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When are Private Standards more Stringent than Public Standards?

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Abstract

Retailers' private standards are increasingly important in addressing consumer concerns about safety, quality and social and environmental issues. Empirical evidence shows that these private standards are frequently more stringent than their public counterparts. I develop a political economy model that may contribute to explaining this stylized fact. I show that if producers exercise their political power to persuade the government to impose a lower public standard, retailers may apply their market power to install a private standard at a higher level than the public one, depending on several factors.

Keywords: Private standards, public standards, political economy
JEL classifications: D72; L15

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1 Introduction

Private standards, introduced by private companies, are increasingly important in the global market system (Henson and Hooker 2001; Henson 2004; Fulponi 2007). Retailers and producers have the possibility to introduce private standards in the same domains as in which the government imposes public standards, such as safety, quality, and social and environmental aspects of production, retail, and consumption.

Retailers and companies have a variety of motives to implement private standards. First, private standards may reduce consumers' uncertainty and information asymmetry about product characteristics such as safety, quality, and social and environmental aspects, thus increasing consumer demand. For example, Kirchhoff (2000) shows that firms may voluntarily reduce pollution to attract 'green' consumers if firms are able to signal their pollution abatement, for example through a private standard. Similarly, in a business to business environment, private standards allow to ensure and communicate product attributes about production, quality etc. which may facilitate firms to gear their activities to one another.

Second, firms may use private standards as strategic tools to differentiate their products, thus creating market segmentation and softening competition. A basic result from the vertical differentiation literature is that firms are able to reduce price competition and raise their profits by differentiating the (vertical) quality attribute of their products (see e.g. Spence 1976; Mussa and Rosen 1978; Tirole 1988). Such quality differences can be signaled by setting a private standard. Several other authors have

shown that in a vertically differentiated market a minimum quality standard imposed by the government (a public standard) may raise welfare, depending on the type of competition between producers (see e.g. Leland 1979; Ronnen 1991; Boom 1995; Crampes and Hollander 1995; Valletti 1995; Winfree and McCluskey 2005). If the minimum quality standard is not prohibitively high such that it does not exceed the highest quality voluntarily supplied by producers, firms differentiate their quality levels: some produce at the minimum quality level while others produce at a higher quality level. The latter firms can signal their higher quality by setting a private standard that is more stringent than the public minimum quality standard (see e.g. Arora and Gangopadhyay 1995).

Third, private standards may also serve to preempt government regulations. For example, Lutz *et al*. (2000) show – in a vertical differentiation model with minimum quality standards – that high-quality firms may have an incentive to commit to a quality level before public standards are set, in order to induce the regulator to weaken public standards. They demonstrate that this results in welfare losses.[1] In the same line of reasoning, McCluskey and Winfree (2009) argue that an important advantage of private over public standards is that the former are more flexible in response to changes in consumer tastes and preferences, and to changes in technology. Therefore, by preempting public standards through setting their own private standards, firms may minimize the negative effect of standards on revenues. From a political economy perspective, Maxwell *et al*. (2000) argue that firms may strategically preempt costly political action through

[1] Lutz *et al*. (2000) assume that firms are the first movers in the standard-setting process by committing to a fixed quality level, whereas other papers on minimum quality standards (such as Leland 1979; Ronnen 1991; Valletti 2000; Boom 1995) typically assume the government to be the first mover in setting minimum quality standards.

voluntary private standards. They argue that a private standard raises consumers' welfare in the event that no public standard is imposed, which reduces consumers' incentives to lobby for a public standard in case political entry is costly for consumers. The authors show that this preempting private standard is more stringent than the public standard which would have been imposed in absence of the private standard.

Fourth, some authors have argued that instead of introducing private standards, firms may favor the imposition of a public standard that applies to all firms. Salop and Scheffman (1983) develop a model to show that a firm may demand stricter public standards if compliance is relatively more costly for its rivals. Similarly, Swinnen and Vandemoortele (2008; 2009; 2011) show that domestic firms may lobby in favor of a public standard if the standard's marginal impact on production costs is larger for foreign than domestic firms. They show that if the political power of domestic firms is sufficiently large, standards may serve as protectionist instruments, either by over- or under-standardization. Maloney and McCormick (1982) argue that firms may benefit from public standards if the regulation increases marginal costs more than average costs. Their result holds either when entry is restricted, or when entry is free and the price effect exceeds the cost effect only for a subset of firms.

