Economic Welfare and Quality Standards: An Empirical Assessment

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Abstract

Quality measures, effecting external or internal markets; large or small, has an impact on trade. The Sanitary and Phytosanitary measure was introduced to avert the impact on trade and provide a harmonised system of quality standards. However, disease, health and safety impacts, which lead to the destruction or harm of raw material, play a part in the cost of high quality protection of trade. The purpose of this paper is to capture the material, economic welfare costs that stem from the altered path of consumption resulting from the implementation of high quality standards in food trade. The empirical simulation draws upon results by compounding welfare loss from consuming in an economy with low or no health and safety standards. The assessment is based on how much would an individual be willing to pay to have higher assurance of quality food, hence a safe and healthy food commodities market? The pure economic welfare losses from low standard levels are quite considerable. The results in this paper provide on average, individuals would permanently give up to approximately 8 percent of their current level of consumption to have produce that has a higher health and safety assurance. Such potential welfare gains from increased standards utility levels contradict existing policies.

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INTRODUCTION

In practice and theory the workings of Non-Tariff Barriers (NTBs) are complex in their own terms as can be seen from statements from the OECD (2006), that state, "far less information exists for NTBs than for tariffs, which complicates the understanding of the nature, extent and trade effects of these measures". Furthermore, there are numerous definitions for NTBs. The basic definition states they are governmental measures, regulations, and policies, other than tariffs that restrict trade flows and in the process protect domestic industries from foreign competition. Hence, they are a means of keeping foreign goods out of domestic markets while abiding to the multilateral agreements of the World Trade Organisation (WTO). Hillman (1991); has a rather different definition that states NTBs are all restrictions, that are non-traditional customs duties, which distort international trade. Arguing that they are "any governmental device or practices other than a tariff which directly impedes the entry of imports into a country and which discriminates against imports, but does not apply with equal force on domestic production or distribution." Thornsbury, et al. (1999) also endorses this concept, while including standards of identity, measures, quality, and packaging. This last definition has a base of commonality with this research; however it is still limited in its context to fully define the extent of the problem between welfare and protectionism and the quantification of international standards like Sanitary and Phytosanitary (SPS) measures, which are considered in this research. The SPS is an agreement adopted to facilitate trade, not to raise health and safety standards disproportionately, while protecting the quality of internationally traded animal, food and plant products.

The basis of this work is related to the international economics sector by considering the international trade and patent/standards protection provision that is provided by the WTO and relates to the SPS provision accord by considering the impact of such measures as a welfare enhancer or a non-tariff protectionist provision implemented by national governments.

The principle objective is to investigate the quantification of international standards, taking the SPS agreement as the bases of the research and evaluate the impact that SPS measures can have in improving the international trade and the standards of animal, food and plant products as an integration of health and safety provisions through the utility of economic simulation modelling.

Therefore, with global trade liberalization and government initiatives of harmonization and integrating of health and safety protection for animal, food and plant products, the global agricultural sector has been overwhelmed by new problems in common language, technical barriers and information sharing, these numerous barriers have caused concern with a lack of understanding from agricultural producers, governmental agencies and developing nations. The problem recently recognized through the process of the research is the affect of current and future information systems for the implementation of international recognizable standards and its impact on global provisions for
trade, hence the affects that policies regarding standards may have on the movement of goods beyond borders, as standards are not just left at the border, but go beyond as standards have to be both domestically and internationally recognised, this contradicts the theoretical definitions of NTBs that state they are not applied equally between domestic and imported products.

Furthermore, information sharing and international standards implementation in the agricultural area with such SPS measures have caused a huge number of problems, such as uninformed policies that have been put in place and have led to the wastage of trade creation. However, on the other hand it has provided an improved system of protection against health scares and disease outbreaks. The controversial dilemma is addressed for the first time by devising a simulation model of risk assessment protection and welfare enhancement through reported agricultural commodity problems by countries and those reported to the WHO (World Health Organisation) and WTO’s Dispute Settlement Mechanism (DSM).

The use of quantitative systems as an approach to solve protectionist problems (trade diminishing) or common language problems has been of increasing use, with the latter as a health and safety enhancement mechanism. Therefore, information problems and quantitative modelling of international standards can enhance an area prone with problems of misinformation and information system problems and will help deal with the complexity, interdependency, that exists between Sanitary and Phytosanitary measures.

