq. 12), but smaller than the change in the benchmark (eq. 8). Policy elasticity of consumer surplus in this case is exactly equal to the one in the previous case (eq. 13). This means that consumer surplus variations have decreased from the previous case at the same level as the initial CS (before NTM) and final CS (after NTM) have decreased from the previous scenario. This shows that imposition of new regulations will change the consumer surplus of the two extreme cases with the same elasticity. In other words, incomplete information of consumer does not change the situation for the government to impose new regulations for two cases. All consumers' concerns about the product cannot alter the consequences of welfare changes after the government interventions from the situation that all consumers are indifferent. In fact, when the whole society is concerned about the negative properties of the foreign product, imposition of new regulations changes their welfare relative to their initial situation at the same level as if they were indifferent about the foreign product. This finding is closely equivalent to the benchmark (eq. 9). Therefore, in this scenario policy elasticity is equal in all cases for any values of η.

The reason behind this finding is mainly that they have incomplete information and are ignorant about the prohibitive regulation by the government. Their preferences

will not change after the new regulations because they still believe that there exists foreign product in the market. However, if they become informed about the policy, they will remove the negative effects of bad products from their preferences; then, the policy elasticity will differ in two extreme cases.

Producer welfare changes:

Total producer welfare changes is simply PS before imposition of the regulations (PS_{O1C}) subtracted from PS after the NTMs (PS_{M1C}), which is as follows:

$$\Delta PS_{1C} = PS_{M1C} - PS_{O1C} = \frac{(5b^2 + 2bc)(a - r)^2}{2(2b + c)(3b + c)^2} \tag{16}$$

Eq. (16) is positive if $a > r$, which was assumed from the beginning to imply that concerned consumers wanted to stay in the market. Policy elasticity of producer surplus in this case is exactly equal to the respective value in previous case and the benchmark (eq. 10)

4.2. Scenario 2

4.2.1. Benchmark

Consumer welfare changes:

Since the market is segmented between the two groups of consumers, total consumer welfare should be the sum of the CS from the two segments ($CS_{O2} = CS_{O21} + CS_{O22}$). First segment is for the indifferent consumers while the second segment is for the concerned consumers. Total CS changes will be calculated separately for each segment; then their summation will show the total CS changes. In other words, subtracting total CS before regulations (CS_{O2}) from new CS after NTM (CS_{M2}) will give the total CS changes. First line of the following equations (ΔCS_{21}) refers to the variations of CS for the indifferent consumers and the second line (ΔCS_{22}) refers to the changes of welfare for the concerned consumers:

$$\Delta CS_{21} = CS_{M21} - CS_{O21} = \left(\frac{a}{2b + c}\right)^2 \frac{\eta b}{2} - \frac{b}{2\eta} q_{O21}^2$$

$$\Delta CS_{22} = CS_{M22} - CS_{O22} = \left(\frac{a}{2b + c}\right)^2 \frac{(1 - \eta)b}{2} - \frac{b}{2(1 - \eta)} q_{O22}^2 \tag{17}$$

Because of the complexity of the second terms in both lines of equation (17), it is not easy to see the signs of the changes of consumer welfare. Thus, calibration of data can better determine them.

Policy elasticity of consumer surplus for each segment of the market is as follows:

$$\frac{\Delta CS_{21}}{CS_{O21}} = \frac{CS_{M21}}{CS_{O21}} - 1 = \frac{\left(\frac{a}{2b+c}\right)^2 \frac{\eta b}{2}}{\frac{b}{2\eta} q_{O21}^2} - 1$$

$$\frac{\Delta CS_{22}}{CS_{O22}} = \frac{CS_{M22}}{CS_{O22}} - 1 = \frac{\left(\frac{a}{2b+c}\right)^2 \frac{(1-\eta)b}{2}}{\frac{b}{2(1-\eta)} q_{O22}^2} - 1 \tag{18}$$

Producer welfare changes:

Total producer welfare changes are simply the subtraction of PS before NTM (PS_{O2}) for both segments from the PS after the new regulations (PS_{M2}), which will be the changes of domestic producer profit after NTM, which will be as follows:

$$
\begin{aligned}
\Delta PS_2 = PS_{M2} - PS_{O2} \\
= a(q_{M2} - q_{H1} - q_{H2}) + b\left(\frac{1}{\eta}q_{O21}q_{H1} + \frac{b}{1-\eta}q_{H2}^2 - Q_{M2}^2\right) \\
+ \frac{c}{2}((q_{H1} + q_{H2})^2 - Q_{M2}^2)
\end{aligned}
\tag{19}
$$

Equation (19) and the policy elasticity of domestic consumer will be calibrated in the next section to see the exact effect of NTM on the producer welfare changes. The foreign industry simply loses its surplus after imposition of new regulations, which will be as follows:

$$
\Delta PS_{F2} = k - \pi_{F2} = bq_{O21}q_{F1} + \frac{c}{2}q_{F1}^2 - aq_{F1}
\tag{20}
$$

4.2.2. Extreme case A

When all consumers are indifferent about the negative characteristics of the foreign product, this scenario is simply reduced to a one demand function where $Ir = 0$, similar to the extreme case A of the first scenario.