Empirical evidence shows that 80% to 90% of retailers assess their own private standards slightly or significantly higher than public standards (see Figure 1). So far, to the best of our knowledge, only two models may offer an explanation for this observation, i.e. why retailers set their private standards at higher levels than what is required by law – and both explanations have weaknesses. First, the explanation offered by the vertical differentiation literature is that those retailers who set their private

standard at a higher level than the public minimum quality standard aim at differentiating themselves from other retailers that sell at the minimum quality standard, thus raising profits by reducing competition. However, this does not explain the phenomenon that organizations such as the BRC (British Retail Consortium) or the GLOBALG.A.P. (Global Partnership for Good Agricultural Practice) introduce private standards that are more stringent than public standards, and that these relatively stringent private standards are adopted by almost all retailers in European countries. Another important example is the Global Food Safety Initiative (GFSI), a standard-setting organization where leading retailers collaborate in developing collective private standards for food safety and/or sustainability (Fulponi 2007).

Second, the political economy model of Maxwell *et al*. (2000) offers another potential explanation for the relative stringency of private standards vis-à-vis public standards: private standards may preempt public standards if consumers' costs of getting politically organized are sufficiently high. This model explains why private standards are imposed in some domains where public standards are lacking. However, the model does not explain why private standards may be higher in areas where public standards already exist.[2]

The aim of this paper is to provide an additional explanation for the observation that private standards may be set at higher levels than their public counterparts – even when implementation costs do not differ between public and private standards. In our analysis, we assume that both public and private standards positively affect consumer utility by reducing information asymmetries, and that they both involve implementation

[2] In the explanation of McCluskey and Winfree (2009), public standards are imposed (even though preempted by private standards) but at equal or higher levels than private standards.

costs for producers. Consumer utility and production costs are not affected differently by public and private standards, ceteris paribus, so differences in the level of public and private standards are not attributable to intrinsic differences between public and private standards. This is different from McCluskey and Winfree (2009) who assume that private standards are less costly to implement and may therefore be used to preempt public standards.

A key innovation of our model is that we explicitly account for the role of a third (private) party in private standard-setting. So far the literature has only considered two-agent models with 'producers' and 'consumers'. However in reality there are often more agents than 'final consumers' and 'primary producers', and the same model has been used to interpret various stages of the chain. Hence, traders, processors, or retailers could be either 'producers' or 'consumers' depending on the specific case being considered.

In our model we explicitly account for the role of a third private agent and we show that this may have important effects on private standard-setting. More specifically, we model a three-agent chain with producers, retailers, and consumers, where retailers transfer goods from producers to consumers. In reality many private standards are set by retailers or retailer groups – not by producers. Moreover, as our analysis will show, retailers' interests in setting private standards do not necessarily coincide with producers' interests. Retailers' optimal private standards may be suboptimal from the producers' perspective. Therefore we explicitly introduce a monopolist retailer that may set a private standard to regulate the same product characteristics as the government's public standard. The assumption that the retailer is a monopolist is a convenient approach to impose retailers' market power without introducing additional complexity to the model. We

discuss later how this assumption – and thus retailers' market power – affects our results.[3]

The public standard is assumed to be determined in a political game where producers and the retailer have political power to influence the government's standard-setting process. We model this political economy game along the lines of the model in Swinnen and Vandemoortele (2011) which is based on the seminal model of Grossman and Helpman (1994). We assume there are no fixed costs of entering the political game. This assumption is different from Maxwell *et al*. (2000) who argue that private standards may preempt public regulation because the former reduce consumers' incentives to lobby for public standards in case political entry is costly.

Our analysis yields several findings. Most importantly, our analysis offers an explanation for the relative stringency of private standards vis-à-vis public standards. We show that a retailer may set its private standard at a higher level than the government's optimal public standard if the retailer is able to shift the burden of the private standard's implementation cost to producers. This outcome depends on the retailer's market power and producers' political influence. We show that also other factors such as the standard's efficiency gain, implementation cost, and rent transfer from the retailer to producers affect the relative stringency of private versus public standards. Additionally, we show that side payments from producers to the retailer may influence the outcome, i.e. the levels of private and public standards.