The quantification of standards/SPS related modelling with a dynamic focus in simulating the impact of international standards, is underdeveloped to model the impact that these increasing standards has on provisions of increased trade and the quality of food and agricultural products, which is examined within.

2. STANDARDS AND TRADE
The General Agreement on Trade Tariffs (GATT) opened way at the Uruguay Round to an area more or less untouched by previous negotiations: this was the area of food quality and safety. At the Uruguay Round, SPS and TBT agreements emerged to provide a framework for strengthening food quality and safety measures at the centre of agricultural policies taken by governments while at the same time ensuring that such measures are not unjustified or disguised barriers to international trade.

These changes strengthened the rules provided by the GATT, SPS and TBT disputes increased with frequency, justifiable or not. The disputes that followed usually centred on distinguishing standards which, were of dispute from the ones that are considered legitimate under the WTO. The scope of the SPS agreement under the WTO framework is based upon scientific evidence as a means to deal with
health and safety problems. Therefore any reasons for the unnecessary use of these measures would be to replace more traditional restrictions of trade, which are not allowed in terms of new freer trade agreements. This in essence can therefore, lead to increased levels of protectionist-based economic protection, as domestic agricultural producers use standards, even though trade has reduced the tariff and other non-tariff barriers measures.

However, the contrasting arguments are that standards are implemented to help with consumer confidence towards the agricultural produce as the standards guarantee a scientific backing for an appropriate level of health and safety. This, in essence would increase consumer confidence towards the products with higher scientific standards. Enhancing consumer welfare through a social element and human rights policy; this shall bring about the focus of sustainable protectionism in relation to international standard setting in the field of agricultural products through the SPS/TBT system incorporating the concept of Bio-safety and foodborne pathogens. Bio-safety is considered in food and agriculture, to assess and monitor the possible damaging effects of gene flow, competitiveness and effects of movement of agricultural resources across international borders on human, animal and plant life. The policy and trade views of economists and government decisions, undertaken in regards to bio-safety may therefore be of concern when considering the arguments of implementing standards as they have long-term implications for the sustainability of agriculture and food security, as with the likes of foodborne pathogens that have an aftermath economic impact, for example, BSE, Avian Influenza, Swine Flu and etc.

Not all of the standards can be described as trade-restricting measures. For instance, some of the measures can create or regulate frequent problematic outbreaks that can indirectly have an impact on other countries agricultural industry and in some instances, protect consumers’ health and safety or livelihood. In these instances the fundamental basis for developing these standards and implementing these measures are not to regulate trade, and therefore it would be incorrect to refer to such measures as a trade-protectionist. Therefore unless adequate standards or safeguards measures are implemented and adopted by developed and developing countries they may face environmental and social costs as a result of no agricultural standards. However, on the other hand there are measures such as extreme standards, manipulated scientific standards and biodiversity related national import or export controls or multi-lateral agreements, such as and Geographical Indicators (GI) as stated in Part II (Articles 9-40), Section 3 of the TRIPS agreement for the Protection of Appellations of Origin which clearly is a trade-related measure impacting trade and biodiversity.

