

Review Article

The political economy of trade-related regulatory policy: environment and global value chain

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Date of submission: 2016 10th, October; accepted 2017 3rd, February

Abstract. This paper proposes a selective review of the political and economics literature on non-tariff measures (NTMs), with special emphasis on the so-called behind-the-border measures, such as environmental and food standards. We focus on both theory and existing empirical evidence. The complex issue of international trading rules over domestic regulatory standards, as well as the emerging role of outsourcing and global value chains, is also considered.

Keywords. Endogenous policy, environmental and food standards, heterogeneous firms, global value chains

JEL codes. F12, F13, D72, Q18, Q56

1. Introduction

In the last decades, international markets have been characterized by two interconnected phenomena. On the one hand, the world economy has experienced a never reached level of integration through an impressive growth of international trade and capital flows. This has been largely the result of trade and financial liberalization within the GATT-WTO system (see Caliendo *et al.*, 2015), as well as of the ICT (Information and Communication Technology) revolution that shaped a profound reorganization of the world economy.

On the other hand, a second phenomenon – the subject of this paper – has been the global proliferation of government regulatory activities mainly related to process and product standards, such as technical, quality and environmental regulations.¹ Trade econ-

¹ A parallel trend is related to the explosion of private and voluntary standards set by business groups and large retailers finalized, among other things, to better coordinate modern global value chain (see Beghin *et al.*, 2015; Swinnen *et al.*, 2015). However, because this paper refers on the political economy of regulatory protection, the focus will be mainly on public standards. Among others, see McCluskey and Winfree (2009) and Vandemoortele and Deconinck (2015) on the interaction between private and public standards, also from a political economy perspective.

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omists have called this trend “regulatory protection”, referring to the myriad of cost-raising, behind-the-border measures, that keep substantially inhibiting trade (Baldwin, 2000; Staiger, 2012). According to the UNCTAD, these policy measures are “non-tariff measures (NTMs) other than ordinary customs tariffs, that can potentially have economic effects on international trade in goods, changing quantities traded, prices or both”.

NTMs are *de jure* regulations, *prima facie* imposed to protect consumers from unhealthy or low quality products and the environment from environmental damages. These measures should be the first- or second-best instruments to achieve public policy objectives, such as market failures, information asymmetries and imperfect competition (WTO, 2012). However, *de facto* they often induce an increase in trade costs acting as conventional barriers to trade (WTO, 2012; Orefice, 2015; Beghin *et al.*, 2015a).²

In what follows, I propose a review of the literature on the political economy of trade and regulatory standards, considering both conceptual models and the empirical evidence, with special emphasis on environmental and food standards. These specific regulatory measures represent just a sub-set of NTMs. However, in the last decades they became largely the most important and diffuse type of regulatory standards affecting trade in the agri-food sector.

The key objective is not just to systematically survey the current literature. Indeed, given the importance and the complexity of the field, this issue has been already surveyed from different points of view by several recent contributions, including Baldwin (2000), Oates and Portney (2003), Sturm (2003), WTO (2012), Beghin *et al.* (2015a) and Swinnen *et al.* (2015). I focus instead on what I believe are some of the key contributions of the political economy of trade policy as extended to product and environmental regulations. In doing that, I give emphasis also to the implications stemming from considering trade models with firm heterogeneity, the emerging issue of international trading rules over standards and the role of global value chain.

The paper is organized as follows. After a short overview on the recent diffusion of NTMs (Section 2), I introduce the basic logic behind the political economy approach (Section 3). Then, I discuss shortly the efficiency, distributional and trade consequences of standards (Section 4). Next, I present the leading approaches to endogenous trade policy formation and their extensions to quality and environmental standards (Section 5). Finally, I discuss the problem of negotiating international trading rules over NTMs, also in the context of modern global value chains (Section 6). The conclusions discuss the implications in considering regulatory policies as endogenous, suggesting future research avenues.

2. Stylized facts about NTMs

In this section I consider the definition of non-tariff measures and some emerging evidence about their diffusion and their trade effects.

2.1 Definition and quantification of standards

As the term suggests, NTMs are policy measures other than tariffs that can affect trade flows. They can usefully be divided into three categories (Staiger, 2012).

² Note, however, that by providing more information about a given good, or by improving the characteristics of the good itself, several NTMs may be also a catalyst for trade (see, e.g., Disdier *et al.*, 2008; Maertens and Swinnen, 2009; Olper *et al.*, 2014).

A first category of NTMs includes those imposed on imports, including import quotas, import prohibitions, import licensing, customs procedures and administration fees. A second category is made up by those imposed on exports, such as export taxes, export subsidies, export quotas, and export prohibitions. These first two categories encompass NTMs that are applied at the border, either to imports or to exports. A third category of NTMs, the focus of this review, includes those imposed internally in the domestic economy, also called behind-the-border measures. This category embraces domestic legislation covering an increasing numbers of product characteristics, such as technical, safety, environmental, health, nutrition, and labor standards, as well as internal taxes and domestic subsidies.³ In what follows, the main focus is on behind-the-border standards, and in particular on Sanitary and Phytosanitary (SPS) standards and Technical Barriers to Trade (TBT), disciplined in the WTO by the respective SPS and TBT Agreements.

Within behind-the-border measures a classical distinction is between product standards and process standards. Product standards have to do with the characteristics of goods, in particular with respect to aspects such as quality and safety, e.g. the maximum content of methyl mercury in fish. Process standards instead apply to the condition under which goods are produced, packaged, or refined, e.g. dairy product without hormones. A related distinction is between vertical and horizontal standards. Vertical standards involve regulations that can readily be characterized by being more or less stringent. As an example, the EU versus US legislation on growth hormone in beef or on aflatoxin, with the first being more stricter than the second. This kind of legislation is more complex because it exerts emotion and a strong media attention as it is identified as protecting local consumers from low-quality imports (Baldwin, 2000).

Horizontal standards, however, are often more common especially in non-food manufacturing goods. In this case, a typical example is the difference in electric plugs around the world. Note that, when two countries have such horizontal standards, the differences tend to create reciprocal trade barriers.

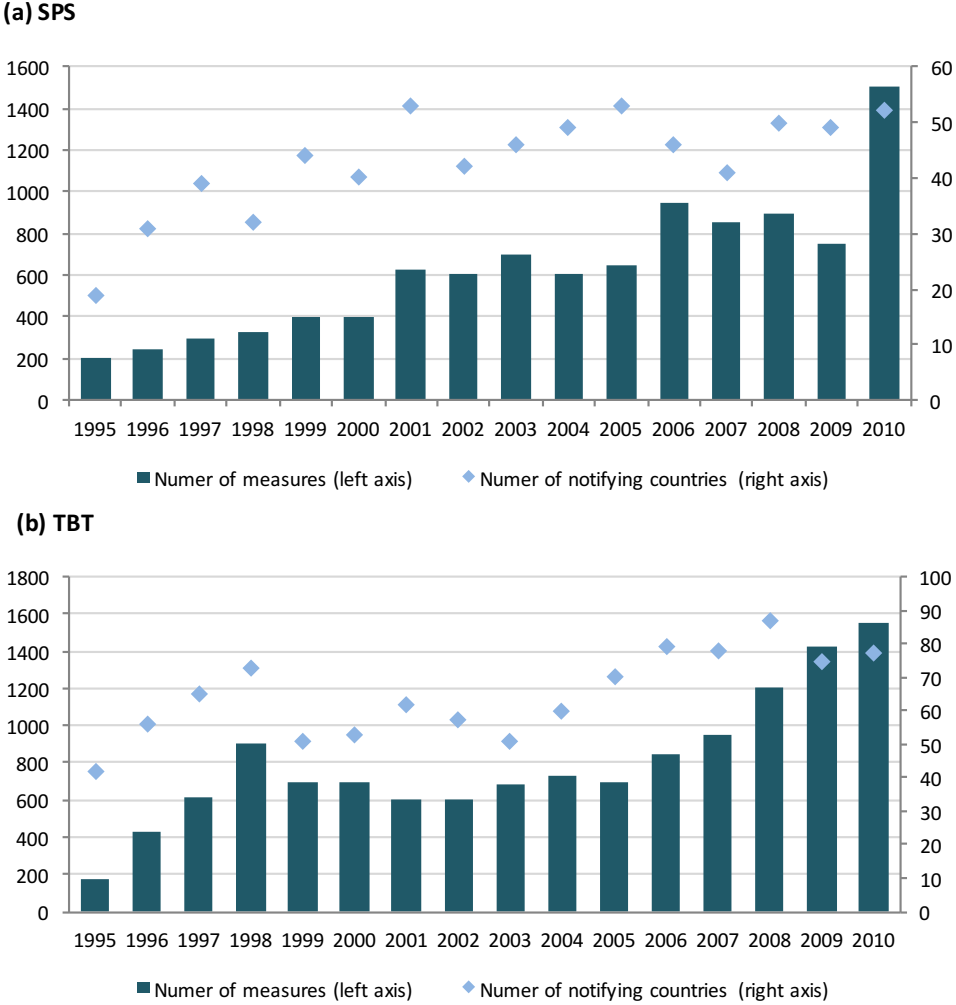
To date, the most comprehensive information of different NTMs, comes from the countries' notifications at the WTO, currently collected in the I-TIP database. Although still problematic, the WTO data have the advantage to offer a comprehensive picture across countries, over time and also among different types of NTMs.⁴ Moreover, as recently shown by the WTO 2012 Report on NTMs (WTO, 2012), other databases, such as the UNCTAD-Trains or the firm-level survey collections of the World Bank, broadly confirm the NTMs patterns of the WTO data.

As far as December 2015, the SPS and TBT measures notified to the WTO were 11,174 and 18,279, respectively. This number is very high compared to all others (border) NTMs, equal to about 5,500. Currently, SPS and TBT measures represent approximately

³Note moreover that, any standard needs a peculiar testing procedure to check the extent to which products are in compliance with the standard. The existence of asymmetry in this testing procedure could create further trade costs and tensions in trade relations, as it happened between the UE and Japan in the 1990s (Baldwin, 2000).

⁴As explained by the WTO I-TIP database, the difference between notifications vs. measures in force is problematic because the same measure can be notified through several notifications, or several measures can be notified in only one notification. Moreover, another lack comes from the fact that very rarely countries notify the withdrawal of the measures, and moreover members have not the obligation to notify all measures imposed. Hence, it is not so clear if the number of the SPS and TBT measures notified to the WTO are inflated or underestimated, although the former hypothesis appears more likely.

Figure 1. SPS and TBT notifications 1995-2010 (# of notifying countries and measures).