[3] We denote the third party as the 'retailer', but this market player may be any intermediate between producers and consumers, e.g. a processing firm. For our analysis, the third party's relevant characteristics are that it acts as an intermediate between producers and consumers, and that it has some market power in exercising its function.

The paper is structured as follows. Section 2 specifies the different market agents in our model, i.e. consumers, producers, and the monopolist retailer, and determines the market equilibrium for a given standard. Section 3 analyzes how a standard affects the different market players. In Section 4 we first determine the retailer's optimal private standard, and second we model the government's decision-making process on public standards which determines the government's optimal public standard. We then compare the levels of the retailer's optimal private standard and the government's optimal public standard to show under which conditions the private standard is set at a higher level than the public one, and which factors influence these conditions. Additionally, Section 4 analyzes to what extent retailers' market power is important to our results. Section 5 applies the model to the case of private standards that regulate developing countries' high-value export sectors. Finally, Section 6 extends the model by allowing for side payments by producers to influence the retailer's private standard-setting behavior, and analyzes how this affects our results. The last section concludes the paper.

2 The Model

We first specify the different market players and the market equilibrium for a given standard, public or private. We assume that consumers are ex ante uncertain about the characteristics of the product (see also Leland 1979). Standards may thus improve upon the unregulated market equilibrium by guaranteeing the presence or absence of respectively positive or negative experience or credence characteristics (Nelson 1970; Darby and Karni 1973) and by reducing asymmetric information between consumers and producers. Similar to most studies, we assume that the introduction of a standard involves implementation costs for producers (see e.g. Leland 1979; Ronnen 1991; Valletti 2000).

We assume that private and public standards are intrinsically the same, i.e. that their impacts on consumer utility and production costs are not different, ceteris paribus, such that differences in levels of public and private standards are not attributable to intrinsic differences between public and private standards. A novel feature of our model is the inclusion of an intermediary agent – a retailer – that transfers products from producers to consumers. We limit our analysis to a closed-economy model to refrain from potential standards-as-barriers-to-trade issues.

2.1. Consumers

Consider a standard which guarantees certain quality/safety features of the product. Such a standard positively affects utility as it reduces or solves information asymmetries. Therefore a standard induces to consume more of the product through an increased willingness to pay, ceteris paribus. For example consumers who perceive health problems with certain (potential) ingredients or production processes may increase consumption if they are guaranteed the absence of these elements. To model this, we assume a representative consumer utility function $u(x,s)$ where x is consumption of the good, and s is the (public or private) standard. A higher s refers to a more stringent standard. Consumer utility is increasing and concave both in consumption $(u_x > 0; u_{xx} < 0)$ and the standard $(u_s > 0; u_{ss} < 0)$.[4] We further assume that $u_{xs} > 0$, i.e. that a standard has a larger marginal impact on consumer utility if consumption is larger. The representative consumer maximizes consumer surplus Π^C by choosing consumption x:

[4] In the remainder of the paper, subscripts denote partial derivatives to x or s, and superscripts refer to consumers (C), producers (P), the retailer (R), social welfare (W), or the government (G).

$$\Pi^C = \max_x \left[u(x,s) - px \right], \tag{1}$$

where p is the consumer price. The first order condition of this maximization problem is

$$\frac{\partial \Pi^C}{\partial x} = u_x - p = 0 . \tag{2}$$

Rewriting Equation (2) gives

$$p = u_x(x,s), \tag{3}$$

which implicitly defines the inverse demand function $p(x,s)$. The inverse demand function is downward sloping with $p_x = u_{xx} < 0$. For simplicity, u_{xxs} is assumed to be zero, i.e. the slope of the inverse demand function is not affected by the standard. Since $p_s = u_{xs} > 0$, a higher standard shifts the inverse demand function upwards. The reduced-form expression for consumer surplus is

$$\Pi^C(x,s) = u(x,s) - p(x,s)x . \tag{4}$$

2.2. Producers

We assume that production is a function of a sector-specific input factor that is available in inelastic supply. All profits made in the sector accrue to the specific factor owners, i.e. the producers. We assume that a standard imposes some production constraints or obligations which increase production costs. The idea behind this assumption is that all standards can be defined as the prohibition to use a cheaper technology. Examples are the prohibition of an existing technology (e.g. child labor) or of a technology that has not yet been used but that could potentially lower costs (e.g. GM technology). Also traceability

standards can be interpreted as a prohibition of cheaper production systems which do not allow tracing the production.