2.1. The Sanitary and Phytosanitary Agreement
The SPS needs to identify ways to ensure that a country’s consumers are being supplied with food that is safe to eat, "safe" in the terms of Quality Food Production (QFP). QFP is an aspect of the Hazard
Analysis and Critical Control Points (HACCP) that is a systematic preventative approach to food safety used to identify potential food safety hazards. The Food and Drug Administration (FDA) and the United States Department of Agriculture (USDA) use HACCP programs as an effective approach to food safety and protecting public health, which is classified as a QFP. This helps maintain standards at a level considered appropriate according to the QFP and HACCP. While at the same time, the economic disclosure maintains the process of ensuring that the strict health and safety regulations are not used as an excuse for protecting domestic producers. Therefore, the measures established in the final act of the Uruguay Round under the Agreement on the Application of Sanitary and Phytosanitary Measures protects humans, animals, and plants from foodborne pathogens, diseases, pests, or contaminants. While controlling SPS measures that may have a direct or indirect impact on international trade, the SPS agreement includes a series of understandings (trade disciplines) on how SPS measures will be established and used by countries when they establish, revise, or apply their domestic laws and regulations. Under WTO-SPS rules, countries have agreed to base their SPS standards on science, and, as guidance for their actions, the agreement encourages countries to use standards set by international standard setting organisations (Codex\(^1\), IPPC\(^2\), OIE\(^3\)). Therefore, the SPS agreement seeks to ensure that SPS measures will not, arbitrarily or unjustifiably discriminate against trade of certain other members nor be used to disguise trade restrictions. Within the stance of the SPS agreement, countries maintain the sovereign right to provide the level of health protection they deem appropriate, but agree that this right will not be misused for protectionist purposes nor result in unnecessary trade barriers. A rule of equivalency rather than equality applies to the use of SPS measures. This is where the concept of welfare enhancement emerges to protect and increase the consumers’ utility function in regards to health in the application of risk analysis to food safety. The welfare function is based on the concept of ‘no appreciable risk’ over a lifetime, providing assurance of protection for all consumers. This is lacking in existing research, as market factors alone do not lead to an optimal resource allocation unless a level of social welfare and private costs and benefits are fully reflected in product prices.

The traditional view is that SPS standards are a form of Non-Tariff Barrier (NTB) that is becoming increasingly visible in agricultural trade disputes. A distinguishing feature of technical barriers is their legitimate use by governments to protect consumers’ health, to recognise citizen preferences in packaging and labelling, and protect the environment from the establishment of non-indigenous pests and foodborne diseases. However, to what extent is the question, it is open to debate from many views, for example some economists view standards as invisible barriers while in particular the

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\(^1\) Codex is the Codex Alimentarius Commission, dealing with food standards.

\(^2\) IPPC is the International Plant Protection Convention is an international treaty to secure action to prevent the spread and introduction of pests of plants and plant products.

\(^3\) OIE is the Office International des Epizooties, an intergovernmental organisation responsible for improving animal health worldwide.
French and some others view standards as a consumer health and safety necessity.

When legitimate safety concerns and externalities or other market failures are addressed, Sanitary and Phytosanitary measures have the potential to increase national welfare, even without consideration of the terms-of-trade effects, this is important in an industry, where the value of international trade in agricultural products has continually increasing, from US$ 852 billion in 2005 to US$ 1,127.7 billion in 2007, according to WTO (2006, 2008) statistics.

2.2. Agricultural change overtime
Agricultural trade has changed a lot over time. Before the last century, international trade in food was relatively simple. It took place between buyers and sellers on the basis of contracts, which included agreed prices and quantity specifications, and there was little, if any, government intervention. However, with little or no government control, food producers took advantage of this system and this led to deceitful food producers and traders. Both domestic and international producers took advantage of the circumstance as they found the market unregulated. This led to the possibility of exploitation, by agricultural food producers and traders, as the system provided the ability to implement unfair trade practices, for example, using practices of misrepresentation through complex nutrition and labelling policies. The consequence of these policies led to practices that threaten the health and safety of consumers, as they provided lower quality food produce by adopting fraudulent practices which in some cases were life threatening. The use of toxic colouring and flavouring agents, dilutants and other unacceptable materials are commonly added to foods and product substitution were and are blatant mismanaged trading practices. This can therefore illustrate the rewards of implementing international sanitary and phytosanitary standards that can protect consumer welfare through health and safety aspects.

Agricultural trade includes all the normal traders: producers, exporters and importers, national governments, international organizations, trade associations and a myriad of merchants. This can lead to numerous problems in the international trade of food commodities; this is a reason why there has been a need for better information modelling systems not just for separate regional trade policies for agricultural produce, but a need for better economic applied information modelling systems that span health and safety aspects as well. Agricultural trade harmonisation has shown a poor history of implementing liberalised trade systems with a near-perfect information system. There has been a lack of understanding shown of the impacts of new information and standards systems that have a new impact upon the trade of agricultural produce in a new-emerging environmentally focused trade platform. Talking of a platform, which also uses a systems thinking approach to understand the welfare utility of the consumer. Hence, here it is asserted that although the inclusion of a Sanitary and Phytosanitary measure will not eradicate all health and safety concerns and not all trade policy
problems either. The information modelling systems adopted to quantify the impact will make a significant beneficial difference to the way in which agricultural trade operates.