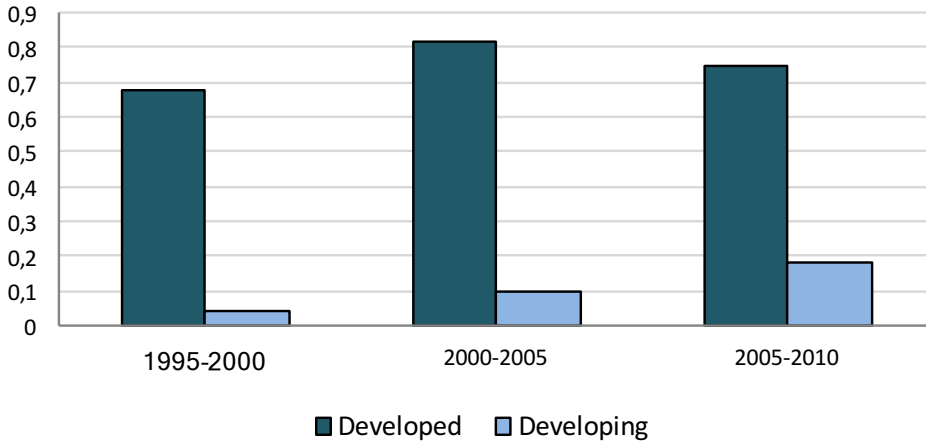
Source: WTO (2012), based on WTO I-TIP Database.

85% of all the NTMs notified to the WTO. This is the trend resulting over the last two decades during which border NTMs have significantly decreased, while SPS and TBT measures have strongly increased (Figure 1). The growing importance of SPS and TBT standards is confirmed by other data sources. For example, considering the UNCTAD-Trains data, in 1994 about 55% of all NTMs were classified as SPS or TBT, a number that increased up to 85% in 2004 (Beghin, 2006). Similarly, for the US, data from 2014 NTMs reveal a share of SPS and TBT measures higher than 85% (Pacca and Olper, 2016).

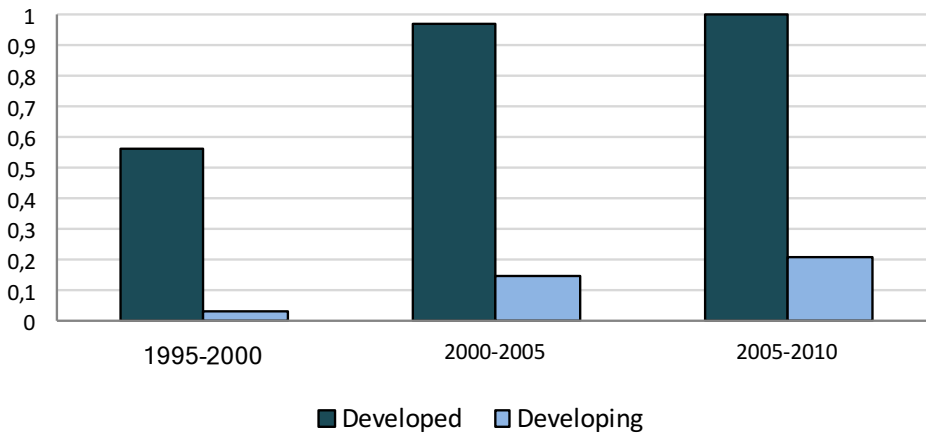
Starting from 2005, the growth of NTMs does not show a clear trend, although in the aftermath of the financial crisis they started increasing again. Yet, in the last period, SPS

Figure 2. # SPS Specific Trade Concerns (STC) “Maintaining” and “Raising” countries as a share of the total number of countries by the level of development.

(a) SPS (maintaining)



(b) SPS (raising)



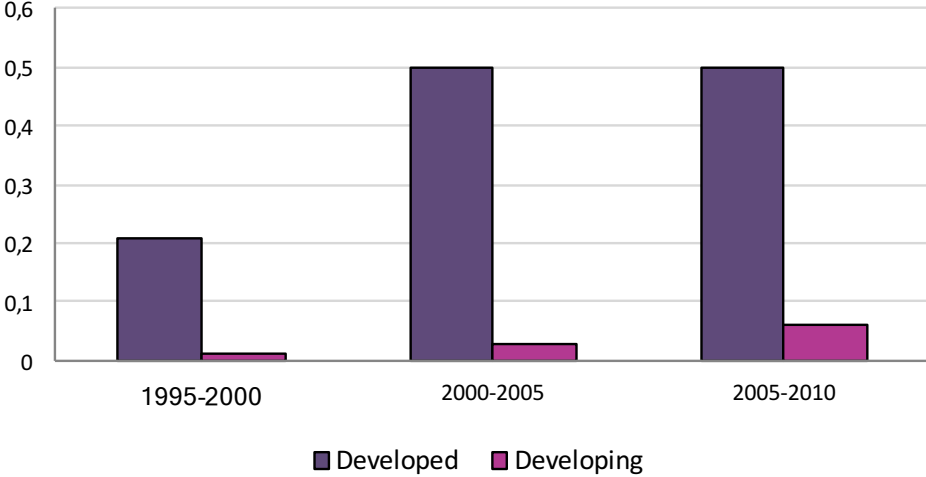
Source: WTO (2012), based on WTO STC Database.

and TBT measures are still growing in their importance (WTO, 2012). A significant confirmation of the SPS/TBT intensification comes from the inspection of the so called “Specific Trade Concerns” (STC). These are formal complaints raised by WTO members to the SPS and TBT Committee on particular trade inhibiting standards. The STC concerning both SPS and TBT measures have increased significantly from 1995 to 2010 (Figures 2 and 3). Such trend has been confirmed in the last years.

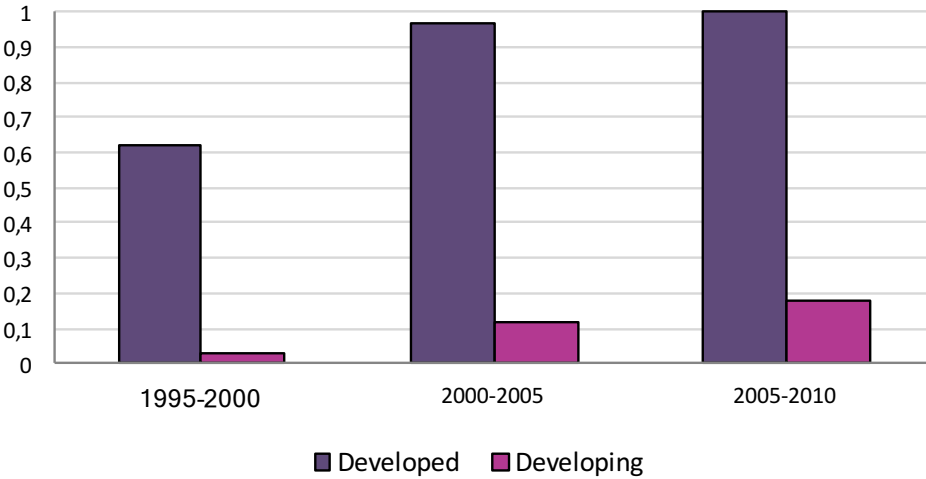
SPS and TBT measures are mainly raised by developed countries, even if some important emerging economies have been particularly active in the recent period (e.g. China,

Figure 3. # TBT Specific Trade Concerns (STC) “Maintaining” and “Raising” countries as a share of the total number of countries by the level of development.

(c) TBT (maintaining)



(d) TBT (raising)



Source: WTO (2012), based on WTO STC Database.

India and Brazil). Considering again STC, developed countries do not only maintain the largest number of STC in place, but they are also the most active in raising complaints against SPS/TBT measures (Figures 2 and 3). This pattern appears to be in line with the broad picture coming from the World Bank surveys, where implementation issues related to standards are the most important source of concerns for exporters from developing countries toward developed ones.

2.2 Trade effect of NTMs

The key question concerning standards is not just their (likely) trade effects, but their overall welfare effects. Yet, as a matter of fact, the large part of the empirical literature over NTMs and standards has focused its attention mainly on the more simplistic issue of the trade effect.⁵

From this point of view, the extent to which the large diffusion of NTMs, and in particular of SPS/TBT measures, negatively affects trade flows, is not out of contention (see WTO (2012) for a recent survey). While many studies showed that, at least on average, NTMs significantly reduce trade flows (see Disdier *et al.*, 2008; Olper and Raimondi, 2008; Vigani *et al.*, 2012), SPS measures, and more often TBT standards, could be trade and quality enhancing, especially when harmonized and/or voluntary technical standards are considered (see Moenius, 2004; Shepherd, 2007; Olper *et al.*, 2014).

To rationalize the large and contrasting literature on the trade effect of standards, Li and Beghin (2012) have recently proposed a meta-analysis of the trade effects of SPS and TBT measures. Main results showed that: international trade in agricultural and food products tends to be more impeded by these barriers in comparison to trade in manufacturing; SPS regulations affect negatively trade in agriculture and food products coming from developing countries toward rich countries, and less between rich countries; finally, the trade effects of other technical regulations are more uncertain.

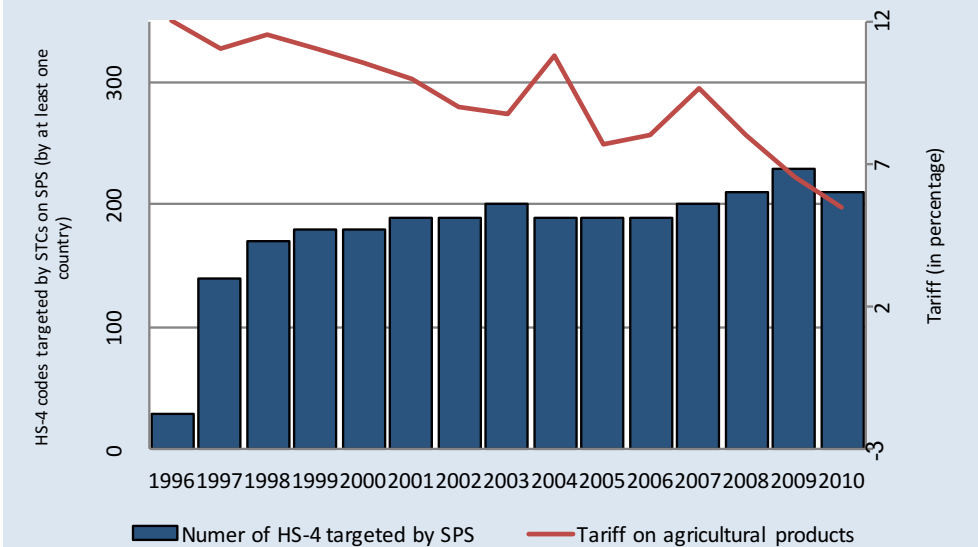
The most recent empirical literature on the trade effects of NTMs started to shed new light on two important questions. First, their effect on the probability to export considering firm level trade. Second, the old but still unresolved issue of the interaction between tariffs and NTMs.

The extent to which SPS/TBT standards, other than the volume of trade, also affect the number of firms entering in the export market – the extensive trade margin – has been recently addressed by Fontagnè *et al.* (2015). By matching France custom trade data with SPS specific trade concerns raised by the EU against its trading partners, these authors find three important results. Firstly, the probability of firm exiting from the export market is higher in SPS-imposing foreign markets. Secondly, the value exported by each firm is decreasing in the presence of SPS, but instead the export unit values (a proxy for price) are increasing. Hence, compliance with new SPS standards may require additional fixed costs to adapt the production process. Finally and interestingly, these negative effects of SPS on the intensive and extensive trade margins are significantly attenuated when large firms are considered. All these stylized facts are consistent with the SPS-induced redistribution of market shares from small toward large firms, predicted by firms heterogeneity trade models (Abel-Koch, 2013). We will come back on this point shortly.