4.2.3. Extreme case B

All of the consumers are concerned about the damaging characteristics of the foreign product and they only use the domestic good since they have complete information about it. Thus, there is no change in the welfare of consumers before and after imposition of new regulations. Changes in consumer and producer surplus are equal to zero in this case.

5. Application and calibration of data

Beghin et al. (2012) calibrated data for consumption of shrimps in France. Their data for demand and supply of shrimps in 2006 for European Union will be used in the calibration. They also conducted a consumer choice experiment in December 2009 in Paris, France. Their random survey sample included 160 participants for the consumption of shrimps including the imported shrimps with antibiotics treatment that can have health hazards. They finally found that the average per-unit damage perceived by the participants "r" is equal to 47 percent of the price of the product[8]. The summary of the data they provided is presented in table 1.

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[8]Their survey is biased because they did not consider those consumers indifferent about the damaging characteristics of the shrimps treated with antibiotics. They simply made an average on the total willingness to pay (WTP) of the consumers, if the prices varying from €0.25 to €4. The WTP before revelation of information regarding the damaging attributes of product was in average 2.14, and after

Table 1- Data on consumption of shrimps in 2006

Variable	Description	Data for EU-15
Q	Consumption (in thousands of tons)	523.166
P	Price per kg (US$)	6.29
ε_D	Own-price elasticity of demand	-0.67
$r_\%$	Per-unit damage of product (in percentages)	47%

Source: Beghin et al. (2012), Table 1, page 369

Table 2- Calculated parameters of the model on consumption of shrimps in 2006

Variable	Calculation	Description	Value for EU-15
b	$b = P/(\varepsilon_D * Q)$	Slope of demand	0.018
a	$a = b * Q + P$	Demand intercept	15.68
c	$c = (2a/Q) - 3b$	Marginal cost of production in duopolistic market clearing	0.006
r	$r = P * r_\%$	Valuation of the damage (US$)	2.96

Source: own calculations according to the data by Beghin et al. (2012)

To simply calculate parameters, extreme case A of the first scenario will be the standard for calibration. In fact, it is assumed that the data presented in table 1 capturing the real world is equivalent to that case. Therefore, it is simply assumed that the real market in European Union is a duopolistic competition between domestic producers and non-EU industries that are symmetric. Moreover, it is assumed that EU citizens are all indifferent about negative characteristics of shrimps produced out of EU (treated with antibiotics) at the time data was collected. Thus, other scenarios are alterations to this case and changes of parameters will be considered afterwards. Table 2 presents the calculation of parameters of the model, using the data provided by Beghin et al. (2012). Calculations of parameters are also shown in this table. Since there was no data on the cost function of shrimps suppliers, marginal costs are simply calculated such that there is duopolistic market clearing in the benchmark model.

Calibration:

Table 3 shows the calibration results for the two scenarios. As shown, changes of CS and international welfare are negative in all scenarios and cases. The magnitude of these changes is highest in extreme case A of first scenario, and lowest in scenario 2. It would be wiser to compare the two benchmark cases and then the interpretation of extreme cases can be derived from them.

When consumers have enough information to freely make their own decision on choosing the product that maximizes their own utility (scenario 2), their initial welfare is lower than the corresponding welfare for the situation in which they cannot identify the origin of products so as to choose what they want ($CS_{O2} < CS_{O1A}$). However, after imposing new restrictions on the import, the welfare in scenario 2 is higher than the first scenario, which is equal to the extreme case 1 of first scenario ($CS_{M2} = CS_{M1B} >$

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revelation of information was 1.13. Then by the relative variation they found that "r" is about 47% of the price of the product.

CS_{M1A}). As it is observed both groups of consumers are losing after imposition of NTM in the second scenario. Nevertheless, total consumer welfare losses in the second scenario are less than corresponding changes in the first scenario. Even the policy elasticity of consumer surplus is better for the second scenario.