3. SCOPE OF STANDARDS AND WELFARE
The purpose of international standards (measures implemented through the SPS/TBT accords) is to protect the health of consumers, to ensure fair practices in food trade, and to promote harmonisation of all food standards. Standards are set within consideration of guidelines or other recommendations as appropriate on the basis of scientific evidence and risk-analysis and having regard, for the health protection of consumers and the promotion of fair practices in food trade. This is discussed in section 4, indentifying that at the international level, there are no current relevant instruments systematically considering bio-safety within collaboration with trade protection, which is the aim of this paper.

The scope of this study; aims to evaluate the extent that international standards are misused and their capacity of enhancing consumer welfare through such measures set by the WTO as viable. The impacts of SPS and TBT measures in agricultural trade have not been well quantified before. Despite the increased visibility of standards in policy discussions, previous research addressing these standards in agricultural trade has been structured around case studies. These studies however only provide, limited descriptive analysis, which only provide insights on specific barriers, but do not assess the impact, nor the prevalence of SPS and TBT barriers that may exist as protection against trade.

Therefore, a more comprehensive model is needed to identify questionable measures like standards in agricultural trade. The developing of such a model has been precluded so far due to complexities and the required large amount of data. However, in general, this research has identified that data on SPS/TBT barriers are widely available if focused on regional markets with standard setting organisations.

Hence, here an applied information economic model is used to equate the real-life implementations of the use of international standards within the agricultural sector. The model tests the proposition that standards are far more health and safety enhancing than protectionist; this is evaluated through a Monte Carlo simulation with an inventory approach to develop a multi-modal framework.

4. LITERATURE
International protection has a wide array of literature examining the impact and use of protectionist instruments. Policies regarding international protectionist measures have been widely examined through economic literature; Hillman (1996) and Roberts (1998) state various conceptions of NTBs,
from regulatory measures that are intended to protect local industry and others with intentions to protect human welfare. However, others argue this idea; Baldwin (1970), states, restrictions that have an overall positive welfare effect should not be considered as NTBs. This is backed by Fukao, et. al. (2004); Corden (1971); Henson and Loader (2000); and Howse and Trebilcock (1999), with similar statements that 'regulatory restrictions are measures that have a negative/decrease on world global revenue'.

Literatures relating to the measurement of NTBs are seen through Beghin and Bureau (2001a, 2001b); Bigsby and Whyte (2000), whom have proposed to measure both economic effects and probability aspects of risk and have developed methods for cases of pest infestation. Furthermore, Deardorff and Stern (1997) state that through measurements a country cannot hold the import price constant through restrictive practices. While at the sometime also isolate the effect on the NTB, unless world markets are infinitely elastic. Further, literature correlates with these arguments for example; Bora, et al. (2002) Ganslandt and Markusen (2001); and Maskus and Wilson (2001), state, many of these studies have critical problems in accurately measuring and qualifying the economic welfare factor, as it is rather complex for simple tools to estimate the real welfare gain and loss.

Further, literature in the area relating to NTBs and protectionist instruments are seen through studies like, Feenstra (1988); Helpman and Krugman (1989); Laird and Yeats (1990a, 1990b); Roningen and Yeats (1976); and Vousden (1990). These studies identify the complexities of modelling and estimating the impact of new standard barriers that have come across as an interesting approach to the evolving environment of international trade. In order to distinguish between legitimate protectionist, welfare enhancing tools and those of a pure protectionist nature, the studies of Bigsby and Whyte (2000); Ganslandt and Markusen (2001); Maskus and Wilson (2001), help with an approach, which is to evaluate on the bases of the rationale of purely science based versus economic approaches, however it is still limited to fully explain the difference and provide a quantification.

Other relevant literature is by Maskus, Wilson and Otsuki (2001); and Roberts, Josling and Orden (1999), examining a framework for technical trade measures. Roberts, Josling and Orden (1999), go further to state "technical trade measures that can satisfy the growing demand for food safety, product differentiation, environmental amenities, and product information at the lowest cost to the consumer and to the international trading system requires an understanding of the complex economics of regulatory import barriers". However, work remains to understand the methodological modelling and quantification of standards. Hence, the objective here is to assess and examine empirical models for the quantification of new arguably sustainable protectionist measures that are a mix of NTBs and importantly welfare-enhancing safety measures in their own right. Contradicting traditional protectionist theories, as a welfare-enhancing element of protectionist measures have not been
integrated into a quantitative protectionist model previously.