A second important issue is the relation between standards and tariffs (Figures 4 and 5). Globalization and the diffusion of standards are clearly two interconnected phenomena. However, understanding whether custom tariffs and standards, and more in general NTMs, are substitutes or complements is a challenge. The existing empirical evidence, although scarce, seems to support more the substitution hypothesis. However, there is

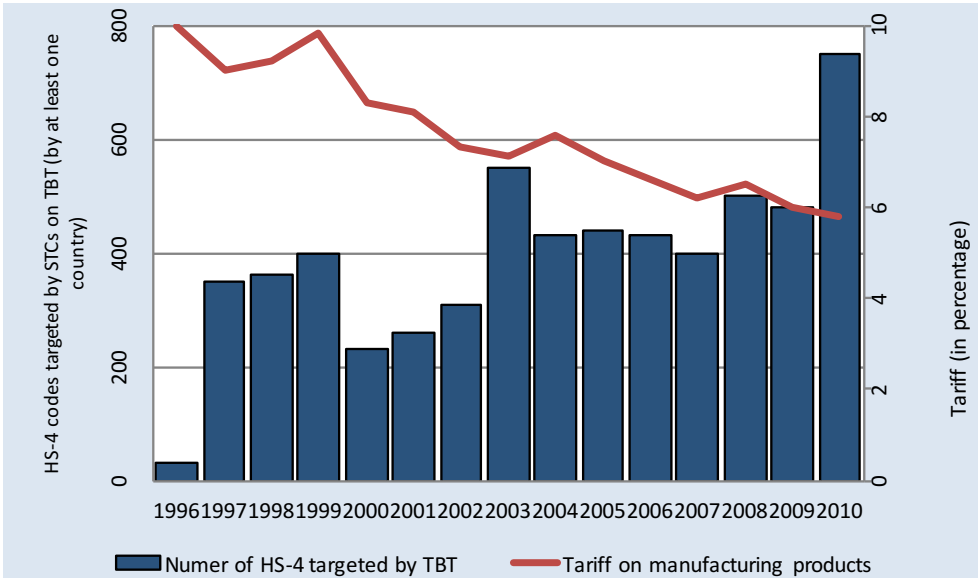
⁵ See Disdier and Marette (2010) for one of the few contributions that investigated simultaneously the trade and welfare effects of SPS standards.

Figure 4. SPS trade concerns and applied tariff level 1996-2010.



Source: Orefice (2015), based on WTO STC Database and Trains (for applied tariff).

Figure 5. TBT trade concerns and applied tariff level 1996-2010.



Source: Orefice (2015), based on WTO STC Database and Trains (for applied tariff).

also evidence of complementarity in the literature (see Ray, 1981; Goldberg and Pavcnik, 2005). The work by Kee *et al.* (2009) perhaps represents the most compelling evidence on the substitutability between tariff and the Ad-Valorem Equivalent (AVE) of NTMs. Using cross-sectional data for 91 countries, they find support to the substitutability hypothesis. Yet, given the conceptual difficulty and the huge data problems in transforming the NTM trade effects in their respective AVE (Beghin *et al.*, 2015b)⁶, cross-sectional evidence cannot be taken as definitive answer.

Beverelli *et al.* (2014) make an important contribution by exploiting the cross-country and time-series dimension of SPS/TBT specific trade concerns. Interestingly, considering these specific measures, they find a strong confirmation of the substitutability hypothesis, meaning that SPS and TBT standards are raised in response to a tariff cut, and this is especially true in developed countries where the cost of meeting the standards (for home firms) is relatively lower.⁷ Instead, their findings support a complementarity relationship between tariffs and TBT in developing countries, while not for SPS, where the substitution effect prevails also in developing countries. All these results have implications for the political economy of standards.

Finally, an important point is to recognize that the mere fact that SPS/TBT standards restrict trade and competition is by no means an argument for their removal (Swinnen *et al.*, 2015). Good governance requires regulation to protect environment, health, safety and well-being of citizens, animals, plants as well as to facilitate market transactions and global value chains. However, as many evidence and trade disputes have already showed, the problem with standards is the difficulty to know whether a particular regulation serves the public or the protectionists' interest and indeed, both motives are often combined in a single SPS/TBT (Baldwin, 2000).

3. A general political economy framework

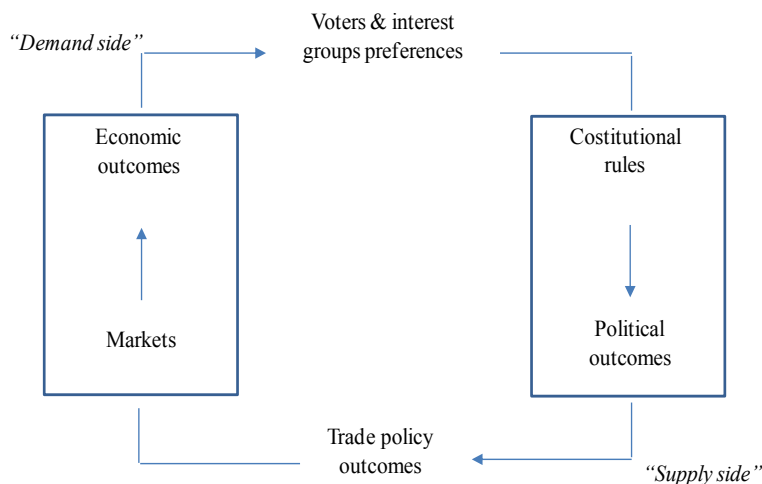
Figure 6 presents a stylized view of the democratic policymaking. Starting from the box and arrows on the right in the figure, voters and interest groups in society have conflicting preferences over trade policy. Political institutions – i.e. electoral rules, forms of government and decision rules – aggregate these preferences into specific political outcomes. This result translates into *ad hoc* political incentives, transforming economic and political interests in economic policy decisions, such as trade policies, by interacting with private interests and decision rules.

Moving to the box and arrows on the left of Figure 6, trade policies interact with markets influencing the prices of different goods, and factors' return in different industries (and/or firms). These market outcomes will affect individual preferences over trade policy depending on the sources of individual income. The economic (left) and political (right) boxes of the figure are occasionally called the “Demand side” and the “Supply side” of the political market, respectively (see Rodrik, 1995).

⁶ Beghin *et al.* (2015b) showed that the NTM AVE estimates of Kee *et al.* (2009), being based on the (assumed) restriction that NTMs can affect only negatively trade flows, may be distorted upward. By modelling the (possible) externalities addressed by NTMs, they confirmed this statement quantitatively.

⁷ See also the contribution of Orefice (2015), who studied the relationship between STC and tariff variation from the point of view of the exporting country raising SPS/TBT specific trade concerns.

Figure 6. The democratic policymaking process.



Source: adapted from Persson and Tabellini (2003).

Until recently, models have treated analytically mainly the left box and arrows of the figure, considering the right box largely as implicit components. Yet, in the last decade economists have started to look seriously also to the right box – traditionally a domain of political scientists – by developing political economic models of different democratic (and autocratic) institutions, with the aim of formally addressing how different institutional structures affect political outcomes and, in turn, economic policy and growth.⁸ Given the complexity of the issue, a satisfactory treatment of all these factors is hard, in the sense that a complete political economic model would be intractable. Hence, apart few notable exceptions,⁹ political economy models used to study the formation of trade-related regulatory policy leaves implicit some of the right-hand side elements of the structure summarized above.

Every political economy model of trade-related policy starts from the economic domain. This is important because the interaction between trade policy, markets and economic outcomes (left box) is at the heart of *coalitions formation* over government policy. The simplest approach, still used nowadays, is the one of a small open economy based on the Ricardo-Viner (specific-factors) or on the Heckscher-Ohlin trade model.¹⁰

⁸ Comprehensive reviews of these comparative political economy studies can be found in Persson and Tabellini (2000) and Acemoglu and Robinson (2006). Empirical evidence of the effect of political institutions on policy outcomes is reported in Persson and Tabellini (2003) for macroeconomic policy, Fredriksson and Millimet (2004) for environmental policy and Olper and Raimondi (2013) for agricultural and food policy.

⁹ Considering trade policy, models of Grossman and Helpman (2005) and Zissimoss (2014) are examples going in that direction. The first considers the formation of trade policy in a democracy comparing majoritarian versus proportional electoral rules. The latter develop a political economic model of trade policy under autocracy and democracy, by merging the Acemoglu and Robinson (2006) model of democracy with the Heckscher-Ohlin trade model.

¹⁰ In the Ricardian model, everybody gains from trade and loses from trade protection, since there is a single factor of production (labor). Hence, no clear domestic coalition will emerge having a real interest to depart from

These neoclassic approaches have the advantage to predict stark distributional consequences of trade policy and thus to clear-cut predictions about who gains and who loses from protection, pointing to coalitions formation that have conflicting interests on trade policy (Hillman, 1989).¹¹

As it is well known, within this perfectly-competitive small open economy framework, whatever the (neo-classical) trade model is chosen, free-trade is the optimal trade policy for the welfare maximizer government. In this framework, any deviation from free-trade should be labelled as “protectionist”, and is the result of a self-interested government who cares about its own welfare - such as (re)-election - and uses trade policy to transfer resources to special interests with that purpose (Hillman, 1989).

4. Modelling the economic effect of standards

The basic framework outlined above, although useful, does not work clearly in the presence of regulatory standards introduced to address consumption (or production) externalities. This is because domestic regulations, such as food safety and environmental standards, by adding technological constraints on how goods can be produced (e.g. genetic modified technology, or the use of hormone in cattle breeding), have complex effects on both the trade patterns and the firms’ competitive environment, other than on consumer welfare. For this reason, understanding the extent to which a regulatory standard can be labeled as “protectionist”, is often a complex issue driven by the nature of the standard itself and the (trade) model assumptions.

Before moving to an open economy, it is useful to address shortly the main effects of a standard in a closed economy. Consider a product standard that address a consumption externality, as studied by Swinnen *et al.* (2015) and many others. The introduction of this standard has both efficiency (welfare) and equity effects. In particular, social welfare increases when consumers gain exceeds producers implementation costs, and *vice-versa*. However, standards always induce *rent distribution* between consumers and producers, as well as among producers when firms differ in their implementation costs. Thus, due to the distributional effects of standards, different groups in the society have different interests towards them, raising political economy problems.

4.1 The economic effect of standards in an open economy

One of the first theoretical contributions on the economic effect of product standards is proposed by Fischer and Serra (2000), who studied the impact of a minimum quality standard on Home and Foreign firms, modelling a duopoly in a homogeneous goods set-

free trade. Yet, things change considering neo-Ricardian models with firms heterogeneity (see Eaton and Kortum, 2002; Arkolakis, 2010).

