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Economics and politics of food standards, trade, and development[#]

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Abstract

Standards have played an important role in food trade for a very long time. Their rapid growth in recent years has triggered vigorous debates on their impacts on international trade and development, with many arguing that standards are "non-tariff barriers" to trade and that standards are marginalizing the poor. I present conceptual frameworks and review empirical evidence on the equity and efficiency effects and the political economy of standards. Models which incorporate essential aspects of standards yield complex theoretical results and nuanced conclusions. Careful empirical analyses support such nuanced arguments and find complex effects. For trade, standards can create welfare gains but also involve rent redistribution which induces lobbying by interest groups to set the standards at their preferred level. This makes it difficult to distinguish socially desirable standards from those resulting from political rent-seeking. For development, it is crucial to explicitly account for (a) the endogeneity of the institutional organization of value chains and (b) both smallholder contracting and employment creation on large scale farms when considering the impact of standards on development and poverty.

JEL classifications: F13, F15, O19, Q12, Q18, P16, L15

Keywords: standards; globalisation; value chains; trade; development; poverty reduction; political economy; food; agriculture; vertical coordination; non-tariff measures; public policy

1. Introduction

"*Do not use dishonest standards when measuring length, weight or quantity.*
Use honest scales and honest weights (. . .)."
Holy Bible, Leviticus, Chap. 19, verses 35–36

"If a wine-seller makes the measure for drink smaller than the measure for corn,
they shall call that wine-seller to account, and they shall drown her in the water."
The Code of Hammurabi, King of Babylon (2000 BC)
(In: Harper, 1904).

Adulterations and frauds have existed as long as products have been exchanged and traded. The addition of water in wine or in milk to increase the volume has been documented throughout history and across the globe. Standards to prevent fraud have been introduced by governments, religious authorities and private agents.

In recent years, standards have increased rapidly, both geographically and in addressing new concerns. Production and trade are increasingly regulated through stringent public and private standards on quality, safety, environmental, and ethical aspects (Maertens and Swinnen, 2014). An illustration of the rapid increase in public food standards is the number of notifications of new SPS measures to the WTO. These have increased exponentially from a few hundred in the mid 1990s to almost 13.000 in 2011. Private standards are often more stringent than public ones (Fulponi, 2007; Vandemoortele and Deconinck, 2014). An illustration is the number of producers that are GlobalGAP certified that increased from around 20.000 in the mid 1990s to around 120.000 in 2011.

These standards have spread through trade and foreign investments,[1] effectively "linking rich consumers to poor producers", and have resulted in changes in the way global value chains are organized with increasing levels of vertical coordination, upgrading of the supply base and increased dominance of large multinational companies (McCullough et al., 2008; Swinnen and Maertens, 2007).

The rise and spread of standards has triggered vigorous debates on the impacts on international trade and development.

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[1] The growth of foreign direct investment (FDI) has been triggered by several factors, including a wave of investment liberalizations in the past 20 years and strong economic growth in emerging and developing countries. A well-documented form of FDI is the so-called "supermarket revolution" as large retail chains increasingly invested in emerging and developing countries (Dries et al., 2004; Reardon et al., 2003).

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There are two broad lines of debate, respectively in the trade and the development literature. Interestingly these literatures have had little overlap, either methodologically or in terms of the issues. The first debate is whether standards are (nontariff) trade barriers. As international trade agreements such as the WTO have contributed to a global reduction in tariffs, it is often argued that countries have turned to standards as new instruments to shield their domestic markets from foreign competition (see arguments in e.g. Anderson et al., 2004; Augier et al., 2005; Beghin et al., 2012; Brenton and Manchin, 2002; Fischer and Serra, 2000; Maertens and Swinnen, 2007; Marrette and Beghin, 2010; Van Tongeren et al., 2009).

The second debate is whether developing countries and the poor can comply with the standards and, if not, whether this is leading to the exclusion of small and weakly capitalized producers from these "high standard (HS) value chains"[2] and, for those who can participate, whether they are hurt by rent extraction through superior bargaining power of increasingly concentrated downstream agents, or whether they may benefit from institutional innovations in the value chains (see arguments in e.g. Dries et al., 2009; Maertens and Swinnen, 2009; Minten et al., 2009; Reardon et al., 2003, 2009; Swinnen, 2007; Swinnen and Vandeplas, 2011; Unnevehr, 2000; Warning and Key, 2002).

The implications of standards for development and poverty have been analyzed for a variety of sectors, including textiles and forestry (Czubala et al., 2009; LeClair, 2002), but global supply chains of agricultural and food products have attracted much attention (Reardon et al., 1999). One reason is that agriculture in developing countries, and exports of agricultural commodities, are seen as a very important potential source of pro-poor growth (World Development Report, 2008). Another reason is that rich country food safety and quality standards, both from private and public sources, have tightened dramatically over the past decade, strongly affecting international trade and global value chains in these commodities (Dolan and Humphrey, 2000; Jaffee and Henson, 2005).

Both debates, although separated, have key similarities. They have both been stimulated by a series of publications, which focused primarily on the negative implications, using conceptual frameworks that ignored or did not emphasize the positives. I will argue in this article that models that include both negative and positive aspects of the standards yield nuanced/complex theoretical conclusions, and that careful empirical analyses support such nuanced arguments and complex effects.

2. Standards, efficiency, and equity in a closed economy

A crucial aspect of standards is that they have both efficiency and equity effects, and that these effects may be influenced by various factors such as consumer preferences, implementation costs, etc. Standards may enhance aggregate welfare, but they may also be set at suboptimal levels, causing welfare losses. Moreover, the introduction of a standard may create winners and losers in society as its effects can differ for consumers and producers, and even within consumer and producer groups.

In our basic framework, standards generate efficiency gains by solving (or reducing) externalities or asymmetric information problems, but they also involve implementation costs. Under these assumptions, standards can create welfare gains but also involve rent redistribution between consumers and producers, and among consumers and producers.

2.1. An economic model of standards

Consider the market for a "credence good", that is, a good with certain characteristics that cannot be determined by the consumer, neither by search nor experience.[3] A standard that guarantees certain credence features of the product positively affects consumer utility as it reduces informational asymmetries. It induces consumers to buy more of the product through an increased willingness to pay, ceteris paribus.