Literature and the undertaken research so far, shows that there still exists a major gap between the empirical frameworks and the practically applied methodologies for estimating the protectionist element of 'traditional' and 'new' NTBs. Examinations so far have identified that many traditional qualification models are limited by assumptions and can be criticised. However, some have the potential to illustrate the quantification of traditional and new generation protection, but only if the models are more integrated.

5. **EMPIRICAL MODEL**

The empirical model will provide a wider framework of comprehensive assessment of the actual impact of technical standards, which is necessary to address the role to be given to non-tariff instruments and barriers in a future trade agreement. As traditional models and research lacks the possibility to evaluate and distinguish NTBs and legitimate regulations used to protect consumers. The term 'barrier' is used in a wide subjective view for all trade restrictions, however this creates problems as it also covers standards which can incidentally act as a trade restrictor, but whose principal objective is to correct market inefficiencies. This research moves away from some of the traditional views of trade restriction and prove that standards are a common language problem rather than a pure-trade restrictor.

Considering the International exposure of standards, in particular Sanitary and Phytosanitary rights, (which are standards/measures to protect human, animal and plant life or health and to ensure that food is safe to eat). It is determined that the characteristics of Sanitary and Phytosanitary measures as an international protectionist measure is more linked with sustainable characteristics (rather a Sustainable NTB (SNTB)) as opposed to a traditional Non-Tariff Barriers (NTBs). The distinction between a trade-oriented concept and a sustainable welfare-oriented definition of a NTB is not only theoretical. It has direct consequences on empirical measurements since the two conceptions lead to different approaches. Some methods rely on the measurement of possible trade impacts only (this is the case of methods based on price-wedge estimation, surveys, and gravity models). Other methods are grounded in welfare economics, and measure NTBs through a larger range of effects than trade alone (this is the case of methods based on comparative-statics or cost-benefit analysis and general equilibrium analysis). Welfare-based approaches are conceptually superior because they capture a larger range of affects (e.g. they account for the positive externality of a regulation that, say, protects consumers). Incorporating the analysed models below a new approach of accounting for the quantification of protectionism is evolved.

The main assumption behind the model is that under the right conditions of what can be called
progressive liberalisation, through welfare enhancement; numerous differences can be made to economic development. This means by combining better opportunities (standards) and the harmonisation system (HS), this can lead to increasing capacities as a result of food and efficient governance with lower collateral costs as a result of poor and high external costs from low health and safety standards. The assured rights to sustainability, economic collateral costs and a stable legal system and modern efficient infrastructures in agricultural production and trade can be of huge benefits.

**Simulation**

The assumption of independence between contamination and consumption is generally not questioned in the case of foodborne pathogens and chemical contaminations since the contamination of a food is not conditional on behaviour. But have variability such as consumption and contamination, risk assessors use methods called parametric. Which consist of the parametric adjustment of laws to approach normal distributions of consumption and contamination. For contamination, the log normal is the most widely used although it fits poorly with the tails of distributions. To remedy this, solutions like the use of parametric laws of or a combination of several different parametric laws are considered.

Another solution is to use a log-normal distribution multidimensional, relatively simple to simulate the variance-covariance matrix of consumption is known but that does not fit well with the presence of multiple zeros. Therefore the distribution of exposure is examined through Monte Carlo simulation. If $f_c$ is the density of multidimensional vectors of consumption and $f_{Q_1}, \ldots, f_{Q_r}$ is the densities (dimensional) contamination, the distribution $f_D$ of exposure is a functional, $f_c \times \prod_p f_{Q_p}$ approximated by drawing a random number $B$ of values depending $f_D$.

The exhibit can be constructed by considering a fixed level of contamination for each food or food group. This level is determined from the observed data of contamination or pathogen: it may be the average of the median to get a realistic estimate of exposure.