¹¹ Within the Ricardo-Viner model the consequence of trade policy can be clearly traced knowing the individuals’ factors ownership in the import-competing and export sectors. A tariff in the import-competing sector leads to an increase in the return of the specific factor, while reducing the return of the specific factor used in the export sectors. In the Heckscher-Ohlin model, the effect of a tariff works along factors (not sectors) lines, i.e. the Stolper-Samuelson theorem. An import tariff increases the return to the scarce factor and reduce the return to the abundant factor.

ting, under the small country assumption. The modeled standard is reflected in a change in the level of a *negative* consumption externality, along the line of Copeland and Taylor (1995). The authors' main conclusion is that, in the presence of a consumption externality, e.g. pollution, the standard chosen by the domestic social planner is always protectionist. This is because, on the one hand, rents can be transferred from the foreign to the home producer due to the increase in market power of the domestic firm, and on the other hand, part of the cost in reducing the (domestic) externality is absorbed by the foreign producer. These result motivate the authors' definition of a *protectionist* standard as "one that is higher than the standard the social planner would choose if all firms were domestic." (Fischer and Serra, 2000).¹²

Marette and Beghin (2010) question this conclusion. Specifically, within a similar framework, they analyze the introduction of a domestic standard to address a consumption externality, allowing heterogeneity of foreign and domestic firms in the cost of addressing the standard. In this setting, they argue that the welfare maximizing (domestic) standard chosen by the social planner can be anti-protectionist - i.e. lower than the standard which maximizes international welfare - when foreign producers are much more efficient than domestic producers at addressing the externality. This conclusion is interesting because, at least within this model structure, it has consequences for the practical estimation of the ad-valorem equivalent of a NTM, that would also be sensitive to the heterogeneity of costs structure in meeting the standards of the domestic and foreign firms.

The two papers mentioned above refer to a particular type of NTM, namely a standard that accounts for a consumption externality. Hence, the natural question is on whether similar conclusions can be drawn by comparing different types of NTMs. Marette (2014), extends the previous analysis highlighting the complexity in characterizing *protectionism* – in the Fisher and Serra (2000) sense – in relation to different NTMs and producers' costs structure. In particular, Marette (2014) analyzed two extreme cases where a standard can affect only variable costs or, alternatively, fixed costs, and where the home government, alternatively, could adopt a mandatory label to inform consumers.¹³ Under these assumptions, he showed that when the standard affects only variable costs, the introduction of a mandatory label can be protectionist. Differently, when the standard impacts only fixed-costs, the standard can be protectionist.

These and other similar results and conclusions are mainly obtained in models with homogeneous goods and price-taker competitive firms (see Swinnen, 2015 for an extensive survey). Yet, because NTMs systematically affect fixed firm' costs other than variable costs, even a simplified model should conceptually require imperfect competition, increasing returns and differentiated goods (Baldwin, 2000). Adding these more realistic features to the analysis, however, significantly increases the complexity and the source of ambiguity of the NTMs effect. This is deeply documented with several examples by Baldwin (2000), which represents, to date, one of the most interesting survey on the trade effect of NTMs.

¹² Essaji (2010) extends the Fisher and Serra's model analyzing the simultaneous impact of trade liberalization on NTMs and showing that one cannot make an unequivocal connection between falling tariffs (or subsidies) and rising standards. Ultimately, this will depend on the government objective function, namely on the weight government attaches to different interests (see Section 5).

¹³ Note, in Marette (2014) because the introduction of the standard removes the externality, then it is alternative to the mandatory label.

Furthermore, whenever NTMs involve fixed costs, it would be appropriate to analyze them within firms heterogeneity trade model. In fact, as summarized in Section 2.2, this is strongly supported by a growing empirical evidence showing that, although NTMs can sometimes affect positively the volume of trade, they systematically negatively affect the probability that a firm exports to a certain market destination (see WTO, 2012; Fontagné *et al.*, 2015). Moreover, considering firms' heterogeneity, is particularly important from a political economy perspective, because it adds a new dimension to the possible coalition formation in favor or against NTMs. In models with firms heterogeneity, indeed, conflicts of interests over trade policy, traditionally based on the cross-sectoral or cross-country dimension, are broken-down over the within-sector dimension depending on firms' characteristics, such as size and productivity. Interestingly, this is consistent with the observation that larger firms, as measured by sales, are systematically more active in lobby activities both in the US (Bombardini, 2008) and in the EU (Bernhagen and Mitchell, 2009; Belloc, 2015). For all these reasons the next section pays some attention to this more realistic setting.

4.2 Effects of standards when goods and firms are heterogeneous

When firms are heterogeneous and the standard involves also fixed costs, the latter affects *differently* Home (and Foreign) firms' profitability, forcing the least efficient firms to exit. To see this, let's consider the model of Abel-Koch (2013) who studied the economic effects of a standard in the Melitz (2003) model.¹⁴

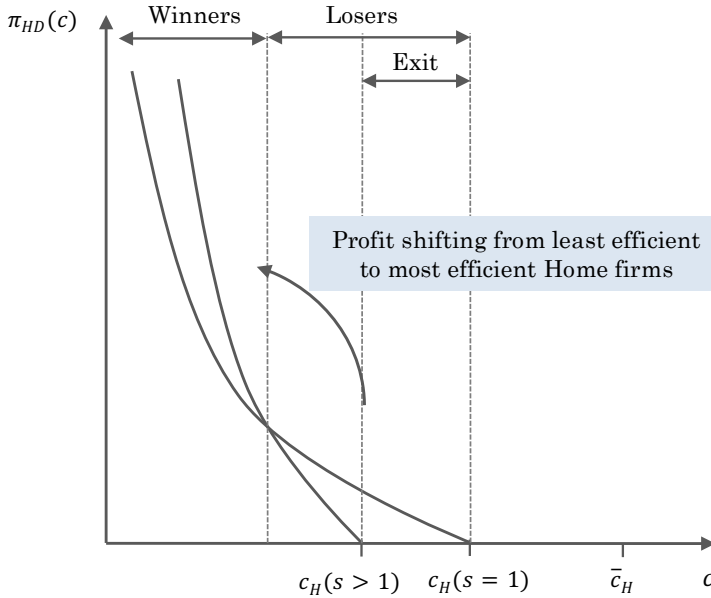
On the supply side, firms operate in a monopolistically competitive market with increasing returns to scale, using only one input, labor. Each firm produces one variety, with marginal costs c_i . Trade between Home and Foreign is subject to both variable (iceberg) and fixed trade costs, τ and f , respectively. Given firms' heterogeneity, the higher the firm marginal costs, the lower its sales on the domestic market. Hence, there exists a *cutoff* level of marginal costs, c_{H^*} , defined by the zero profit condition, $\pi_H(c_{H^*}) = 0$, such that only Home firms with $c_i \leq c_{H^*}$ will be active on their domestic market. Similarly, for Foreign firms with $c_i \leq c_{F^*}$.¹⁵

Next, let's consider a standard which increases the fixed costs of accessing the Home market by a factor $s > 1$, such as food safety and health standards, and assume also that it has not beneficial effects on consumer welfare. Such standard has an *anti-competitive* effect because it forces the least efficient Home producers and Foreign exporters to exit from the Home market. This is because by reducing the respective *cutoff* level, c_{H^*} (and c_{F^*}), it will increase the minimum firm's efficiency needed to operate with non-negative profit in the domestic market for both Home and Foreign firms.

¹⁴ In Melitz (2003) consumers have identical preferences over a composite (numéraire) good and a continuum of varieties of a differentiated good, with constant elasticity of substitution (CES). This specification ensures that a variation of the number of product varieties affects directly the ideal price index, and thus welfare, i.e. Dixit-Stiglitz (1977) "love of variety" preferences.

¹⁵ The model assumes that the distribution of marginal costs, c , follow a Pareto distribution of marginal productivity $1/c$, characterized by the shape (k) and the scale parameter (\bar{a}). The shape parameter is a measure of the dispersion of firms efficiency, e.g. if $k_H < k_F$, it means that in Home the ratio of very efficient firms to rather inefficient firms is higher than in Foreign. Instead, the scale parameter defines the (positive) lower bound of the distribution.

Figure 7. Introduction of a standard ($s > 1$) on the profits of Home firms.



Source: adapted from Abel-Kock (2013).

As a result, the NTM induces a reduction in Home market competition, creating a gain in the market share of the most efficient firms (at the expense of the least efficient Home and Foreign firms) more than compensating the increase in their fixed costs (due to scale economies). This *profit-shifting* effect for the Home firms active in the domestic market is summarized in Figure 7. A similar picture applying to Foreign firms exporting in the Home market.

With this model, the implementation of anti-competitive regulations can never be a social optimum because the potentially positive effect of the standard s on the aggregate profits of Home firms is always dominated by its negative effect on consumer surplus, due to the loss of the Home available varieties.¹⁶ Clearly, this conclusion could be reversed under the condition such that the standard is implemented to reduce a consumption externality, whenever the increase in the consumers' surplus attributable to the externality reduction, more than compensate the decrease in the number of Home available varieties.

4.3 Summary and implications

From the above discussion we can derive some important considerations useful for the introduction of the political economy of standards. First, there is a huge economic

¹⁶ The introduction of a NTM can also induce an across countries profit-shifting when industries in the two countries are characterized by differences in the shape parameter. Indeed, when $k_H < k_F$, the ratio of very efficient firms to rather inefficient firms and hence the ratio of winners to losers from the introduction of NTMs is higher in Home than in Foreign, implying that in the aggregate, profits are shifted from Foreign to Home firms.

uncertainty over the true economic effects of a standard, because results are sensitive to the researcher's modelling assumptions. This may raise problems in characterizing univocally the conflict of interests over NTMs, that will depend on specific market conditions, heterogeneity of the costs structure and type of standard under investigation. Hence, generalizations are always difficult.

Second, as shown by many WTO disputes on NTMs, there is a genuine uncertainty about the safety, health and environmental benefits of many regulations. This is because, frequently, the scientific consensus can rarely offer a conclusive answer to the effects generated by certain product or technology, especially in the initial phase of the introduction of a new technology (Sturm, 2006). Third, many modelling exercises often abstract from the precise characterization of the NTM, and thus considerable uncertainty will persist about the *level* of the welfare maximizing standard.¹⁷

This uncertainty opens the door to interest groups and politicians opportunistic behaviors. In fact, politicians, who are electorally accountable for their policy choice, may prefer to implement the least efficient product standard to protect a domestic industry, as the uncertainty on the optimal level of standard translates into a lower electoral penalty for his policy choice.

5. Political economy models

Models of endogenous trade policy start from an economic model as the ones summarized above, and relax the assumption of the (exogenous) welfare maximizer social planner (Rodrik, 1995). This is done, firstly by assuming that the objective function maximized by the government gives different preferences to certain distributional outcomes and, secondly, by assuming that voters and lobbying groups are able to transmit their particular preferences to shape the government's behavior.

Political economy models can be firstly distinguished in voting models, where the interaction is between unorganized voters and politicians, and lobbying models, where the interaction is among organized interest groups and politicians. The first typology assumes that political parties compete only for votes, with a framework based on some variations of the median voter model.¹⁸ The models presented by Mayer (1984) and List and Sturm (2006) are two examples with applications to trade policy and environmental regulation, respectively.

The majority of models used to study both trade policy formation and the effect of environmental and food standards can be classified into interest groups or lobbying models, and have their roots in the Olson (1962) logic of collective action, the Stigler (1971) theory of economic regulation, and the Becker (1983) model of competition among pres-

¹⁷ Here the problem is similar to the Pigovian tax and the measurability problem of the externality. For example, Baumol (1972) argued that it is extraordinarily difficult to measure the social costs of any externality, especially because many costs are psychological and individual in nature. See also the discussion in Vaughn (1980), on the relevance of the subjective costs.