A representative consumer has a utility function $u(x, s)$ where x is consumption of the good, and s is the level of the standard.[4] A higher s represents a more stringent standard.[5] Consumer utility is increasing and concave both in consumption ($u_x > 0; u_{xx} < 0$) and the standard ($u_s > 0; u_{ss} < 0$).[6] We assume that $u_{xs} > 0$, that is, that an increase in the standard leads to a higher marginal utility of consumption. One example of a functional form that meets these assumptions is the Mussa-Rosen (1987) demand specification.[7]

Maximizing consumer surplus $\Pi^C = u(x, s) - px$ by choosing consumption x, given consumer price p, yields the first-order condition

[2] Several empirical studies indicate that small producers are excluded because of increasing standards (Belton et al., 2011; Gibbon, 2003; Key and Runsten, 1999; Kherralah, 2000; Maertens and Swinnen, 2009; Ouma, 2010; Reardon et al., 2003; Subervie and Vagneron, 2013; Weatherspoon and Reardon, 2003). For example, evidence from Kenya, Zimbabwe and Cote d'Ivoire suggests that horticulture exports are increasingly grown on large industrial estate farms, thereby excluding smallholder suppliers in the export supply chain (Dolan and Humphrey, 2000; Minot and Ngigi, 2004).

[3] For more details and other types of standards, such as those addressing externalities, see Swinnen et al. (2015).

[4] For the closed economy, we denote both consumption and production by x to simplify the notation.

[5] As I focus on the more general economic impacts of standards, I make some simplifying assumptions. Here I assume that a standard can be described in terms of "strictness." This may not always be the case. While standards such as pesticide MRLs or car emission standards can be unambiguously ranked on a vertical scale, and hence have a notion of strictness, other standards do not have such "vertical" qualities. Such standards can be measured as binary choices. I refer to Swinnen et al. (2015) for a classification and examples of different models. I also do not distinguish here between different types of standards such as rules of origins and safety standards. The implications of such differences are discussed briefly at the end of Section 4.

[6] Subscripts denote partial derivatives to x or s.

[7] The Mussa-Rosen specification is widely used in agricultural economics and in particular in studies focusing on quality differentiation. We use a more general demand function, so all of our results hold for a Mussa-Rosen specification as well (see Swinnen et al. (2015, chapter 2) for a review of different approaches to modeling quality). With Mussa-Rosen demand, a continuum of consumers with different taste parameters $\theta \tilde{} U[0, 1]$ obtain utility $\theta s - p$ from consuming one unit of the good (with quality s and price p). They buy at most one unit, which implies that consumer utility is $u(x, s) = sx - sx^2/2$.

$$\frac{\partial \Pi^C}{\partial x} = u_x(x,s) - p = 0, \quad (1)$$

which defines the inverse demand function. Given our assumptions on the utility function, the inverse demand function is downward sloping and a higher standard shifts the inverse demand function upwards. On the production side, a representative producer has cost function $c(x,s)$ that depends on output and the standard. The cost function is increasing and convex both in production ($c_x > 0; c_{xx} > 0$) and the standard ($c_s > 0; c_{ss} > 0$). We further assume that $c_{xs} > 0$, that is, that a standard increases the marginal costs of production. Maximizing profits $\Pi^p = px - c(x,s)$ by setting output x yields

$$\frac{\partial \Pi^P}{\partial x} = p - c_x(x,s) = 0, \quad (2)$$

which defines the inverse supply function. The inverse supply function is upward sloping, and a higher standard shifts the function upwards.

At the market equilibrium (x^*, p^*), demand equals supply and

$$p^* = u_x\left(x^*, s\right) = c_x\left(x^*, s\right). \quad (3)$$

In equilibrium, aggregate welfare $W(s)$ is the sum of consumer surplus and profits: $W(s) = u(x^*, s) - c(x^*, s)$.

2.2. Impact of a standard on welfare and income distribution

Using conditions (1)–(3) and applying total differentiation and the envelope theorem, it follows that the impact of an increase in the standard on consumer surplus is

$$\frac{\partial \Pi^C}{\partial s} = u_s - x^* \frac{\partial p}{\partial s}. \quad (4)$$

The first term, u_s, is the (positive) utility gain of the more stringent standard, that is, the value that consumers attach to the reduced informational asymmetries. The second term, $-x^* \frac{\partial p}{\partial s}$, is the marginal increase in consumption expenditure, and is negative as consumption expenditures increase because of an increase in the equilibrium price due to increased demand and the cost of implementing the standard. The net effect depends on the relative size of the efficiency gain and the increased consumption expenditures.

Using a similar approach, the impact of an increase in the standard on producer profits can be derived as

$$\frac{\partial \Pi^P}{\partial s} = x^* \frac{\partial p}{\partial s} - c_s. \quad (5)$$

The first term on the right-hand side is the increase in revenue, due to increased prices with higher standards. The second (negative) term, $-c_s$, represents reduced profits due to costs of implementing the standard. The net impact depends on the relative size of the increase in revenue and the implementation cost.

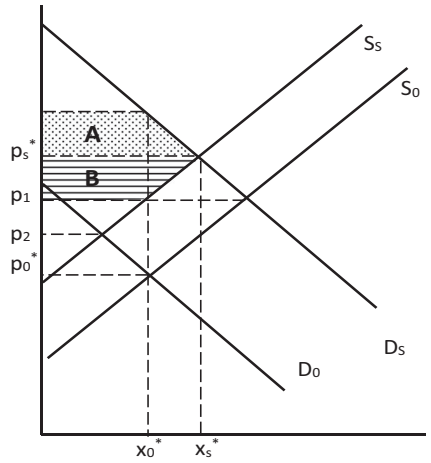

Fig. 1. Efficiency and equity effects of standards in a closed economy.