Table 3- Calibration results

Welfare	Scenario 1, ($\eta = 0.5$)	Scenario 1, ($\eta = 1$)	Scenario 1, ($\eta = 0$)	Scenario 2, ($\eta = 0.5$)
CS_{O21}				1253.74
CS_{O22}				662.58
CS_O	2075.40	2455.76	1616.94	1916.33
CS_M	1086.94	1250.80	823.56	1250.8
ΔCS_{21}				-628.35
ΔCS_{22}				-37.18
ΔCS	-988.46	-1204.96	-793.38	-665.53
$\dfrac{\Delta CS_{21}}{CS_{O21}}$				-0.50
$\dfrac{\Delta CS_{22}}{CS_{O22}}$				-0.6
$\dfrac{\Delta CS}{CS_O}$	-0.48	-0.49	-0.49	-35
PS_O	1178.50	1436.62	945.91	1828.43
PS_M	2400.98	2926.86	1927.14	2926.86
ΔPS	1222.49	1490.25	981.22	1098.43
$\dfrac{\Delta PS}{PS_O}$	1.04	1.04	1.04	0.60
ΔW	234.03	285.29	187.84	432.9
$\Delta IntW$	-944.47	-1151.33	-758.07	-413.74

Source: own calculation

With respect to the initial and final PS, the domestic producer has also a better situation in the second scenario relative to the first scenario. Policy elasticity of PS shows that producers are enjoying new regulations in the second scenario less than in the first scenario. Total welfare increase and total international welfare decrease present a better situation when the information about the origin of the products is available for consumers. Calibration of the model suggests that informing consumers puts the international welfare changes in a better situation than not informing them. Foreign industry's losses in the second scenario (-846) are lower than the best situation in the extreme case B of first scenario (-945). Lack of information is one of the market failures and the findings therefore suggest that an increase of information assuredly improves the market behavior in response to a trade policy.

In general, it can be concluded that when market efficiencies are improved and there is available information for consumers, their welfare has a better situation than when there is not enough information. Even after a prohibitive NTM that decreases the competitiveness within the market, when there is complete information for consumers, there are fewer losses than when consumers cannot identify the origins of the products. Knowledge on the origins of the products can inform them (consumers) about the characteristics of the product which can be internalized in their preferences. In all cases studied in this paper, total social welfare of the society has increased while the consumers made losses. Domestic producer's gains relative to its initial surplus in scenario 2 are much lower than in scenario 1 (60% relative to 104%). In both cases, government might have imposed NTMs to support the domestic industry instead of protecting consumers. However, when government tries to inform consumers about the characteristics of products (scenario 2) from the beginning, it can suggest that officials are actually pursuing safety of society. In other words, by not informing the society and only by providing scientific evidences about harmful effects of foreign products for the imposition of NTMs governments are relatively seeking to maximize domestic industry's profits. Observing transparent and enough information in the market of a country can be a good but not sufficient proof that the government is trying to protect public safety. Hence, before acceptance of an NTM by international organizations or by other countries, efforts of the government to provide transparency in its domestic market should first be observed. Nevertheless, special interest groups lobbying with governments prefer a lower increase in their profits with monopolistic power rather than an oligopolistic competition with foreign industries.

5. Conclusions

In this paper, I tried to provide a partial equilibrium framework to analyze the welfare consequences in a country imposing NTM on a specific product produced abroad with negative characteristics that effects only concerned consumers directly. The intuition behind was mainly to show whether or not the paternalistic behavior of governments is in line with the willingness of the consumers. To support the idea of the possibility to protect the domestic industry that is lobbying the government, oligopolistic market was studied before imposition of NTM rather than a perfect competition. Two scenarios were the focus of analysis, which are mainly differing in the existence of information in the market. It was assumed in both scenarios that awareness of consumers about negative characteristics of foreign products is informed through media and scientific channels. However, existence of information means that they can distinguish between the origins of the goods, which is provided by the government only in the second scenario.

Changes in the welfare after imposition a prohibitive NTM that restrict the foreign product with negative characteristics have been analyzed in this paper. Calibration of the data simplified the analysis and provided interesting outcomes that are in line with the assumptions of the model. It was proved that when consumers have enough information about the origin of products, a prohibitive NTM decreases their surplus less than when they cannot distinguish between products with bad and good attributes. Moreover, in the case of complete information producers are gaining less than when there is incomplete information in the market. This suggests that when government tries to increase efficiencies of the market by spreading the information to consumers, the officials are seeking for the public safety more than seeking for protection of the domestic industry. In a scenario when there is not complete information, increase in

the producer's profits is greater than the scenario when there is complete information. However, findings from this paper cannot evidently define the motivations behind imposition of NTMs. Because in none of the scenarios studied here, government increases domestic welfare of consumers. Hence, they cannot state it as their own motivations.

Possible extensions to this model can be done by: Firstly assigning probabilities for the consumption of two types of products in preferences of concerned consumers when there is incomplete information about the products; Secondly, externalities can be added to the preferences instead of direct negative effects of the products, which can be used to analyze the welfare implications of NTM focusing on products with negative indirect externalities; Thirdly, conducting a similar analysis on welfare changes after the foreign industry endured some costs to comply with new regulations and entered the home market; Fourthly, undertaking a suitable experimental survey that captures assumptions of the model and provides a good data for calibration of parameters is significantly advised.