¹⁸ The most important variations of the basic median voter model are models that assume probabilistic voting behavior (Coughlin, 1992), where voters' intentions are uncertain, and political agency models, which stress the importance of (voters) imperfect information. For an in-depth treatment of the different voting models, see Persson and Tabellini (2000).

sure groups. These models differ by the degree of micro-foundation in the interaction between lobbies and politicians, and by the extent to which they consider an explicit role for voters, elections and/or social welfare within the government objective function. There are different variations, surveyed by Rodrik (1995) and Helpman (1995). A further distinction is related to the *motives* of lobby groups, i.e. the electoral motive approach and the influence motive approach (Grossman and Helpman, 1994 and 1996). The first argues that lobbies wish to promote the candidate that reflects their preferences on a policy issue before upcoming elections. The second argues that lobbies aim at influencing the policy choice of an incumbent politician.

Currently, for several reasons discussed below, the leading approaches are still based on the menu-auction framework firstly proposed in the “Protection for Sale” model of Grossman and Helpman (1994), from now on the GH model. We start by summarizing the main intuition of the GH model, discussing its relevance for empirical analyses, and the most recent extensions to study the endogenous formation of NTMs. Next, we summarize other recent prominent approaches based on electoral competition.

5.1 The protection for sale framework

Grossman and Helpman (1994) proposed a menu-auction model to study trade policy formation in the context of active pressure groups.¹⁹ The key model assumption is that the influence motives of pressure groups are at the heart of campaign contributions. The underlying economic framework is the one of the specific-factor model in a small open economy. Interest groups move first, offering politicians campaign contributions linked to their policy preferences, with the objective to maximize the group members’ economic return. Next, politicians decide on their policy stances, after knowing how campaign contributions are linked to their selected policies. Finally, the government will set the policy vector, t , that maximizes the objective function $G(t)$. This is represented by a weighted sum of lobby group contributions, C , and the wellbeing of the population, W , $G(t) = \phi W(t) + C(t)$, where ϕ is the weight the government places on the voters welfare relative to lobby contributions.

GH showed that, at the non-cooperative Nash equilibrium, trade policy is selected to maximize the joint surplus of all the parts involved. Hence, setting $\Pi_j(t)$ as the welfare of the specific-factor owners, the equilibrium trade policy is obtained by maximizing a weighted social-welfare function:²⁰

$$\Omega(t) = \phi W(t) + \sum_{j \in L} \Pi_j(t). \quad (1)$$

Equation (1) says that, in equilibrium, “truthful” contributions schedules by the interest groups induce the government to behave as if it were maximizing a social-welfare

¹⁹ The model of Peltzman (1976) and the derived political-support function approach of Hillman (1982), can be interpreted as reduce forms of the PFS model. See Helpman (1995) for an indebt discussion of these models and their link with the GH model, and its extension to electoral competition and international trade negotiations.

²⁰ To solve the equilibrium lobbying game, GH rely on the Bernheim and Whinston (1986) subgame-perfect non-cooperative Nash equilibrium. These authors showed that the set of a lobby’s best responses to any combination of contribution schedules offered by all other lobbies always includes a “truthful” contribution schedule.

function that weights different members of the society differently, with individual represented by an interest group receiving a weight of $1 + \phi$, while those not represented receiving the smaller weight ϕ (Grossman and Helpman, 1994, 841).

The basic GH model has been firstly derived for trade taxes (tariffs and export subsidies), but the same approach can be applied to other policy instruments as well, such as environmental policy (Fredriksson, 1997), import quota (Facchini *et al.*, 2006), and food standards (Swinnen and Vandemoortele, 2008). Other important extensions implied the use of monopolistic competition, instead of the specific-factor model, and firms' heterogeneity (Bombardini, 2008; Abel-Koch, 2013).

The most important reason of the GH model success,²¹ other than its simplicity and elegance, is its micro-foundation for lobbying. Indeed, being built on sound economic principles, the model allows for a structural estimation of the theory and the underlying structural parameters, and in particular the relative weight, ϕ .²² Goldberg and Maggi (1999) and Gawande and Bandyopadhyay (2000) tested for the first time the GH model in the context of the US industry protection, using non-tariff measures as protection variable.²³ Their results strongly support the model predictions, namely that US industry protection structure is increasing in the (inverse) of import penetration ratio, but only for organized industries. Yet, the result of these and almost all the applications of the GH model is that the estimated structural parameter ϕ , the weight government attaches to social welfare, is much higher than the one attached to campaign contributions. This means that welfare carries a strong weight in government's payoff, a conclusion that it is at odd with the model name "Protection for Sale".²⁴

5.2 Protection for sale and environmental standards

One of the first applications of the GH model to the determination of domestic regulations has been developed in the domain of environmental policy.²⁵ Fredriksson (1997) modelled a production emission proportional to output. Emissions induce disutility to an organized subset of the population defined as "environmentalists" who lobby for reducing

²¹ There are also criticisms to the GH model structure, and the possibility of testing it empirically. See in particular Rausser *et al.* (2011) and Ederington and Minier (2008), respectively.

²² The model predicts that protection in organized industries is growing in the level of (inverse) import penetration, and is decreasing in the value of import demand elasticity (Ramsey rule). At the empirical level the main challenge is to estimate a lobby equation using campaign contributions and the import penetration equation, noting that both are simultaneously determined with the protection equation (see Goldberg and Maggi, 1999, for details). This last point, together with the low disposability of data on campaign contributions, represents the main difficulty in estimating the GH model.

²³ The use of NTMs instead of tariffs, the standard approach in the majority of the empirical test of the GH model, is the result of the following consideration. While tariffs are decided cooperatively within the GATT/WTO negotiations, NTMs are largely decided unilaterally and, as such, this is more consistent with the non-cooperative Nash equilibrium of the GH model.

²⁴ Note, this does not mean that the US government is a pure welfare maximizer. Recently, some authors suggested that one reason can be related to firms' heterogeneity (e.g. Bombardini, 2008), namely the fact that within the same industry firms lobby in opposite direction depending on their export (or import) status. However, to date we do not have a sound empirical test of this hypothesis.

²⁵ Note, several papers on the political economy of environmental policy, strictly speaking, focused on green taxes and subsidies more than on environmental standards *per se*.

them. As in the standard GH model the specific factor owners called “industrialists” are organized and lobbying the government, while the consumers are unorganized.

In this setting, the government chooses an optimal environmental tax rate, $t^\#$, aiming at maximizing lobby contributions from the two organized interest groups - “environmentalists” (C^E) and “industrialists” (C^I) - conditional to overall welfare W :

$$\Omega(t) = \phi^E C^E(t) + \phi^I C^I(t) + W(t), \quad (2)$$

where ϕ^E and ϕ^I are the relative weights that government attaches to the environmental and industrial lobby groups, respectively. The welfare of the environmental and industrial groups depends on the share of total pollution tax revenue and labor income allocated to the respective lobby groups, the aggregate disutility from pollution of the environmental lobby group, and the aggregated profit of the industrial group. The main result of the paper shows that the political equilibrium environmental tax rate, $t^\#$, tends to be different from the (optimal) Pigouvian tax, t^* , depending on the size of the two lobbies, their political contributions, and the relative weight the government attaches to social welfare.

Schleich (1999) adds an important extension to the above framework through the use of a trade tariff (or subsidy) within the available government policy instrument set, to study the interaction between green and trade policies. Main results show that, with a production externality, only the environmental subsidy will be implemented at the equilibrium because the government, being sensitive to social welfare, has an incentive to implement the most efficient policy that will internalize the externality, in order to maximize campaign contributions from lobbies.²⁶ Yet and quite paradoxically, environmental quality could be higher in a situation where only trade policy is available, because the additional distortion induced by the trade policy will damp the government’s income redistribution. See also Aidt (1998) and Schleich and Orden (2000) for similar results considering polluting inputs and a large country, respectively.

An important question studied within this strand of literature is the extent to which environmental tax or subsidy are affected by exogenous trade liberalization episodes. Fredriksson (1999) extended his lobby model by including an abatement technology and a tariff on the imported pollution good that is exogenously given. Key results show that trade liberalization has ambiguous effects on the environmental policy, mainly because tariff elimination reduces output in the pollution sector. Hence, environmental quality could increase or decrease after trade liberalization when political economy motives are taken into account.

A further extension by Eliste and Fredriksson (2002) focuses on a situation where the government can use an environmental tax and a production subsidy for the pollution sector. The authors analyzed the effects of an exogenous increase in the green tax showing how this event endogenously increases the production subsidy affecting both the level of output and trade flows. Interesting, the authors test their predictions running cross-country regressions on agricultural sectoral data. Main results confirm key model propositions, showing that more stringent environmental standards in agriculture are associated with larger direct transfers to farmers.

²⁶ Under consumption externality, the same logic implies that the equilibrium government green policy will be a consumption tax on the polluting good, and a trade tax necessary for distributing income from unorganized to organized interest groups.

Lai (2005 and 2007) and Kawahara (2014) represent further refinement of the interaction between trade liberalization and environmental standards in a GH model setting. Interestingly, Kawahara (2014) following Mitra (1999) considered the case where interest groups are endogenously given. In particular, they showed that, under certain conditions, unilateral trade liberalization in a large country importing a pollution good, might raise (endogenously) inefficient environmental standards in another (small) exporting country. Similarly, Fredriksson and Matschke (2016) extend the GH model to the federal system case (e.g. the US), showing that trade liberalization leads to a decline in pollution taxes, regardless whether these taxes are set at federal (centralized) or local (decentralized) level, and increases welfare.²⁷

From an empirical point of view results are mixed, in the sense that more open economies affect differently emissions of several pollutants, but tend to reduce SO₂ in many countries (see Frankel and Rose, 2005). An interesting application is the one by Ederington and Minier (2003), who studied the extent to which environmental policy represents a secondary trade barrier. In line with the endogenous trade policy literature and in particular with the important contribution of Trefler (1993), these authors accounts for the inherent endogeneity problems in studying the impact of the stringency of environmental standards on trade flows. Main results show that import-competing industries are under regulated in the environmental area, but also that lower tariff rates are associated with more stringent standards, i.e. government uses environmental regulation as a secondary means in providing protection to domestic import-competing industries.²⁸ To date, however, a formal test of the GH model in the domain of environmental standards, that exploits information on lobby campaign contributions, does not exist yet. One possible reason is that, when secondary policy issues such as environmental policy are considered, electoral incentives matter more than lobby contributions, as argued by List and Sturm (2006). We will come back on this paper and this important hypothesis later.

5.3 Protection for sale and food quality standards

As it is well known, agriculture and food industry represent, by far, sectors where the diffusion of NTMs, and in particular SPS/TBT standards, is more pervasive. One of the first applications of the GH model to study food (quality) standards is the work by Swinnen and Vandemoortele (2008 and 2011).²⁹ These authors introduced two main changes into the standard GH model. First, the modelled standard, s , addresses a consumer externality, e.g. it guarantees a minimum quality level or safety features to a credence good and, as such, it increases consumers' welfare. Second, differently from GH, one key

²⁷ Other applications studied how free trade impacts the burden sharing of environmental policies between producers and consumers, and the implication of the stringency of environmental standards (see, e.g., Gulati, 2008).