The impact on aggregate welfare depends on the utility gain and increased cost due to the standard:

$$\frac{\partial W}{\partial s} = u_s - c_s. \quad (6)$$

In summary, if the utility gain for consumers exceeds the implementation cost for producers, social welfare increases. The socially optimal level of the standard, s^*, is where the marginal utility gain for consumers equals the marginal cost for producers:

$$u_s\left(x^*, s^*\right) = c_s\left(x^*, s^*\right). \quad (7)$$

However, standards not only affect overall welfare but also affect the distribution of income between consumers and producers. As is clear from Eqs. (4) and (5), the term $x^* \frac{\partial p}{\partial s}$ represents a transfer between producers and consumers: standards lead to increased revenue for producers and increased expenditures for consumers. Prices increase due to an increase in consumer demand with higher standards and due to the increased costs. The larger the price effect, the more producers are likely to benefit from the standard, and the less consumers are likely to benefit. The size of this effect depends on the supply and demand elasticities and on the size of u_{xs} and c_{xs}.[8]

Fig. 1 illustrates this. Terms S_0 and D_0 represent the pre-standard supply and demand functions[9] and p_0* and x_0* the equilibrium price and consumption (which equals production in this closed economy). The introduction of a standard s shifts supply and demand functions to S_s and D_s. The new equilibrium price and quantity are p_s* and x_s*. The total price effect (p_s* – p_0*) is the result of rising prices due to the growth in demand ($p_1 - p_0$*) and a cost increase ($p_2 - p_0$* = p_s* – p_1).

[8] See Swinnen et al. (2015, chapter 3) for a formal derivation.

[9] The figure can also be interpreted as from a lower to a higher standard.

In the case illustrated by Fig. 1 the effect of the growth in demand (represented by the vertical shift in the demand curve) is stronger than the increasing cost effect (represented by the vertical shift in the supply curve). As a consequence, consumption and production increase ($x_s^* > x_0^*$) and both producers and consumers gain. Consumer surplus increases by area A and producer surplus increases by area B. Total welfare increases by area A + B.

It is easy to illustrate that with different elasticities of supply and demand the size of the effects would be different. With different shifts in (or rotations of) the supply and demand curves the sign of the effects could be different—in particular if the cost effect is larger than the demand growth effect, the impact on welfare would be negative.

3. Standards and politics

Because of these distributional effects of standards, various groups in society have a vested interest in trying to influence governments' decision processes on standards. Lobbying by interest groups may cause governments to choose standards, which are not welfare maximizing.

3.1. A political economy model of standards

Consider a government that maximizes its own objective function, which, following the approach of Grossman and Helpman (1994) and applied to standards by Swinnen and Vandemoortele (2011), consists of a weighted sum of contributions from lobbies and social welfare. More specifically, the government's objective function $\Pi^G(s)$ is a weighted sum of social welfare and lobby contributions C^i of producers ($i = P$) and consumers ($i = C$):[10]

$$\Pi^G(s) = \alpha^C C^C(s) + \alpha^P C^P(s) + W(s), \tag{8}$$

where α^i are the political weights, reflecting relative lobbying strengths of producers and consumers (with $0 \leq \alpha^i \leq 1$ and $\alpha^P + \alpha^C = 1$). The politically optimal standard, $s^\#$, is determined by:[11]

$$\frac{\partial \Pi^G}{\partial s} = \left(1+\alpha^C\right)\left[u_s - x^\# \frac{\partial p}{\partial s}\right] + \left(1+\alpha^P\right)\left[x^\# \frac{\partial p}{\partial s} - c_s\right] = 0, \tag{9}$$

where $x^\#$ denotes consumption and production in the political optimum.

The first term represents the weighted marginal impact of a public standard on aggregate consumer surplus, which may also be positive or negative. The second term captures the marginal impact of a public standard on producers' profits weighted by their lobbying strength $(1+\alpha^P)$. As we explained earlier, this marginal impact may be positive or negative. If producers and consumers have the same lobbying strength ($\alpha^P = \alpha^C$), this yields the social optimum. In that case, the term $x^\# \frac{\partial p}{\partial s}$ capturing the rent transfer between producers and consumers cancels out. When producers and consumers have differing lobbying strengths, however, the political equilibrium will generally differ from the social optimum. In that case, the rent transfer $x^\# \frac{\partial p}{\partial s}$ will affect the standard set by the government.

Studies that use Grossman–Helpman models often assume that producers (and in particular import-competing industries in trade analyses) and owners of specific factors of production are well organized and consumers not or much less. However, such assumptions do not seem very relevant for analyses of food standards since many food standards have been introduced under pressure from consumers. The first wave of modern public food safety and quality regulations in the mid 19th century were induced by public outrages of consumers over the use of cheap and sometimes poisonous ingredients in food production (Meloni and Swinnen, 2015, 2016). Similarly, more recently the tightening public standards in food in the EU have followed food safety scandals in the late 1990s with consumers demanding better protection (McCluskey and Swinnen, 2011). Also the introduction of various public regulations in China followed the "milk scandal" where people died from consuming milk products with poisonous ingredients (Mo et al., 2012). Hence, it appears that in all these cases, the threat to their health caused sufficient welfare threats for consumers to overcome organizational obstacles and costs to effectively lobby the governments.

Note that influential interest groups may lobby for both more stringent or less stringent standards depending on the relative magnitude of the price effect compared to the implementation cost (for producers) or the utility gain (for consumers). Hence, the political equilibrium standard $s^\#$ may be set either too high ($s^\# > s^*$) or too low ($s^\# < s^*$) from a social welfare point of view, depending on which interest group is more effective in lobbying and how the standard affects its utility.

[10] This simplified model of the political economy ignores lobbying by other vested interests such as environmental NGOs. The importance of this omission obviously depends on the nature of the standard. For a model of NGO activities and their relationship with their donors and supporters see, for example, Chau and Huysentruyt (2006), Aldashev and Verdier (2010), and Swinnen et al. (2011).

[11] Each level of the standard corresponds to a certain level of producer and consumer surplus, and hence also to a certain level of political contributions by producers and consumers, respectively. This is driven by the functional form and the truthfulness of the political contributions schedule. The government receives higher contributions from producers (consumers) if the imposed standards creates more surplus for producers (consumers). Therefore in the Grossman–Helpman framework maximizing the political contributions of an interest group is equivalent to maximizing their surplus. With total welfare (W) equal to the sum of producer and consumer surplus, this yields optimality condition (9). See section 4.9 in Swinnen et al. (2015) for a more elaborate and detailed derivation of this optimality condition; and Rausser et al. (2011) for a discussion on these political objective functions.