To model this, consider a representative producer with cost function $c(x,s)$ that depends on output and the standard.[5] The cost function is assumed to be 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 $c_{xs} > 0$, i.e. that a standard has a larger marginal impact on production costs for a larger output. Producers are price takers, maximizing their profits Π^P by setting output x:

$$\Pi^P = \max_x \left[wx - c(x,s) \right], \tag{5}$$

where w is the producer price. The first order condition of this maximization problem is

$$\frac{\partial \Pi^P}{\partial x} = w - c_x = 0. \tag{6}$$

Rewriting Equation (6) gives

$$w = c_x(x,s), \tag{7}$$

which implicitly defines the inverse supply function $w(x,s)$. The inverse supply function is upward sloping with $w_x = c_{xx} > 0$. For simplicity, c_{xxs} is assumed to be zero so that the slope of the inverse supply function is not affected by the standard. Since $w_s = c_{xs} > 0$, a higher standard shifts the inverse supply function upwards. The reduced-form expression for producer profits is

$$\Pi^P(x,s) = w(x,s)x - c(x,s). \tag{8}$$

[5] Since in equilibrium consumption equals output, we use the same symbol x for both output and consumption.

In the remainder of the analysis we assume that production costs are sufficiently convex and consumer utility sufficiently concave in s to ensure global maxima.

2.3. The Retailer

We assume that output is sold by producers to consumers through one intermediary agent – a monopolist retailer. This assumption is a convenient approach to model retailer market power without introducing additional complexity to the model. We discuss later how this assumption – and thus retailers' market power – affects our results. We will show that retailers' market power is one part of the explanation why some industry-wide private standards are more stringent than public standards.

The retailer's handling costs are normalized to zero. The monopolist retailer is a Stackelberg leader who sets consumer and producer prices such that, under optimal price-taking behavior of consumers and producers, consumption and output equal at a level that maximizes the retailer's profits, Π^R. This is formally equivalent to maximizing the retailer's profits with respect to quantity, x, using the inverse supply and demand functions (7) and (3) which represent the optimal price-taking behavior of consumers and producers and thus define producer and consumer prices for a given quantity. Formally, the retailer's profits are

$$\Pi^R = \max_x \left[\left(p(x,s) - w(x,s) \right) x \right], \tag{9}$$

where $p - w$ is the retailer's margin.

2.4. The Market Equilibrium

The first order condition of the retailer's profit maximization is

$$\frac{\partial \Pi^R}{\partial x} = p - w + x\left(p_x - w_x\right) = 0\,, \tag{10}$$

and hence the equilibrium quantity $x^*(s)$, for a given level of the standard s, is

$$x^*(s) = \frac{u_x - c_x}{c_{xx} - u_{xx}}. \tag{11}$$

Equation (11) is not a closed-form solution since both u_x and c_x depend on x. The denominator is always positive because the cost function is convex and the utility function concave in x. The numerator is positive if $u_x > c_x$, or according to Equations (3) and (7), if $p > w$. This condition – which we assume to hold throughout the paper – assures a positive retailer margin and profits. The reduced-form expressions for consumer surplus, producer profits, and retailer profits at market equilibrium are respectively

$$\Pi^C(s) = u\left(x^*(s), s\right) - p\left(x^*(s), s\right)x^*(s); \tag{12}$$

$$\Pi^P(s) = w\left(x^*(s), s\right)x^*(s) - c\left(x^*(s), s\right); \tag{13}$$

$$\Pi^R(s) = \left[\, p\left(x^*(s), s\right) - w\left(x^*(s), s\right)\right]x^*(s)\,. \tag{14}$$

3 The Impact of a Standard

Before determining the optimal public and private standards and how they compare, it is instructive to analyze the effect of a marginal change in the standard (whether public or private) on the market equilibrium, the interests of the different market players, and

social welfare. The impact of a marginal change in the standard on the equilibrium quantity, $x^*(s)$, is

$$x_s^* = \frac{1}{2}\frac{u_{xs} - c_{xs}}{c_{xx} - u_{xx}}. \tag{15}$$

Equation (15) shows that the standard's marginal impact on the equilibrium quantity may be positive or negative. The equilibrium quantity increases with a more stringent standard if the upward shift in the inverse demand function, u_{xs}, is larger than the upward shift in the inverse supply function, c_{xs}; and vice versa.[6] In other words, a higher standard induces the retailer to transfer a larger quantity $\left(x_s^* > 0\right)$ if the standard's impact on the retailer's margin is positive $\left(p_s - w_s = u_{xs} - c_{xs} > 0\right)$. As Equations (10) and (11) show, a higher retailer margin allows the retailer to maximize its profits by setting a larger equilibrium quantity x^*.