²⁸ By combining data on environmental regulation at the country level with data on pollution intensity at the industry level, Broner *et al.* (2012) showed that countries with laxer environmental policy have a comparative advantage in pollution industries. This represents one of the few robust empirical evidence supporting the *pollution-haven hypothesis*, namely the idea that because the stringency of regulation varies across countries (and sectors), this affects the location of polluting industries in countries with more laxer environmental regulation, e.g. in developing countries.

²⁹ These and subsequent papers by the same authors are summarized and extended in Swinnen *et al.* (2015).

assumption is that consumers, not only producers, are organized into an interest group lobbying the government through campaign contributions.³⁰ On the production side, the structure is similar to GH and the standard is assumed to affect *only* the firms' variable costs, as in Marette and Beghin (2010) and many others.

In this setting, defining social welfare $W(s)$ as the sum of producers profit Π^P and consumers surplus Π^C , the government objective function $\Omega(s)$ can be written as

$$\Omega(s) = \phi^C C^C(s) + \phi^P C^P(s) + W(s), \quad (3)$$

where C^C and C^P are the lobby contributions of consumers and producers, and ϕ^C and ϕ^P represent the relative weight government attach to consumers and producers interests, respectively. Following GH, the government will set the political optimal standard, $s^\#$, by maximizing consumer and producer group' contributions, conditional to social welfare.

Under these assumptions, the authors find several interesting results. First, in contrast with the socially optimal tariff in a small open economy, where $t^* = 0$, the socially optimal standard may be strictly positive, $s^* > 0$. In fact, although this could lead to a trade reduction effect, it can improve domestic welfare when the quality standard induced increase in consumer welfare more than compensates the producer implementation costs. Then, whether the standard can be defined as "protectionist" or not strictly depends by its definition. If we focus on the home country national welfare (the so-called domestic-efficiency argument) then the standard is not protectionist. Differently, if we focus on the world welfare, as Fischer and Serra (2000) did, then the social optimal standard may be protectionist.³¹

Moreover, the authors highlight two key dimensions for analyzing the political optimal standards in an open economy: first, the issue of over- or under-standardization; second, whether the standard is protectionist or not, namely if the standard results in higher domestic producer profits at the expense of domestic consumers. When $\phi^P > \phi^C$, the public standard is always protectionist, although it can result in both over- ($s^\# > s^*$) or under- ($s^\# < s^*$) standardization. Over-standardization happens when producers' profits rise with a higher standard ($\partial \Pi^P / \partial s > 0$) at s^* . By contrast, under-standardization occurs when the producer profits decrease with the standard ($\partial \Pi^P / \partial s < 0$) at s^* , implying the protectionist optimal standard to be lower than the social optimum.

Differently, when $\phi^C > \phi^P$, government weights more consumers interest in setting its optimal standard. In this case the result will be reversed, namely over-(under) standardization will occur when the consumer welfare is increasing (decreasing) with the standard ($\partial \Pi^C / \partial s \gtrless 0$) at s^* . What is interesting from this results is that, although the politically public standard $s^\#$ will be sub-optimal, it will never be protectionist, *ceteris paribus*.

³⁰ The assumption that consumers are politically organized and, therefore, they make campaign contributions, is mainly the result of the observation that in some countries, e.g. European ones, consumers can be organized into interest groups, also through political parties representing their interests (see Swinnen *et al.*, 2015). The problem with the empirical implementation of this framework is that very rarely, even in the US, consumer groups make direct campaign contributions. However, the informational lobby approach used by Belloc (2015) may be a promising strategy to overcome this issue.

³¹ This line of reasoning has been proposed in the trade literature by Baldwin (1970), who argues that a measure could be defined protectionist if it lowers real global income. This "cosmopolitan-efficiency case", using the word of Bhagwati (1988), is particular relevant to issues such as the design of international trade regimes, i.e. the WTO. On this point, see also the discussion in Beghin *et al.* (2015).

The above discussion highlights the conceptual difficulty behind the analysis of trade effects of standards in general, and in particular when political motives are taken into consideration. Under this framework, the classification of NTMs as protectionist or not is *a priori* difficult and uncertain, as such standards should be analyzed carefully and case-by-case. This conclusion appears in line with the inherent difficulty to find a solution to many international trade disputes over food and environmental standards within the WTO.

From an empirical point of view, no paper to date has tested explicitly the predictions outlined above on the determinants of quality standards using information on both producers and consumers lobby activities.³² Pacca and Olper (2016) tested the GH model on US manufacturing sectors using as policy variable NTMs from UNC-TAD-Trains related to 2014. Interesting, from an inspection of the different US NTMs used in that study, one rapidly concludes that more than 85% of them are now SPS and TBT measures. Their results confirms the GH model predictions, irrespective to the fact that, today, the US protection structure and import penetration are totally different than 25 years ago. Yet, the supposed role of the consumer lobby activity is not still considered in this empirical application due to the intrinsic difficulty of measuring it. Moreover, to test seriously the extension of the GH model to NTMs, one has also to recognize the externality component of the NTMs, e.g. along the line of Beghin *et al.* (2015b). Yet, this raises further conceptual and empirical issues to the correct specification of the GH model.

Belloc (2015) presents one of the few applications to the European Union of a lobby model to explain the formation of NTMs. Since data on lobby contributions are not available for Europe, she relies on informational lobby, namely information on the participation of national and international business organization in the European Commission consultations on trade issues. Merging this original information with NTMs at tariff line level from 1999 to 2007, she was able to exploit the panel structure of the dataset, showing that participation in consultation meetings increases the probability to find NTMs at the industry level. From a theoretical point of view, the author extended a lobbying model of trade policy formation in the spirit of the GH model, to informational lobby.

Empirical evidence on the economic and political determinants of food standards are provide by Li *et al.* (2014). In particular, they investigated the determinants of the maximum residue limits (MRLs) on pesticides and veterinary drugs, showing that MRLs are stricter in countries with high income and larger population, and in sectors with comparative disadvantage. Interesting, they also found that MRLs and import tariffs are policy substitutes.

Finally, Vigani and Olper (2013) studied the determinants of GMO standards across 60 developed and developing countries. Their main findings showed that the stringency of GMO standards are growing in the country comparative disadvantage in agriculture, in the size of the rural population, in the parallel restriction in environmental regulation, and so on. They also found a strong (non-linear) effect of the share of private media outlets on the stringency of GMO regulations. This result supports the view that, when

³² In the domain of agricultural and food trade policy, Gawande and Hoeckman (2006) and Lopez (2008), tested the basic GH model on US data. Main results show that campaign contributions from industry lobbies are central in explaining the cross-industry variations in the protection structure of both NTMs and tariffs.

NTMs address consumers' sensitive issues, the way the different media outlets inform them becomes a key element of the political economy of standards.³³

5.4 Protection for sale and standards when firms are heterogeneous

To date, only few papers have studied the political economy of a public standard within a firms' heterogeneity model. Abel-Koch (2013), building on Bombardini (2008), extended the basic GH framework relaxing the assumption of identical firms. In line with the empirical evidence on lobby behavior (Bombardini, 2008), it is assumed that only the largest and the most efficient firms will lobby together for NTMs, as they gain the most from their introduction (see Section 3).

In the differentiated good sector all firms with marginal costs $c \in (0, c_L]$ are organized into a single lobby L , with the upper bound of the marginal cost of these firms lower than the cut-off for selling in the Home market c_H ($c_L < c_H$). Instead, all firms with marginal costs $c > c_L$ do not join the lobby.³⁴ The welfare of this lobby is then the joint welfare of its member, $W_L(s) = \pi_H^L(s) + \pi_E^L$, with the last term indicating the profit of Home exporting firms (π_E^L), that is clearly unaffected by the (Home) standard s . The equilibrium trade policy is obtained by maximizing a weighted social-welfare function, $\Omega(s) = \phi W(s) + \pi_H^L(s)$, in which organized Home firms are weighted $1 + \phi$, while non-organized (small) firms and consumers are only weighted ϕ . From this maximization process the government sets the political optimal standard, $s^\#$.

The model assumes that the standard, s , does not address any consumption externality, but represents a "pure" non-tariff measure to trade, like several NTMs do. Under this assumption, the social planner optimal standard will be $s^* = 1$, namely no standard into the Home market. Finally, the standard increases the fixed costs of accessing the Home market for both the Home and Foreign firms, by a factor $s \in [1, \infty)$.

Suppose now that the lobby's marginal gain in profits, and thus the Home government's marginal gain in political contributions, is higher than the weighted marginal loss

in social welfare from introducing a NTM, namely
$$\frac{\partial W(s^\#)}{\partial s} + \frac{\partial \pi_{HD}^L(s^\#)}{\partial s} > 0 \text{ at } s^* = 1.$$

Then, Home government has an incentive to deviate from the socially optimum, setting $s^\# > 1$. The equilibrium level of the optimal government standard $s^\#$ resulting from this lobby game is a function of several parameters related to the standard's induced fixed and variable costs on Foreign and Home firms, the distribution of firms' marginal costs in the two countries, and the weight the Home government puts on social welfare. Interestingly, it can be shown that the political optimal standard is decreasing in the import penetration ratio at Home, a result that mimics the baseline GH model. This is because, when Foreign firms become more competitive relative to Home firms, due to a reduction in trade costs or an increase in their productivity, the import penetration ratio will increase and the profit-shifting effect of the standard on Home firms will become weaker, reducing the incentive to lobby for the standard.

³³ Vigani *et al.* (2012) in studying the trade effects of GMO standards showed that when GMO regulations are treated as endogenous in the trade equation, their trade reduction effect increases substantially.

³⁴ The basic model assumes that there is only one lobby (sector).

This result is important since it suggests that liberalizing trade and fostering competition from abroad will lower the equilibrium level of the optimal standard, by reducing the gains from the standard of the (large) Home firms. As a consequence, the model predicts a *positive* relationship between tariffs and NTMs, that within this framework are thus complements, rather than substitutes (Abel-Koch, 2013).

An important extension is referred to the interaction between Home and Foreign governments. Here, the result depends on how the two governments interact, non-cooperatively or cooperatively. In the first case the result is identical to the unilateral trade policy determination summarized above. Instead, when the NTMs are set cooperatively in a trade negotiation and countries are symmetric (i.e. same shape parameter), the equilibrium level of the standard which restricts market access for small firms will be higher than in the non-cooperative case. This is due to the fact that also the lobby of large Foreign firms has a “voice” on the Home government objective function, when policies are set in an international trade agreement (see Grossman and Helpman, 1995).³⁵

Finally, when it is assumed that NTMs address a consumption externality, the consumer loss from the variety reduction effect induced by the optimal standard will be compensated by consumer gains of addressing the externality. Yet and interesting, the overall results remain unchanged, and the only difference is that even in the absence of lobbying, it may be beneficial to introduce this kind of NTM, at least when the positive welfare effect on consumer health outweighs the negative effect on product varieties.

To date, no empirical application tested these predictions using as dependent variable behind-the-border measures. However, Bombardini (2008) exploiting the same dataset of Gawande and Bandyopadhyay (2000), showed that US industries characterized by higher firm size dispersion obtain a higher level of protection because they are more active in lobbying.