If $c_p^i$ refers to the consumption $p$ of the individual product $i$ and $q_p$ refers to the fixed level of contamination for the food, $p$ the exposure of individual product $i$ is:

$$D_i = \sum_{p=1}^{p} q_p c_p^i$$
And the estimator of the distribution of exposure for a population of size $n$ is the empirical distribution function can be, defined by:

$$F_n(x) = \frac{1}{n} \sum_{i=1}^{n} (D_i \leq x)$$

Therefore the variability of contamination or a pathogenic outbreak can be taken into account by using the parametric distributions, a previously rated $f_{Q_1}, \ldots, f_{Q_p}$, the Monte Carlo simulation describes it as a semi-parametric. In this case, the Monte Carlo simulation can be quite fancy and show confusion between approximation to Monte Carlo and bootstrap. In fact, an approximation of the distribution of exposure is to randomly draw and release $B(\gg n)$ vector of consumption (drawn by an empirical distribution function of consumption) and assigned each value of consumption $c_p^i$ from pathogenic contamination by $f_{Q_i}$. Therefore if $L_p$ tests are conducted to estimate the pathogenic contaminant content of the product $p$ and $q_{j_p}^p$ that means the contaminant content of the product $p$ at the $j_p$ analysis ($j_p = 1, \ldots, L_p, p = 1, \ldots, P$), the estimator of the distribution of the exposure of a population of size $n$ is the function of allocating exposures may result from the combination of these levels of pathogenic contamination and consumption $c_p^i$ observed. Which is defined as:

$$F_{n, L_1, \ldots, L_p}(x) = \frac{1}{\Lambda} \sum_{i=1}^{n} \sum_{j_1=1}^{L_1} \ldots \sum_{j_p=1}^{L_p} \left( \sum_{p=1}^{P} q_{j_p}^p c_p^i \leq x \right)$$

or $\Lambda = n \times \prod_{p=1}^{P} L_p$

The distribution of exposure can then approximated through a Monte Carlo simulation of a particular size $B$. considering a random pathogenic contamination, which would mean the estimator of the distribution of foodborne disease exposure is of the form:

$$F_B(x) = \frac{1}{B} \left( \sum_{(i, j_1, \ldots, j_p) \in \zeta} \left( \sum_{p=1}^{P} q_{j_p}^p c_p^i \leq x \right) \right)$$

or $\zeta$ designates a subset of indices $(i, j_1, \ldots, j_p)$ size $B \ll \Lambda$

Therefore considering exposure to a foodborne pathogenic contaminant beyond a given threshold, a distribution can model very different behaviours and can be particularly suited to highlight sub-populations more or less at risk, evaluating welfare element of implementing standards. Therefore indeed, if $\gamma$ is larger then the tail of the distribution curve it would mean that likelihood that the
exposure exceeds a certain threshold $d_0$ is great. Therefore if $\gamma = 0$ the probability is low, however, if $\gamma < 0$ (e.g. for the sub-populations of non-consumers or low consumers of the contaminated products), the probability is very low, so $d_0 < 1/|\gamma|$ and $d_0 > 1/|\gamma|$. Thus under these conditions, $1/|\gamma|$ interprets at risk threshold zero. In order to provide greater flexibility to estimate and take into account the phenomenon of scale, it will be useful to introduce the parameters $\mu$ and $\sigma > 0$ and consider that

$$W_{\gamma,\mu,\sigma}(x) = \frac{1}{\sigma} \frac{x - \mu}{\sigma}$$

In these conditions $\mu$ is interpreted as the infimum of the subset supporting $\sigma$ parameters of scale. Note that in the case $\gamma < 0$ the support the law it is defined as: $[\mu, \mu + \sigma/|\gamma|]$

Therefore in order to identify foodborne pathogen risk one can implicitly assume that, certain exogenous variables $Z_1, \cdots, Z_n$ (will identify sub-populations), this means an exposure to certain pathogenic contaminants is different. But there is a certain hierarchy in the levels of risk. It is this process that can be confirm by more precise methods. A possible solution for estimating the impact of foodborne risk and standards simultaneously is through a generalised Pareto or Pareto index in which risk is conditionally limited exogenously. As it sis defined by:

$$P(X > d|Z) = h(Z\gamma)$$

Therefore, the uses of soft systems methodology and information systems (i.e. inventory and sample models) are interesting, as these are often are not used as research methods within the economic and social development activities. The need for an information system is of prior importance to understand technical and agricultural standards implemented as both protectionist or health and safety, therefore using these approaches in combination is unique, and a new approach in economic quantification.