Next, we derive the standard's marginal impact on the different market players' interests using the envelope theorem. The marginal change in consumer surplus, $\Pi^C(s)$, is

$$\frac{\partial \Pi^C(s)}{\partial s} = u_s - x^*(s)\left(u_{xs} + u_{xx}x_s^*\right). \tag{16}$$

It consists of the *efficiency gain*, u_s, i.e. the positive marginal utility impact because of reduced information asymmetries, minus the marginal change in consumption expenditures, $x^*(s)\left(u_{xs} + u_{xx}x_s^*\right)$. The marginal change in consumption expenditures per unit purchased is a consequence of both the higher willingness to pay for a product with a

[6] Since production costs are convex and consumer utility is concave in x, the denominator of Equation (15) is always positive.

higher standard $(u_{xs} > 0)$ and the change in willingness to pay because of a marginal change in consumption x_s^*. The size of the latter change in willingness to pay is determined by the slope of the inverse demand function, u_{xx}. Because the marginal change in consumption may be either positive or negative, consumption expenditures may increase or decrease with the standard. Hence the standard's marginal impact on consumer surplus is ambiguous. If the efficiency gain is larger than the marginal change in consumption expenditures, consumer surplus increases with the standard; and vice versa.

The marginal change in producer profits, $\Pi^P(s)$, is

$$\frac{\partial \Pi^P(s)}{\partial s} = x^*(s)\left(c_{xs} + c_{xx}x_s^*\right) - c_s, \tag{17}$$

where the first term, $x^*(s)\left(c_{xs} + c_{xx}x_s^*\right)$, is the marginal change in producer revenues and the second term, c_s, is the *implementation cost*, i.e. the marginal cost increase due to the prohibition of using a cheaper technology. The marginal change in producer revenues per unit sold is a consequence of the higher marginal production costs due to a higher standard $(c_{xs} > 0)$ and the change in marginal production costs because of a marginal change in output x_s^*. The size of the latter change in marginal production costs is determined by the slope of the inverse supply function, c_{xx}. Because the marginal change in output may be positive or negative, producer revenues may increase or decrease with the standard. Hence, the marginal impact of a standard on producer profits is also ambiguous. When the implementation cost is smaller than the marginal change in producer revenues, producer profits increase with the standard; and vice versa.

The marginal change in the retailer's profits, $\Pi^R(s)$, is

$$\frac{\partial \Pi^R(s)}{\partial s} = x^*(s)\left(u_{xs} - c_{xs}\right). \tag{18}$$

The factor $u_{xs} - c_{xs}$ is the marginal change in the retailer's margin and may be positive or negative, depending on the relative shifts of the inverse demand and supply functions. Hence the standard's marginal impact on the retailer's profits may be positive or negative. More specifically, the term $x^*(s)u_{xs}$ represents the marginal increase in the retailer's revenues because of the upward shift of the inverse demand function. The intuition is that, as consumers' willingness to pay is higher for a product with a more stringent standard, a higher standard allows the retailer to set a higher consumer price for a given level of consumption x^*. The higher consumer price results in higher revenues for the retailer but also in higher consumption expenditures for consumers (see Equation (16)). We therefore define $x^*(s)u_{xs}$ as the *rent transfer* from consumers to the retailer due to a higher standard. Similarly, the term $x^*(s)c_{xs}$ is the marginal increase in the retailer's expenditures due to the upward shift in the inverse supply function. With a higher standard, the retailer pays a higher producer price for a given level of output x^* to compensate producers for their higher marginal production costs. The higher producer price results in higher expenditures for the retailer and in higher producer revenues (see Equation (17)). Hence, we define $x^*(s)c_{xs}$ as the *rent transfer* from the retailer to producers because of a stricter standard. Equation (18) thus shows that the retailer's profits increase with a higher standard if the rent transfer from consumers is larger than the rent transfer to producers; and vice versa.