5.5 The role of elections and political competition

The first attempt to study environmental policy with a voting model is made by Congleton (1992), who applied the median voter approach contrasting the policy selection under autocracy and democracy. The simple intuition is that authoritarians tend to prefer a lower environmental standard with respect to the median voter, because decision makers in democracies have a smaller marginal cost for pollution control than authoritarians do. Overall, the author finds cross-country support to this prediction. However, more recently Fredriksson *et al.* (2005) qualified both theoretically and empirically this result, showing that what matters is not democracy *per se* but the interaction between voters participation and political competition, other than environmental pressure groups.

McAusland (2003) uses a median voter model to explain environmental policy in a small open economy with two sectors - a clean and a polluting one - considering also the role of inequality and trade in affecting the behavior of heterogeneous voters.

³⁵ When countries are not symmetric, the shape parameter of the productivity distribution differs. Suppose that firm size is more dispersed in Home than in Foreign, then the standard implemented in Home reduces the aggregate profits from exporting of Foreign firms, and its social welfare, as showed in Section 3. Interesting, in a non-cooperative setting this will lead to over-standardization from a global welfare point of view. Instead, in a cooperative setting this negative externality is taken into account and leads to under-standardization.

Contrary to the conventional view, when the economy is closed to international trade, richer voters prefer a weaker environmental policy than poor voters. Yet, opening to trade affects the political optimal policy, since in this case the price of goods is less affected by the change in the environmental policy, and therefore changes the voters' preferences towards it.

Sturm (2006) modelled an environmental standard using a political agency model where the government (the agent) searches political accountability from voters (the principal). The author studied how the standard raised by the Home (importer) country, can be challenged as "green protectionism" by the Foreign (exporter) country. Home politicians have an informational advantage in evaluating the probability that Foreign exported goods cause health or environmental damage, creating an intrinsic divergence between the Home and the Foreign government. Main results show that there exists a political equilibrium in which the importing country applies a more stringent standard than the exporting country, a situation that can be due to both too lax standards in the exporting country or too stringent standards in the importing country.

List and Sturm (2006) apply the political agency model above to study how politicians decide on both a frontline policy issue and a secondary policy issue, i.e. environmental policy. The key prediction of the model is that the incumbent government manipulates the secondary (environmental) policy to attract voters. Using US States and panel data econometrics the authors find that US States environmental expenditures are determined by electoral incentives and the degree of electoral competition. This result is in contrast with the popular view that secondary policies are largely determined by lobbying.

One limit of the Sturm (2006) approach is that it does not consider lobbying as a determinant of environmental policy, disregarding a key element of the policy making. The first attempt to consider simultaneously electoral incentives and lobbying contributions is due to Besley and Coate (2001), who combine the citizen-candidate model of representative democracy with the GH menu-action model of lobbying. The model is based on a three-stage game.³⁶ One of the most interesting result from this modelling framework is that lobbying may not matter at all for policy outcomes when there is electoral competition, subject to certain conditions, i.e. when the public good policy is continuous. More in general, the authors conclude that both lobbying and electoral competition should be considered to understand the policy game, as well as the nature of the policy.

An interesting model that consider lobbying and electoral incentives together is the one of Yu (2005), who adds the relevant concept of direct and indirect lobbying, with the latter referring to the lobbying effort to send message to citizens for influencing their preferred policy. Yu (2005) applied the model to environmental policy.³⁷ In general, the model predicts complementarity between direct (money contribution) and indirect (messages) lobbying. However, it also showed that, under certain condition, e.g. when public persuasion of environmentalists is substantially stronger than for industrialists, a substitution relationship between indirect and direct lobbying comes out from the model. This is

³⁶ In the first stage, citizens decide whether to run for office; in the second, utility maximizing voters express their electoral preferences; in the third stage, the candidate will select the political optimal policy.

³⁷ See Jaeck *et al.* (2015) for a recent application of the Yu (2005) model logic of indirect lobbying to the case of sustainability standards, related to biofuel in the EU and US.

consistent with the observed behavior of US green groups where the effort in indirect lobbying tends to overcome the direct ones.³⁸

Finally, when electoral competition is taken into account, how this competition translates to policy outcomes depends also on electoral rules and institutions (Persson and Tabellini, 2000). Starting from this consideration, Fredriksson and Millimet (2004) studied the formation of environmental standards in different electoral systems contrasting majoritarian versus proportional electoral rules. Under majoritarian rule with single-member districts, a party needs to receive only 50% of the vote in 50% of the districts to win an election. This implies that political parties may focus on a subset of the population rather than maximizing aggregate welfare (Persson and Tabellini, 2000), making majoritarian systems more grounded in local interests (Milesi-Ferretti *et al.*, 2002), and/or inducing a district majoritarian bias in public policy (Grossman and Helpman, 2005). In contrast, a party needs 50% of the national vote to win under a proportional system. Consistently with this intuition, Fredriksson and Millimet (2004) show that indeed governments set stricter environmental policies under proportional electoral systems, as opposed to the majoritarian one.³⁹

6. The role of international agreements and global value chain

This section discusses the problem of international trading rules over NTMs shortly. The economics literature on this topic is quite complex, and in recent years experienced a new revival motivated by the Doha Round crisis, the proliferation of new form of preferential trade agreements (i.e. deep PTAs) and, notably, the increasing importance of trade in intermediated goods, outsourcing and the role of global value chain.

6.1 International trading rules over NTMs

As shown above, both domestic interest groups and/or opportunistic politicians behavior may influence the formation of protectionism public standards. This often happens as a by-product of a trade liberalization process.⁴⁰ In theory, this government regulatory capture could be prevented by negotiating international agreements not only on trade policy (e.g. tariffs), but also on environmental and food standards (Copeland, 1990; Maggi and Rodriguez-Clare, 1998; WTO, 2012; Swinnen *et al.*, 2015).

Yet, given the complexity of the effects of many regulatory standards, there is an intrinsic difficulty in setting and applying international rules. Moreover, this difficult is also the consequence of the incomplete contract nature of these rules, as by definition

³⁸ Interestingly, recent evidence on the lobby's behavior in the US highlighted the existence of an inverted U-shaped relationship between money contributions and workers/voters controlled by the lobby (see Bombardini and Trebbi, 2011). In other words, when an interest group controls many voters, it need less money to reach the same lobby's result.

³⁹ Interestingly, Heller and Holahan (2013) by contrasting electoral rules with the data of the Comparative Manifesto Project on party positions, showed that proportional rules significantly increase the probability that the political parties position is pro-environment.

⁴⁰ This is because trade liberalization, by inducing the elimination of tariffs, left governments without the first-best policy instrument to exploit term-of-trade effects (see Staiger, 2012, for a discussion of this point).

they cannot specify standards for products that may arise in the future (Battigalli and Maggi, 2003; Sturm, 2006). All this precludes the possibility to write efficient international agreements over standards.

There are several and diverse approaches to standards in international agreements (WTO, 2012). The so called “Shallow integration” agreements leave substantial autonomy to national governments in setting standards. “Non-discrimination” and the related “National treatment” in the GATT Agreement (articles I and III, respectively) are examples of this approach. By contrast, “Deep integration” agreements on domestic policy regulation aim not only at coordinating border protection, but also at addressing more complex coordination problems. The principle of “Harmonization” is an example of deep integration.

Considering the current WTO rules, it is not always clear if they should be interpreted as a shallow or deeper integration agreement. This is because, on the one end, the SPS and TBT agreements incorporate also harmonization through the use of international standards, and include obligations that are additional to the GATT non-discrimination rules such as, for instance, the need to ensure that standard requirements are not unnecessarily trade restrictive. On the other hand, when a NTM is inconsistent with the non-discrimination obligations of GATT Articles I and III, it eventually may be justified under one of the general exceptions of GATT Article XX.⁴¹

More in general, choosing which kind of approach works better to solve the countries’ coordination problem over NTMs depends on several factors and also on the level of the externality that the NTM is intended to address. For instance, Costinot (2008) focusing on product standards, highlighted that that mutual recognition, in case of local negative consumption externalities, may induce to set too lax standards because governments do not account for externalities generated by their export on foreign markets. By contrast, national treatment has the opposite effect, i.e. too stricter standards, since the government does not take foreign’ compliance costs into account.

The political economy literature identifies two key issues that a trade agreement might solve (Bagwell and Staiger, 2010). First, governments may view trade agreements as helping them avoid beggar-my-neighbor policies – in particular term-of-trade effects – that are unilaterally attractive but mutually inefficient (Bagwell and Staiger, 1999).⁴² A second reason is related to the commitment value of international agreements, namely the idea that, ex-post, trade agreements render the government less prone to the pressure of special interest groups (Maggi and Rodriguez-Clare, 1998).

One of the first formal analyses of international trading rules over standards is the Bagwell and Staiger (2001) work, developed within the GH model and stressing the term-of-trade motives. Focusing specifically on the trade effects of domestic standards, and so ruling out “global common” issues, they argued that current WTO rules – i.e. reciprocity and non-discrimination – with small changes, are already equipped to

⁴¹ Exceptions of the GATT art. XX relevant for NTMs should assure that “nothing in this Agreement shall be construed to prevent the adoption or enforcement by any Member of measures” necessary to protect human, animal or plant life or health, or relating to the conservation of exhaustible natural resources.

⁴² See Broda *et al.* (2008) and Ludema and Mayda (2013), for interesting empirical evidence in support of the role of country market power (term-of-trade effect) in determining the tariffs’ level, for both non-WTO and WTO countries, respectively.

address the raising issue of the proliferation of domestic standards. Accordingly, negotiations over tariffs alone, coupled with an effective “market access preservation rule” that prevents governments from subsequently manipulating their domestic policy choices to undercut the market access implications of their tariff commitments, can bring governments to the efficiency frontier (Bagwell and Staiger, 2001).⁴³ Yet, recently, Antràs and Staiger (2012a) showed that when international prices are determined as a result of bilateral bargaining – e.g. between the domestic purchaser and the foreign supplier – the above result is overturned, namely one need for deep integration where direct negotiations occur over both tariffs and behind-the-border policies. We will return shortly on this issue.

Limão and Tovar (2011), focused, instead, on the commitment value of international agreements. These authors investigated theoretically and empirically the interaction between government commitment over tariffs and the subsequent use of (less efficient) NTMs. The paper extends the basic GH model to the government choice over NTMs, modelling the political value of commitment over tariffs in international trade agreements as it improves the bargaining position of a weak government relative to domestic interest groups. The authors tested the model predictions on Turkey considering tariffs cap introduced within the WTO and the PTA with the EU. Main results showed that tariff commitments in trade agreements increase the likelihood and restrictiveness of NTMs but not enough to offset the original tariff reductions,⁴⁴ broadly confirming that (domestic) bargaining motive is an important source of the political value of commitment in international agreements.

Yet, there are other interpretations on the recent diffusion of NTMs, especially when developed countries are considered. For example, Bagwell and Staiger (2013), argued that the proliferation of NTMs particularly in developed countries, at a certain degree, could be the result of what they call “globalization fatigue”. With this term, they refer to the fact that the increase in NTMs as substitutes to tariffs could be seen as a second-best policy to leave room for negotiations with developing countries. Indeed, developed countries’ tariffs have been lowered too much to represent a good “bargaining chip” toward developing countries. The evidence by Beverelli *et al.* (2014) discussed in Section 2 is consistent with this interpretation.