6. RESULTS ANALYSIS

The model is a new method of examining agricultural standards in the use of Trade Related Food Commodities (TRFC) and the advancement towards a greater understanding of standards in the context of economic utility and individual enhancement capacity. The model provides an asymmetric analysis of the trade structure of the agricultural industry with the use of SPS measures.

The multi-modal simulation model illustrated in section 5; provides a virtual view of the international
agricultural trade environment considering sub-categories of HS 01-25 of the Harmonised System classification index. This helps to consider standards as welfare enhancing as the health and safety elements of standards provide a security of higher quality goods for consumption. The model illustrates what would happen if an integrated information harmonisation system is to be implemented and provides bases for aid in international agricultural standard disputes. The model thus can be used as a forecasting tool to see what level of protection and welfare is gained through the implementation and/or the increasing of international standards that producers must abide by to undertake trade of their commodity. Furthermore, helps to understand the complexity of disputes and help evaluate the cost and benefits of an SPS system. The results form the simulation model show that on average, individuals would permanently give up to approximately 8 percent of their current level of consumption to be comfortable with produce and that has a higher health and safety assurance.

The traditional view by neo liberal economists is that 'forced liberalisation' - is bound to result in devastating economic and social consequences. However, above it is argued that in virtually every case, it will always depend on the circumstances. Furthermore, there is no proven argument that trade liberalisation will automatically led to greater economic growth. It can be argued, therefore the use of sustainable practices as in the context of SPS standards that are used to lower the chance and probability of outbreaks and diseases in the means of increasing health and safety can be an argument for sustainable economic growth, with a greater lower cost to society. The difference will depend on such factors as to the capacity of existing businesses/enterprises to be able to move up-market or regional integration to establish new sources of comparative advantages. The use of sustainable health and safety practices could deliver longer lasting opportunities for developed (standard setting economies, the EU being the most active member for setting standards) and developing economies to grow and prosper, from which we all would benefit in time.

Assumptions

In assuming/having a positive view on shaping globalisation, developed country businesses should contribute to relocate production and cultivation processes in agricultural produce to efficient regions should take with them, their sense of corporate social responsibility, this is the same with the use and introduction of SPS contact points and training development (umbrella scheme, a scheme used to advance knowledge on the technicalities of SPS standards) in developing countries. This means the influence to leverage and synchronise developed standards are a strong tradition of social justice to human rights for the consumption of approved health and safe food commodities. All-in-all this should benefit all, through progressive liberalisation,
7. CONCLUSION

Although traditional tariffs are still a major-type of protection at the international level, the emergence of NTBs, have pushed tariffs into the background and tariffs have become less important than they used to be, as indicated by Page (1994); Page and Davenport (1994); and Ford (2002). This is similar with the emergence of SPS, TBT and ES measures, which have a welfare enhancement utility function.

To analyse the supply-shifts component of an NTB that can capture both the effect of imports on the domestic supply (in the absence of regulation) and the potentially beneficial impact of a regulation. As viewed with the empirical approach here it limits the cost of pathogens for example (even if this involves some additional costs of testing and detection), the large economic cost is foregone, creating economic benefits while enhancing welfare.

Here unconventional ideas are used to move away from the traditional view of standards being a protectionist measure in totality while taking into use welfare data in collaboration with partial multi-modal equilibrium modelling. The welfare data is in the context of WHO Environmental Burden of Disease (EBD) data that help consider country-by-country analyses of the impact agricultural/environmental factors have on health. The model demonstrates that in every country, people's health could be improved by reducing environmental risks, one of these are agricultural risks of outbreaks foodborne pathogens and life threatening toxins, dilutants and other unacceptable materials that increase the risk towards health and safety for all humans, plants and animals.

Information systems can alleviate some regulatory standards considered by countries as harmful. Importantly the model challenges the preconceptions that exist with regulatory protectionist measures, that they are all harmful in the international trade environment.

The model also incorporates a Human Rights benefit dimension with reference to enhancing or diminishing the standards of rights entailed by each individual as set by the UN in the Universal Declaration of Human Rights.

In essence it can be said that SPS measures are intended to increase health and safety standards and consumer welfare rather than be viewed as barriers or NTBs.
8. REFERENCES