3.2. Development and pro- and antistandard coalitions

These results may explain the empirically observed positive relationship between food standards and economic development.[12] It is often argued that this relationship simply reflects higher consumer preferences for quality and safety standards with higher income levels. While our model confirms that preferences (in the form of the efficiency gain u_s) play a role, it also suggests other factors that affect the relationship between development and the political economy of public standards, causing different standards between developing ("poor") and developed ("rich") countries.

The quality of institutions for enforcement of contracts and public regulations are also positively correlated with development. Better institutions imply better enforcement and control of standards. While poor countries, with low wages and lower land rents, may have a cost advantage in the production of raw materials, better institutions of rich countries lower the marginal increase in production costs caused by standards. A lower increase in production costs could also result from higher education and skills of producers, better public infrastructure, easier access to finance, etc.

An additional factor may be the different organization and structure of the media in rich and poor countries. Mass media is the main source of information for many people. Commercial media is more likely to highlight potential food risks (McCluskey and Swinnen, 2004, 2011). The cost of media information is higher and government control of the media is stronger in poor countries. Therefore, the media structure and information provision is likely to induce a more pro-standard attitude in rich countries than in poor, as increased access to media increases attention to risks and negative implications of low standards (Curtis et al., 2008).

An additional related element is that poor countries have a larger rural/urban population ratio. Asymmetric information may be more important for urban consumers. For example, find that people associated with agriculture are more in favor of GM crops than urban consumers because they have a better idea of the amount of pesticides used on non-GM crops than urban consumers, and hence of the benefits from GM (such as insect resistant crops) (McCluskey et al., 2016).

In combination these factors are likely to induce a shift of the political equilibrium from low standards to high standards with development as the mechanisms identified here may result in a pro-standard coalition of consumers and producers in rich countries. Consumers may derive large utility gains from a standard, while producers incur only moderate increases in costs. In contrast, an antistandard coalition may be present in poor countries if consumers are more concerned with low prices than with high quality (leading to small utility gains from a higher standard) while the implementation costs for producers (both in terms of production costs and transaction costs) may be large. Differences in asymmetric information may reinforce the positive relationship between standards and development.

4. Standards and trade

The rapid growth of standards in recent years raises questions whether standards are nontariff measures (NTMs) used for protectionist purposes. Much attention of trade economists focused on the potential or presumed protectionism of standard-like NTMs, especially in the context of commitments to decrease or eliminate tariffs and expand imports under tariff-rate-quota schemes following multiple multilateral and preferential trade agreements (Bacchetta and Beverelli, 2012).

The implicit comparison with tariffs in the trade debate is not entirely valid. In a small open economy, the socially optimal tariff level is zero. A positive tariff-level that constrains trade is harmful to social welfare, and is by definition protectionist. However, this is not necessarily the case for standards since this ignores the potential consumer or societal benefits induced by standards.

4.1. Optimal standards in a small open economy

Extending our model to an open economy setting shows that there is no simple relationship between the trade effects of a standard and the social optimum (Swinnen and Vandemoortele, 2011). Define x^S as domestic production (supply) and x^D as domestic consumption (demand). The impact of standards on aggregate welfare in a small open economy is then:[13]

$$\frac{\partial W}{\partial s} = u_s - x^D \frac{\partial p}{\partial s} - c_s + x^S \frac{\partial p}{\partial s} = u_s - c_s - \left(x^D - x^S\right) \frac{\partial p}{\partial s}, \tag{10}$$

where (in comparison with Eq. (6)) the last term captures the change in expenditures on imports or revenues from exports as a result of the standards-induced price effect. It is clear from Eq. (10) that the socially optimal standard s^* (from a domestic welfare point of view) may be greater than zero even if this leads to a reduction in trade.

Moreover, standards may both stimulate trade ("catalysts") or reduce trade ("barriers"). Since the trade reduction effects of standards are well known, Fig. 2 illustrates a case where standards increase trade. The introduction of a standard causes a

[12] There may be an interesting comparison with the environmental Kuznets curve, which the environmental economics literature has explicitly incorporated into models of growth, environmental damage and standards (e.g., Copeland and Taylor, 2004). Like empirical research on the existence of the Kuznets curve (e.g., Stern, 2004) it would be interesting to analyze how strong the relationship between food standards and economic development is.

[13] This is consistent with the standard definition in the international trade literature: the socially optimal policy maximizes domestic welfare. Interestingly, Fischer and Serra (2000) define the socially optimal standard as a measure that maximizes domestic welfare as if all producers were domestic. However, since in our model the effect of a standard on the world price equals the change in average costs of foreign producers, their profits are not affected by the standard and our definition of the social optimum is equivalent to the definition of Fischer and Serra (2000).

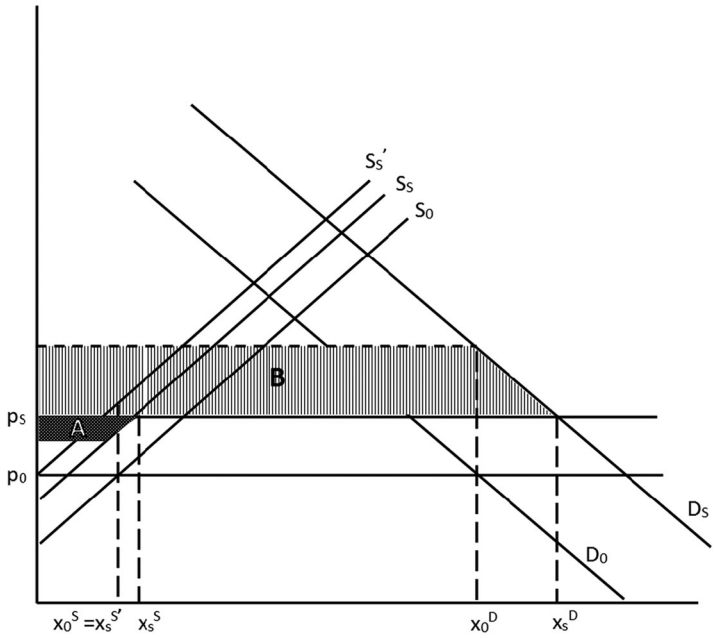

Fig. 2. Efficiency, equity, and trade effects of standards in a small open economy.

shift of the domestic supply curve from S_0 to S_S and of domestic demand from D_0 to D_S. The import price increases from P_0 to P_S, where the difference is caused by the implementation costs of the standard for foreign producers. The (vertical) difference between P_0 and P_S is larger than between S_0 and S_S, representing the case that the implementation costs for domestic producers are smaller than for foreign producers. Domestic consumption increases from x_0^D to x_S^D and domestic production increases from x_0^S to x_s^S. The benefits of the standard for domestic producers are represented by area A. The benefits for domestic consumers are represented by area B.