6.2 Global value chain and trade policy

Governments’ incentive to cooperate on international agreements over standards could be also the result of the effect of NTMs on firms’ fixed costs for entering foreign markets, as summarized in the firms heterogeneity model discussed in Section 4.2. In this setting, NTMs could determine the extent of competition. NTMs that affect fixed costs, besides acting like a tariff, and thus affecting international terms-of-trade, would have an additional effect on market entry decisions in the foreign country. Moreover, NTMs, by

⁴³ Note however that, in the growing situations where international externalities are not pecuniary – such as global warming – this focus on the term-of-trade motive loses importance.

⁴⁴ Limão and Tovar (2011) also emphasized that, although in the majority of the investigated situations the government justified the introduction of the new NTMs using consumer and/or environmental concerns, the selected NTMs never really account for these externalities.

imposing fixed costs, will induce trade concentration in larger and more efficient firms (WTO, 2012; Abel-Koch, 2013).⁴⁵

The proliferation of global chains coordinated by large players increases the international interdependency and may provide a rationale for a deep cooperation on NTMs (and tariffs) within trade agreement (WTO, 2012). In fact, other than spillovers associated to the term-of-trade effect, the break-up of the production process across different countries creates new forms of cross-border spillovers (Staiger, 2012; Antràs and Staiger, 2012b; Blanchard, 2014).

One of the salient characteristics of global value chain is represented by the surge of trade in (processed) intermediate goods. This is the result of different phenomena, such as the strong reduction of the costs of international transactions – due to both declining trade costs and ICT – and the rising role of global players and foreign direct investments-FDIs (see Baldwin and Lopez-Gonzalez, 2014).

Intermediate input purchases tend to be associated with significant lock-in effects for both buyers and sellers. This is because intermediate input varieties are often customized to the needs of the buyers, incorporating a growing amount of relationship specific investments, which may be hard to recoup when transacting with alternative parties. Moreover, offshoring often involves the costly search for suitable foreign suppliers or foreign buyers, which makes separations costly and thereby provides another source of lock-in (Antràs and Staiger, 2012b).

These global value chain linkages alter the conventional calculus of trade policy (Blanchard *et al.*, 2016). Introducing import tariffs hurt those upstream domestic firms that supply inputs to foreign producers, as tariffs reduce the value of foreign goods, and so the revenue accruing to domestic input suppliers. These linkages reduce the governments' incentives to impose a tariff. Similarly, when domestic firms use foreign value added in production, a part of the gains due to an import tariff translates back through the supply chain to foreign input suppliers (Blanchard *et al.*, 2016). The extent to which the current institutional framework, originally drafted for a world trade in final goods, can address this new forms of interdependency, appears to be an open and difficult question (WTO, 2012; Blanchard, 2014).

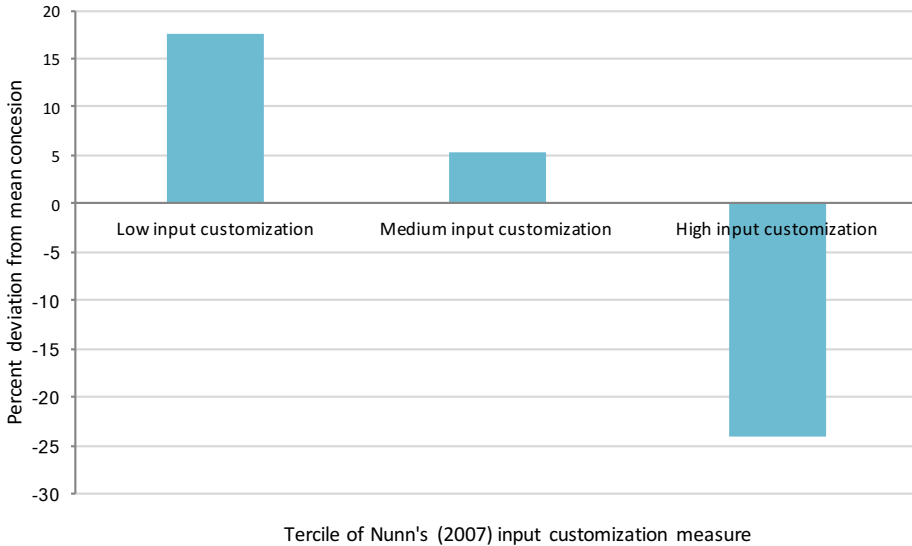
Antràs and Staiger (2012b) reported an interesting empirical evidence in support of the ideas that actual WTO rules do not work well in presence of global value chain interactions. Specifically, for a sample of 16 countries that joined the WTO after its creation in 1995, they showed that tariff concessions were markedly greater in sectors with low levels of input customization than in sectors with high levels of input customization (Figure 8).⁴⁶

Conceptual and empirical works on the role played by global value chains in affecting government' incentives over trade policy is still in its infancy. Yet, important contributions already exist. For example, Orefice and Rocha (2014) provide one of the first empirical evidences showing that there exists a two-way link between deep PTAs and the share in trade attributable to vertical specialization. In particular, the authors showed that sign-

⁴⁵ See Alfaro *et al.* (2015) for a recent model of global value chains where heterogeneous firms decide the boundary along the value chain. See Baldwin and Lopez-Gonzales (2015) for an overview of recent global supply chain stylized facts.

⁴⁶ Antràs and Staiger (2012) measured the sectoral level of inputs customization as the share of an industry's inputs not traded in organized exchanges (see Nunn, 2007).

Figure 8. Percent deviation from concession by tercile of input customization measure.



Source: Antras and Staiger (2012b).

ing deeper agreements increases trade in production networks between member countries by almost 12 percentage points on average. In addition, the impact of deep integration is more significant for industries that by their nature require higher levels of regulation.

Blanchard and Matschke (2015) combine firm-level data on US foreign affiliate activity with detailed measures of US trade policy to study the interlink of offshoring and PTAs. In line with the theoretical expectation they showed positive correlation among US trade preferences and offshoring activity, and the size of the economic effect is important.⁴⁷ Blanchard *et al.* (2016), introduced cross-border supply chain linkages into the standard terms-of-trade model of trade policy formation based on the GH framework. They used this model to study how government objectives over final good tariffs depend on the nationality of the value-added content embodied in home and foreign final goods. The key prediction of the model is that the surge of global value chain trade is reshaping the political incentive over trade policy, by erasing distinction between final goods made at home versus made abroad.

Theoretically, Blanchard *et al.* (2016) add two important contributions. First, they showed that, considering the value added content of trade in the production process changes the mapping from prices to income, altering government incentives over trade policy. Secondly, by incorporating this new incentives into a political economy model, they reach several new results. For example, the domestic content embodied in foreign final goods dampens a country's incentive to manipulate its terms-of-trade. Interesting,

⁴⁷ For example, they estimated that a 10% increase in US foreign affiliate exports to the US is associated with a 4% increase in the rate of preferential duty-free access.

Blanchard *et al.* (2016) using bilateral applied tariffs, temporary trade barriers (i.e. anti-dumping and countervailing duties) and value-added contents of trade, find strong support to the model predictions.

Finally, Gawande *et al.* (2015) investigated the trade policy response to the 2008 crisis in seven large emerging countries. The main aim of the paper was the attempt to understand the extent to which the country participation in global value chains represented an important economic factor in driving the trade policy response to the crisis. As it is well known, the effect of border protection in presence of trade in intermediate goods is significantly amplified simply because “goods” crossed the country borders several times (Hummels and Yi, 2001). Interestingly, although they find heterogeneity in the country-level results, overall they support the notion that the position of domestic and foreign exporters in the global supply chain exerted offsetting forces in many countries. In particular, the demand for cheap inputs by downstream users, and the demand for a country’s exports by vertically specialized producers in partner countries, exerted countervailing pressure against protectionist pressure from domestic lobbies. Hence, the main message of this paper’s results is that today the nature of trade produces powerful incentives against protectionism, which goes well behind the standard term-of-trade motives.

7. Concluding remarks

Agricultural economists have been traditionally aware that the key determinants of agricultural and food policy are largely political in nature, and this also applies to environmental and food standards, as it clearly emerges from this survey. There is a long and important literature that documents this awareness, taking the peculiarities of NTMs into account and raising new theoretical and empirical challenges. As briefly discussed in Section 2, building a sound model on the economic effects of environmental and food quality standards is difficult. For the same reason, modelling them as endogenous response to the political process should have higher priority in our research agenda.

There are several areas where further progress is needed. First, political economy models in general, and in particular when applied to the formation of regulatory standards, need to consider simultaneously both electoral incentives and lobbying behavior (and their possible interaction). Some preliminary effort has been done from a theoretical point of view (e.g. Yu, 2005; Swinnen *et al.*, 2015). Yet, empirical tests of the model predictions are rare, and often too simplistic for understanding the complex interaction between voters, lobbying and political interests. In particular, models of environmental and quality standards are waiting for sound empirical tests. Here, the difficulty is to consider more seriously the exact role and behavior of different interests (e.g. “green” versus “industrialist” groups), as well as whether and how consumers’ and voters’ interests really matter.

Second, the underlying modelling structure to study the political economy of standards should be the one of monopolistic competition with firms’ heterogeneity. This is not only because this modelling framework accounts for more realistic features of the effects of standards, but because it adds a new important dimension in the coalition formation in favor or against NTMs. Indeed, with firms’ heterogeneity the traditional cross-sectoral conflict over trade policy is broken-down over the within-sector dimension depend-

ing on firms' characteristics. The extension of the GH model to firms heterogeneity could perhaps contribute to solve some empirical inconsistency of the model, as suggested by Chang and Willmann (2014). Yet, a downside of this approach is the need of detailed lobby and industry data at firm level to test the model predictions properly.

Third, the design of international rules over standards requires a better understanding of the complex coordination problem between countries and firms. However, the policy implications for the effect of environmental and food standards from a model that includes more realistic details of the current globalization waves, i.e. the structure and linkages of modern GVCs, have not been developed yet.⁴⁸ This perhaps represents one of the most compelling challenges for our profession, given the analytical complexity of this literature and the necessity to adapt actual modelling tools to the peculiarity of agri-food value chains. Indeed, this emerging literature, briefly summarized in Section 6, has been largely developed with specific manufacturing industries in mind, such as chemicals and electronics, where vertical specialization and global outsourcing are a fact, and focusing mainly on trade policy (tariffs). Although also the agri-food sector experienced an increase in vertical specialization, some features of this industry are still different and peculiar. For example, the dependence of the agricultural process on natural resources (land, water, and climatic conditions), the perishable nature of many food products, and differences in international transactions and contracts between players, raise further complexities calling for a careful adaptation of the current modelling tools. All that, clearly, could result in policy implications for regulatory standards that go in different directions with respect to what is emerging with reference to the manufacturing industry.

Acknowledgment:

The author thanks Susan Senior Nello, the Editor, and a referee of the Journal for several constructive comments on an early draft, as well as Lucia Pacca and Chiara Falco for critically reading the manuscript.

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⁴⁸ Some exceptions, largely focused on issues of developing countries, can be found in Swinnen *et al.* (2015).

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