The second factor in Equation (18) is the same as the numerator of Equation (15) which implies that x_s^* has the same sign as $\frac{\partial \Pi^R(s)}{\partial s}$. This is in line with the discussion following Equation (15): an increase in the standard induces the retailer to transfer a larger quantity if the higher standard results in a higher retailer margin, or equivalently if the rent transfer from consumers is larger than the rent transfer to producers. Hence the equilibrium quantity only increases (decreases) if the retailer's margin and profits increase (decrease) in the standard.

We can now also analyze the standard's marginal impact on social welfare, $W(s)$, which is defined as the sum of consumer surplus, producer profits, and retailer profits:

$$W(s) = \sum_j \Pi^j(s), \text{ with } j = C, P, R. \tag{19}$$

The marginal change in social welfare is

$$\frac{\partial W(s)}{\partial s} = u_s - c_s + x^*(s) x_s^* (c_{xx} - u_{xx}), \tag{20}$$

and equals the direct welfare effects, i.e. the efficiency gain u_s minus the implementation cost c_s, plus an additional welfare gain (loss) if the equilibrium quantity increases (decreases). Therefore social welfare may increase or decrease with a higher standard, depending on the relative size of these factors. It is instructive to rewrite the third term in Equation (20):

$$\frac{\partial W(s)}{\partial s} = u_s - c_s + \frac{x^*(s)}{2}(u_{xs} - c_{xs}). \tag{21}$$

This shows that the third term is only positive if the standard's marginal impact on the retailer's profits is positive (see Equation (18)), i.e. if the rent transfer from consumers is larger than the rent transfer to producers.

In summary, it follows that all market players may gain or lose from a change in the standard, and that this change involves rent transfers between the different market players. Likewise, social welfare may either increase or decrease with a change in the standard, depending on the relative size of the efficiency gain, the implementation cost, and the different rent transfers.

4 Optimal Public and Private Standards

We analyze the optimal standard-setting behavior of both the retailer and the government. In line with the literature on minimum quality standards, we assume that the government moves first in setting its public standard (see e.g. Leland 1979; Ronnen 1991; Boom 1995; Valletti 2000). We solve the game by backward induction and therefore determine first the retailer's optimal private standard for a given level of the public standard. Second, we determine the government's optimal public standard and third, we compare the level of the retailer's optimal private standard, s^R, to the level of the government's optimal public standard, s^G. Finally, we analyze to what extent retailers' market power is important to our results.

4.1. The Retailer's Optimal Private Standard

Being the only intermediary agent between producers and consumers, the retailer is able to unilaterally impose a private standard.[7] The retailer maximizes its profits by imposing a private standard, given the market equilibrium in Equation (11) that takes into account the retailer's own optimal price-setting behavior and the consumers' and producers' optimal price-taking behavior. Formally, the retailer's optimal private standard, s^R, is determined by the following first order condition, subject to $s^R \geq s^G$:[8]

$$x^*\left(s^R\right)\left(u_{xs} - c_{xs}\right) = 0\,. \tag{22}$$

Equation (22) shows that $u_{xs}x^*\left(s^R\right) = c_{xs}x^*\left(s^R\right)$ at s^R. Referring to the discussion following Equation (18), Equation (22) implies that the rent transfer from consumers to the retailer equals the rent transfer from the retailer to producers at s^R. This is intuitive: the retailer sets its private standard at the level where marginal revenues from increasing the private standard equal marginal expenditures. Additionally, abstracting from the trivial case where $x^*\left(s^R\right) = 0$, Equation (22) implies that $u_{xs} = c_{xs}$ at s^R, i.e. that the retailer sets its optimal private standard such that the shift in the inverse demand function is equal to the shift in the inverse supply function. From Equation (15), it also follows that $x_s^* = 0$ at s^R.

[7] In the categorization of Henson and Humphrey (2008), such a private standard is labeled as a 'de facto public standard' although it is issued by a private organization, i.e. the retailer. These assumptions are consistent with private standards set by retail consortiums such as the BRC, GLOBAL.G.A.P., and GFSI.