While consumers and producers benefit, imports also increase: from $x_0^D - x_0^S$ to $x_S^D - x_S^S$. Hence, in this case the standard and the associated consumption increase lead to both an increase in domestic production and an increase in imports. Hence this standard is a "catalyst" for trade, despite the fact that domestic producers benefit. The catalyst-effect of the standard would be even larger when implementation costs were identical for domestic and foreign consumers. In this case the domestic supply function would shift from S_0 to $S_S{}'$ and domestic production would remain at $x_0^S = x_S^{S'}$. Imports would increase from $x_0^D - x_0^S$ to $x_S^D - x_0^S$.

In summary, the optimum standard in the presence of asymmetric information or externalities is complex (see also Beghin, 2013; Marette, 2014; Marette and Beghin, 2010). Standards do affect trade. Only in very special circumstances would standards not affect trade: this is when the effect on domestic production exactly offsets the effect on consumption. It depends, among others, on the relative ability of domestic and foreign industries to comply with the standard.

4.2. Trade, standards, and politics

This result however does not imply that there are no political forces and protectionist elements in standards setting. The politically optimal standard in an open economy is determined by the impact of the standard on the government's objective, which is:[14]

$$\frac{\partial \Pi^G}{\partial s} = \left(1+\alpha^C\right)\left[u_s - x^D\frac{\partial p}{\partial s}\right] + \left(1+\alpha^P\right)\left[x^S\frac{\partial p}{\partial s} - c_s\right] = 0, \quad (11)$$

using a similar political economy model as in Eqs. (8) and (9). Comparing (10) and (11) shows that, as in the case of a closed economy, political factors will affect standard setting in an open economy.

Lobbying of domestic firms and consumers may lead to standards being set "too low" or "too high" in the political equilibrium, depending, among other things, on relative costs of compliance and the relative strength of lobbies (Swinnen and Vandemoortele, 2008, 2011). These conclusions have important implications for policy and trade negotiations.

Standards in international trade are therefore what John Beghin (2013) referred to as "a challenge for the profession" because there is no blanket policy recommendation paralleling those on tariffs or quotas. The simple "standards as protectionism" arguments ignore the social benefits of standards in terms of consumer welfare, for example, by reducing asymmetric information, and in terms of reducing externalities in

[14] See footnote 12 on the derivation behind this political equilibrium condition.

society. Including these other effects of standards makes the impact of standards on trade and welfare much less obvious as I have just demonstrated and others have argued before (e.g., Sheldon, 2012; Van Tongeren et al., 2009).[15] The direction and magnitude of effects on trade are sector specific and specific for different standards (Xiong and Beghin, 2014). However at the same time our political economy analysis suggests that it is unlikely that the standards chosen by governments are the social optimal levels and are likely to be influenced by lobby groups, including protectionist pressures.

The complexity and nuances of these conceptual findings complicate the empirical measurement and its use for policy.[16] The empirical implementation of such protectionism concept is sensitive to the definition of welfare, the nature of the standards and of the associated (fixed or variable) costs (Baldwin, 2000; Marette, 2014). The informational requirements are huge: one needs reliable estimates of fixed and variable costs for heterogeneous firms and valuation of external effects by consumers. Moreover, the policy instruments involved are often dissimilar and difficult to aggregate; data are scarce for effects of public regulations and almost inexistent for private standards. Li and Beghin (2014) conclude that sorting out the protectionism of standards is complex once one moves beyond simple detection strategies and that policy prescriptions on standards depend on the particular context of the policies. Economists should therefore be careful in promoting a zero-standard environment or systematic reductions in standards but at the same time be aware that the level and nature of specific standards in trade settings may well be suboptimal.

5. Standards and development

The previous sections have shown that food standards that affect trade are not necessarily protectionist, but certainly can be. Yet, even when standards are not set based on protectionist objectives, they will affect developing countries by imposing new costs or by enhancing trade—and thus potentially welfare in those countries.

While quality and safety standards may make production more costly, at the same time they may reduce transaction costs in trade, and also in this way can be "catalysts" for trade (Henson and Jaffee, 2007; Maertens and Swinnen, 2007). Standards can communicate the presence of desirable attributes or the absence of undesirable attributes, which are otherwise difficult, costly or even impossible to verify by consumers (Roe and Sheldon, 2007).[17] By providing a bridge between consumer concerns and preferences in high-income countries and producers in developing countries, food standards can also be catalysts to developing countries' participation in trade (Maertens and Swinnen, 2007).

In fact, despite the rapidly growing and more stringent standards, global agricultural and food trade has increased sharply during the past three decades. Over the past 25 years, the growth in exports from developing countries has been strong in sectors where standards have spread rapidly.[18] This is, for example, the case in high value (and high standards) food exports—which includes fruits, vegetables, seafood, fish, meat, and dairy products. In Asia and in Latin America, exports of such high-value food products increased from around 20% of agricultural exports in the 1980s to around 40%, with overall exports increasing significantly. The process is similar, albeit somewhat slower, in Africa (Maertens and Swinnen, 2014). Jaffee and Henson (2005) argue that the most successful countries and sectors have used high quality and safety standards to (re)position themselves in global markets. Yet it is not only international standards that affect development. As Tom Reardon and his colleagues have convincingly demonstrated also domestic supply chains in developing countries are transformed through investments and quality upgrading, including the introduction of standards (Reardon et al., 2003; Reardon and Timmer, 2014).