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Appendix for Calculations

1. Scenario 1, Benchmark

Best response functions of the home and foreign industries:

$$BR_H(q_F): q_H = \begin{cases} \dfrac{a\eta}{2b+c\eta} - \left(\dfrac{b}{2b+c\eta}\right)q_F, & a-r < p \le a \\ \dfrac{a-(1-\eta)r}{2b+c} - \left(\dfrac{b}{2b+c}\right)q_F, & p \le a-r \end{cases}$$

$$BR_F(q_H): q_F = \begin{cases} \dfrac{a\eta}{2b+c\eta} - \left(\dfrac{b}{2b+c\eta}\right)q_H, & a-r < p \le a \\ \dfrac{a-(1-\eta)r}{2b+c} - \left(\dfrac{b}{2b+c}\right)q_H, & p \le a-r \end{cases} \tag{1}$$

Total quantity supplied (Q_{O1A}^S) and price (p_{O1A}^S) before NTM

$$Q_{O1A}^S = \begin{cases} \dfrac{2a\eta}{3b+c\eta}, & a-r < p \le a \\ \dfrac{2(a-(1-\eta)r)}{3b+c}, & p \le a-r \end{cases}$$

$$p_{O1A}^S = \begin{cases} a - \dfrac{2ab}{3b+c\eta}, & a-r < p \le a \\ [a-(1-\eta)r]\left(1-\dfrac{2b}{3b+c}\right), & p \le a-r \end{cases} \tag{2}$$

Total quantity supplied (Q_{M1A}^S) and price (p_{M1A}^S) after NTM in autarky

$$Q_{M1A}^S = \begin{cases} \dfrac{a\eta}{2b+c\eta}, & a-r < p \le a \\ \dfrac{a-(1-\eta)r}{2b+c}, & p \le a-r \end{cases} \tag{3}$$

$$p_{M1A}^S = \begin{cases} a - \dfrac{ab}{2b+c\eta}, & a-r < p \le a \\ [a-(1-\eta)r]\left(1-\dfrac{b}{2b+c}\right), & p \le a-r \end{cases} \tag{4}$$

Consumers' welfare before the imposition of NTM:

$$CS_{O1A} = \frac{2b(a-(1-\eta)r)^2}{(3b+c)^2} + (1-\eta)\frac{\eta r^2}{2b} \tag{5}$$

Consumer's welfare after the imposition of NTM:

$$CS_{M1A} = \frac{b(a-(1-\eta)r)^2}{2(2b+c)^2} + (1-\eta)\frac{\eta r^2}{2b} \tag{6}$$

Producer welfare before imposition of the regulations:

$$PS_{O1A} = \frac{(a - (1-\eta)r)^2(2b + c)}{2(3b + c)^2} \tag{7}$$

Producer surplus in the prohibitive regulation:

$$PS_{M1A} = \frac{(a - (1-\eta)r)^2}{2(2b + c)} \tag{8}$$

Calculations of extreme case A and B are simplifications of above calculations.

2. Scenario 2

Profit of the home industry is different because of segmentations of the market, while the foreign industry has similar profit the same as previous scenario (equation 3 of the main text). Therefore, profit of home industry is:

$$\pi_H = p_1(q_{H1} + q_{F1})q_{H1} + p_2(q_{H2})q_{H2} - \frac{1}{2}c(q_{H1} + q_{H2})^2 - K \tag{9}$$

Maximization of domestic industry's profit with respect to q_2:

$$\frac{\partial \pi_H}{\partial q_2} = 0 \iff q_2 = \frac{a(1-\eta)}{2b + c(1-\eta)} - \frac{c(1-\eta)}{2b + c(1-\eta)}q_{H1} \tag{10}$$

Best response functions of the home and foreign industries:

$$BR_{H1}(q_{F1}): \frac{\partial \pi_H}{\partial q_{H1}} = \frac{\partial \pi_H}{\partial q_2} = 0 \iff q_{H1}$$
$$= \frac{a\eta(2b + c(1-\eta)) + ac\eta(1-\eta)}{(2b + c\eta)(2b + c(1-\eta)) + c^2(1-\eta)}$$
$$- \frac{b(2b + c(1-\eta))}{(2b + c\eta)(2b + c(1-\eta)) + c^2(1-\eta)}q_{F1} \tag{11}$$

$$BR_{F1}(q_{H1}): q_{F1} = \frac{a\eta}{2b + c\eta} - \left(\frac{b}{2b + c\eta}\right)q_{H1}$$