These observations triggered a major debate among academics, development organizations and policy-makers whether developing countries and the poor can comply with the standards and, if not, whether this is leading to the exclusion of small and weakly capitalized producers from these "HS value chains" and, for those who can participate, whether they are hurt by rent extraction through superior bargaining power of increasingly concentrated downstream agents. Two reasons why the effects could be beneficial as well was (a) that while quality and safety standards indeed make production more costly, at the same time they increase the value of the products, potentially yielding higher profits and (b) that endogenous institutional innovations in the HS value chains would affect both the surplus creation and the distribution of the benefits.

5.1. Efficiency and equity effects of standards in vertically coordinated value chains

To explain how standards affect both efficiency (surplus creation) and equity (surplus distribution) in value chains we use, again, a simple conceptual framework.[19] Consider a farmer who produces a "low standard (LS) product" that can be sold locally. The farmer's alternative is to produce a "HS product" to sell to a processor (or retailer). The HS product is sold at a higher price than the LS product, but to comply with the standard, the farmer needs to apply specific inputs

[15] Conceptually, determining protectionism of standard-like measures is defined by Baldwin (1970), or Fisher and Serra (2000), with some limitations highlighted in Marette (2014), and Marette and Beghin (2010).

[16] See special issues of the *World Trade Review* (guest edited by Heckelei and Swinnen, 2012) and the *World Economy* (guest edited by Beghin and Orden, 2012) and Beghin et al. (2015) for a review.

[17] In addition, minimum quality standards may increase welfare in a vertically differentiated market by reducing firms' pricing power. Standards may also solve problems related to network externalities.

[18] Obviously this observation does not necessarily imply any causality, and does not provide evidence that standards did not constrain trade.

[19] The conceptual framework is a simplified version of the theoretical model of Swinnen and Vandeplas (2011)—see also Swinnen et al. (2015, chapters 11–16).

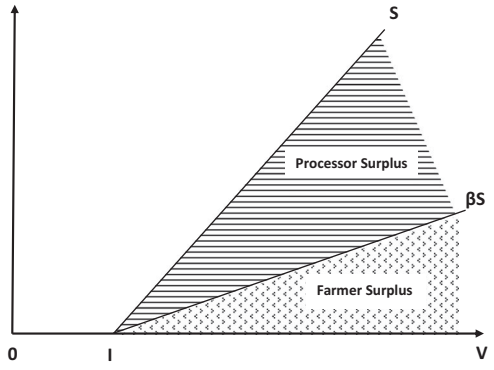

Fig. 3. Efficiency and equity effects of standards in value chains with perfect markets.

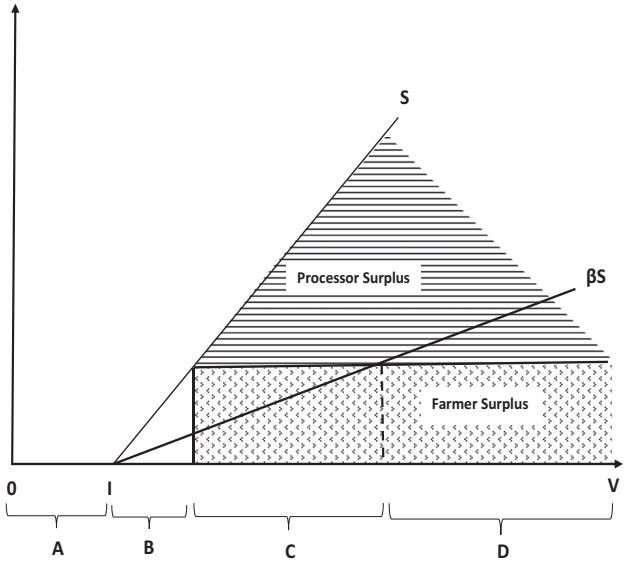

Fig. 4. Efficiency and equity effects of standards in value chains with market imperfections and holdups.

or technologies with a cost I. Assuming that other costs are the same for the LS and HS product, the value generated by applying inputs/technology to produce the high standard product is V and the value chain surplus is therefore $S = V - I$. S thus represents the efficiency effect of the standards. The equity effect depends on bargaining between the farmer and the processor over the distribution of the surplus. A crucial insight is that this bargaining outcome, and thus the distribution of the surplus, will not only be influenced by the market power of processor and farmer but also importantly by market imperfections, vertical coordination and holdup problems.

To illustrate this, consider first the case that there are no market imperfections and that bargaining leads to a surplus distribution where β is the farmer's share of the surplus, with $0 \leq \beta \leq 1$.[20] In this case, Fig. 3 illustrates the total surplus S, the farmer's surplus (βS) and the processor surplus.

However, this is unlikely to be a good representation of the situation in developing and emerging countries. Many farmers in these countries face technology and credit market imperfections, making it difficult for them to make the required investments (Feder et al., 1985; Reardon et al., 2003). This would imply that these farmers are excluded from HS value chains, as has often been suggested, and that no surplus would be created. However, in reality, institutional innovations, in particular different forms of vertical coordination, in the HS value chains have been developed to overcome such constraints (Gow and Swinnen, 1998, 2001; Swinnen and Maertens, 2007). Processors typically have better access to the inputs or technology than the farmer or have less credit constraints. Processors can then offer the farmer a contract, which includes the transfer of inputs or technology for the HS product.

Empirical evidence shows that such contracts may be formal or informal, but in either case, contract enforcement is not obvious. Contract breach can take many forms. The farmer may divert the inputs provided by the buyer to other uses (or sell them) or could default on the contract by side-selling the HS product to an alternative buyer. The buyer may renegotiate the contract terms *ex post*, that is, upon delivery of the product. These vertical coordination arrangements and their enforcement problems affect both the creation and the distribution of the surplus. Under perfect contract enforcement, vertical coordination may make surplus creation possible because it overcomes the input market imperfections. However, the potential for holdups may make contracting infeasible. Each party can gain "bargaining power" (i.e., claim a larger part of the surplus), by making a legitimate threat to hold up the other party.

Fig. 4 illustrates how surplus creation and distribution changes with the value in the HS chain and the associate holdup opportunities of farmer and buyer. At low HS value levels (domain A), the value of the HS product is lower than the investment costs I and it is thus not efficient to produce HS. In domain B, the value V is large enough for HS production to be socially efficient but is insufficient to avoid farmer holdup and so no HS production will take place. The potential surplus (S) is insufficient to overcome the benefits that the farmers can get from side-selling inputs or HS output. In domain C, the value is large enough to compensate the farmer so that s/he sticks to the contract, that is, to make the contract self-enforcing. In this case, the buyer needs to offer—what Swinnen and Vandeplas (2011) have termed—an "efficiency premium" to the farmer on top of the perfect enforcement payoff to avoid contract breach. At low levels of V in domain C almost the entire surplus S is needed to compensate the farmer not to divert the inputs. Hence, in this value region most of the surplus goes to the farmer to make the contract self-enforcing. The holdup possibility increases the farmer's effective bargaining power. This theoretical result offers an interesting hypothesis to explain sometimes significant

[20] The division of the contract surplus can be modeled as a Nash bargaining problem, where each party receives his or her disagreement payoff and a share of the contract surplus (see Swinnen and Vandeplas (2011) for more details).

benefits for smallholder farmers from participating in these value chains despite strong concentration at the buyer level.

As V increases beyond that point, more surplus is created and more surplus is left for the buyer. At higher levels instead, there is no longer need to compensate the farmer (domain D). Instead there will be processor holdup unless the contract compensates the processor sufficiently, imposing a maximum surplus for the farmer and shifting the rest of the surplus to the processor.[21]

In summary, vertical coordination through interlinked contracts can help create surplus in HS production with market imperfections and will also affect the distribution of the surplus. A simple look at the market structure and market imperfections may give a biased indication of the potential for high standards production and its distributional effects. If the farmer has little market power (represented by a low β), he or she might still be able to capture a significant share of the surplus of HS production if the farmer's holdup opportunities create incentives for the processor to pay the farmer an efficiency premium as part of the contract. On the other hand, *ex post* processor holdups may restrict the potential benefits of farmers.

5.2. Value chain governance and smallholder inclusion

As I explained, contracting and vertical coordination can be an institutional solution for HS value chains in the presence of imperfect markets. This is typically categorized as a "hybrid" form of value chain governance on a spectrum between spot markets on one extreme and vertical integration on the other (Williamson, 1991). The specific nature of vertical coordination can help to avoid holdup and align incentives by re-distributing the contract surplus, depending on the extent of external enforcement and the specificity of the inputs or technology. Sophisticated institutional designs may be required to make contracts feasible and transfer technology. Swinnen and Kuijpers (2016) discuss a variety of (hybrid) institutional innovations in agrifood value chains that have been attempted in reality to enable technology transfers. These include triangular structures and special purpose vehicles involving processing companies, banks and input providers. Bringing other companies to the table that also benefit from the HS production may enhance contract feasibility by spreading the risk and costs of contract breach, and by enhancing the enforcement capacity through lower information asymmetries and higher reputation costs.

However, it may be that in the absence of external enforcement, for some conditions, self-enforcing contracts will not work and different forms of governance are required for HS production. The most extreme institutional solution to problems of holdup is vertical integration, whereby two successive stages within the value chain (e.g., agricultural production and processing) are brought together under common ownership and management. In this case, technology transfer occurs within a vertically integrated company, which avoids holdup problems—but, as is well known, may lead to other types of inefficiencies (Klein et al., 1978; Williamson, 1985).

Empirical studies show that the requirements for farmers to satisfy standards and to invest in modern technology in HS value chains (as well as the need to economize on transaction costs) has resulted in a remarkable heterogeneity in value chain governance, including a significant amount of vertically integrated production systems, but also various forms of smallholder contracting (see e.g., Beghin et al., 2015; Maertens and Swinnen, 2009, 2014; Reardon et al., 2009).[22] The designs of the contracts often vary considerably, going from (short run) provision of seeds and technical advice to complex (longer run) schemes that provide interlinked bank loan guarantees and investment loans for significant on-farm investments (such as cooling equipment in dairy) involving processors, financial institutions and technology companies (e.g., Dries et al., 2009; Swinnen and Kuijpers, 2016). Others show how greenhouses and irrigation infrastructure investments have resulted from vertically integrated value chains (e.g., Maertens et al., 2011).

5.3. Technology transfer, trough value chains, and productivity and income effects[23]

The empirical studies do confirm that the integration of smallholders with HS supply systems is often associated with important changes in the industrial organization of value chains, such as the growth of vertical coordination with important effects on access to technology, capital, and crucial inputs for local suppliers (Dries et al., 2009). Successful contract-farming typically involves technology and input transfers to local suppliers with limited access to capital and technology. Empirical studies document the resulting productivity increases from these technology transfers: see for example, Dries and Swinnen (2004, 2010), Gow et al. (2001), Maertens and Swinnen (2009), Minten et al. (2009), Negash and Swinnen (2013).[24] These studies find that technology (and management) transfer through value chains generates significant productivity increases both for the product itself and for other production activities at the farm level. For example, Minten et al. (2009) and Riera and Swinnen (2016) also find that the better technology

[21] Note that Figure 4 is a stylized and simplified version of a more complex set of surplus and distribution functions (see Kuijpers and Swinnen (2016) Swinnen et al. (2015) for more complex and more general cases).

[22] For example, Minten et al. (2009) show that in Madagascar most fresh fruit and vegetable production for exports is on very small farms, often on a contract-basis with the agrifood industry, and with important positive effects on farmers' productivity. Similar results are found by studies in Asia (Gulati et al., 2007), in Eastern Europe (Dries and Swinnen, 2004; Dries et al., 2009), and in China (Wang et al., 2014). Moreover, in some cases smallholder exclusion was imposed by the state rather than the market (Jia et al., 2012; Mo et al., 2012).

[23] For a formal model of the distributional and growth effects of technology transfer through value chains, see Kuijpers and Swinnen (2016).

[24] Similarly, Negash and Swinnen (2013) and Riera and Swinnen (2016) find positive effects on food security of smallholder biofuel value chains in Ethiopia because of (a) enhanced cash income during lean periods and (b) spillover effects on increased food crop productivity through fertilizer access from value chain contracts.

and management practices related to contract-farming spill over to other crops, generating large productivity increases in rice production, and further improving the food security situation of rural households.

Studies measuring the impacts on welfare, income or poverty often find positive effects for poor households in developing countries who may participate either as smallholder producers or through wage employment on larger farming companies (Maertens and Swinnen, 2009; Minten et al., 2009; Rao and Qaim, 2011; Rao et al., 2012).[25] These benefits occur in several of these cases despite the fact that trade is organized by monopsonistic exporting companies. These observations would be consistent with the theoretical arguments above why processors may pay their supplying farms an "efficiency premium" in high value chains, even with very unequal bargaining power. In a context of weak contract enforcement to deal with holdup opportunities for the farmers, processors may offer sufficiently attractive contract terms in order to secure their returns to investment. Hence, poor suppliers can benefit from the introduction of standards in a weak contract enforcement context.[26]

Much of the early literature considered vertical integrated production structures with large scale farming as a problematic sign of "exclusion of smallholders." More recent studies have pointed out that poor households in developing countries who participate in HS value chains through wage employment on larger farming companies may benefit as well and significantly so.[27] HS trade creates new employment opportunities in labor-intensive processing and handling of produce, and on vertically integrated large contracted farms. Maertens and Swinnen (2009), Maertens et al. (2012), Mano et al. (2011), and Van den Broeck et al. (2016) found that such employment is well-accessible for the poor and that this employment has a large positive effect on household incomes and on poverty reduction.[28]

Moreover, there seems to be a high demand specifically for female labor in these export sectors (Maertens and Swinnen, 2012). Besides the direct effects, this further results in indirect effects such as increased child schooling (Maertens and Verhofstadt, 2013). By creating off-farm employment opportunities for women, HS agrifood export chains can contribute to female empowerment in rural households.

Finally, Xiang et al. (2012) simulate the general equilibrium effects of the growth in high standards food on household welfare. Their simulation results indicate that the growth and equity effects of HS production are determined by a complex set of factors and mechanisms, including the functioning of credit and labor markets, the factor intensity of the HS production systems, as well as the source of increased demand for HS products—factors that are often ignored in the empirical literature. Hence there is room for better empirical research.

6. Conclusion

While standards have played an important role in food trade and exchange for a very long time, in recent years, food standards have spread rapidly. These standards have spread through trade and foreign investments "linking rich consumers to poor producers", and have resulted in changes in the way global value chains are organized.

The rise and spread of standards has triggered vigorous debates on the impacts on international trade and development, with many arguing that standards are mostly "nontariff barriers" to trade and that standards are detrimental to poor farmers as they will be marginalized since they cannot satisfy the new requirements. Both debates, although separated, have key similarities in the way they have been analyzed and discussed. In this article, I presented conceptual frameworks and reviewed empirical evidence on the equity and efficiency effects of standards. These equity and efficiency effects drive the choice of standards. I have explained why models that incorporate essential aspects of standards yield complex theoretical results and nuanced conclusions; and that careful empirical analyses support such nuanced arguments and complex effects.

Standards can generate efficiency gains by solving (or reducing) externalities or asymmetric information problems, but they typically also involve implementation costs. Under these assumptions, standards can create welfare gains but also involve rent redistribution between consumers and producers, and among consumers and among producers. These rent distributional effects will induce lobbying by these groups to set the standards at their preferred level. Hence, socially optimal standards are likely to have an impact on trade. However at the same time political processes are unlikely to yield socially optimal outcomes. These conclusions have major and difficult implications for policy-makers and for analysts: they make it hard to distinguish socially desirable standard (levels) from those resulting from political rent-seeking.

Also the development implications are complex. It is crucial to explicitly account for the endogeneity of the institutional organization of value chains when considering the impact of

[25] Maertens and Swinnen (2009) find that farmers' income increased strongly as a result of being included in the horticultural export chain in Senegal; and Dedehouanou et al. (2013) point out that this increases farmers' subjective well-being or happiness. Rao and Qaim (2011) and Rao et al. (2012) find that the participation of smallholder vegetable farmers in high-standard supermarket channels in Kenya increases farm productivity and income with almost 50%. Minten et al. (2009) find that inclusion in a contract-farming scheme for high-standard vegetable export production in Madagascar improves poor households' food security.

[26] Handschuch et al. (2013), Asfaw et al. (2009), and Subervie and Vagneron (2013) find that smallholders' certification to GlobalGAP results in improved quality, increased volumes, higher farm-gate prices and higher net incomes from fruit or vegetable production for respectively Chile, Kenya, and Madagascar.

[27] Maertens and Swinnen (2009) find that farmers' income increased strongly as a result of being included in the horticultural export chain in Senegal; and Dedehouanou et al. (2013) point out that this increases farmers' subjective well-being or happiness. Rao and Qaim (2011) and Rao et al. (2012) find that the participation of smallholder vegetable farmers in high-standard supermarket channels in Kenya increases farm productivity and income with almost 50%.

[28] The increase in standards may also create improved employment conditions for workers (Barrientos et al., 2003; Colen et al., 2012).

standards on development and poverty. Both theoretical analyses predict and empirical studies show that there is much heterogeneity on how high standards affect the industrial organization of high standards value chains, and on their supply systems, reflecting differences in resource constraints and factor intensity in production, market imperfections, institutions for contract enforcement, etc. Recent studies show that HS benefits for the poor may result both from smallholder contracting and from employment creation in rural areas on large scale production and processing facilities.

Interesting issues that I did not cover in this article are the dynamic political and economic effects. Historical evidence suggests that there are indeed important dynamic political economy components of food standards. Many of today's food standards have their roots in regulations in the 19th century or even earlier and have influenced the development of the food industries. Countries with similar food production systems and consumer preferences may diverge importantly after the introduction of different standards. Examples are the introduction of the Reinheitsgebot (Purity Law) in Germany about 500 years ago, which still has a lasting impact on the German beer market (Van Tongeren, 2011), or the introduction of different food (including chocolate) regulations in western countries in the mid 19th century, or of different wine regulations in the early 20th centuries (Meloni and Swinnen, 2013, 2014, 2015), which had long-lasting impacts on the economic development of the food industry and the political economy of later negotiations on food standards. A more recent example is the divergence of GMO regulations in both OECD and developing countries with major implications for agriculture and related industries. There is little known on these dynamic issues and this is certainly an interesting research area for the future.

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