[8] This condition reflects that the standard which effectively regulates the market is $s = \max\left\{s^G; s^R\right\}$. Since the retailer moves second, he has no incentive to set a private standard that is lower than the public one, s^G, even if the retailer's optimal private standard is lower than the public standard. Hence, either the retailer sets its private standard at a higher level than or equal to the government's public standard (which is assumed to be given at this stage), or the retailer refrains from setting a private standard.

Before turning to the government's optimal public standard, we first discuss the marginal change in consumer surplus, producer profits, and social welfare at the retailer's optimal private standard. This will already reveal some of the factors that play a role in the comparison between the levels of the public and private standard. At s^R, the standard's marginal impact on consumer surplus is

$$\left.\frac{\partial \Pi^C(s)}{\partial s}\right|_{s=s^R} = u_s - x^*\left(s^R\right)u_{xs}, \tag{23}$$

which equals the standard's efficiency gain minus the rent transfer to the retailer, and may be positive or negative. Consumer surplus increases at the retailer's optimal private standard if the efficiency gain is larger than the consumers' rent transfer to the retailer. Similarly, the standard's marginal impact on producer profits at s^R is

$$\left.\frac{\partial \Pi^P(s)}{\partial s}\right|_{s=s^R} = x^*\left(s^R\right)c_{xs} - c_s, \tag{24}$$

which equals the rent transfer from the retailer to the producers minus the implementation cost. The sign of Equation (24) is also undetermined: producers' profits decrease at the retailer's optimal private standard if the implementation cost is larger than the retailer's rent transfer to producers; and vice versa.

These marginal effects demonstrate that only under very specific circumstances – depending on the efficiency gain, implementation cost, and the different rent transfers – the interests of consumers and producers coincide with the retailer's interest. This only happens when Equations (23) and (24) simultaneously equal zero at s^R. In any other case, the interests of the various market players differ.

From Equation (21) it follows that at s^R the standard's marginal impact on social welfare is

$$\left.\frac{\partial W(s)}{\partial s}\right|_{s=s^R} = u_s - c_s\,, \tag{25}$$

which may be positive or negative depending on the relative size of the efficiency gain and the implementation cost. Hence, the retailer's optimal private standard, s^R, equals the socially optimal standard, s^W, if and only if the efficiency gain equals the implementation cost $(u_s = c_s)$ at s^R. In any other case the optimal private standard is either higher (if $u_s < c_s$ at s^R) or lower (if $u_s > c_s$ at s^R) than the socially optimal standard. The cause for the potential welfare sub-optimality of the retailer's optimal private standard is that the retailer does not incorporate the direct utility and cost effects into its profit maximizing behavior – the retailer only cares about maximizing the net rent transfer whereas the welfare calculus does take the net direct effects into account.

Importantly, Equations (23) and (24) show that even if the private standard would be socially optimal ($u_s = c_s$ at s^R), the private standard would involve rent transfers and consumers and producers could gain or lose.

4.2. The Government's Optimal Public Standard

We now analyze the public standard-setting behavior of a government that is interested in both interest group contributions and social welfare. For this purpose we build on the political economy model of public standards as developed in Swinnen and Vandemoortele (2011).

Consider a government that maximizes its own objective function which, following the approach of Grossman and Helpman (1994), consists of a weighted sum of contributions from interest groups and social welfare. Similar to Grossman and Helpman (1994), we restrict the set of policies available to politicians and only allow them to implement a public standard s. We assume that producers and the retailer are politically organized into separate interest groups that lobby simultaneously and that consumers are not organized.[9]

The 'truthful' contribution schedules of the producers and retailer are of the form $C^k(s) = \max\left\{0, \Pi^k(s) - b^k \mid s \geq s^R\right\}$ with $k = P, R$.[10] b^k is a constant, a minimum level of profits the interest groups do not wish to spend on lobbying. The government's objective function, $\Pi^G(s)$, is a weighted sum of the interest group contributions, weighted by α^k, and social welfare, where α^k represents the relative lobbying strength of the interest groups:

$$\Pi^G(s) = \sum_k \alpha^k C^k(s) + W(s). \tag{26}$$

[9] Our assumption that consumers do not lobby is not essential to our results. Consumer interests still play a role but through the social welfare function in the government's objective function.

[10] The common-agency literature (e.g. Bernheim and Whinston 1986) states that a truthful contribution schedule reflects the true preferences of the interest group. In our model this implies that lobby groups set their lobbying contributions in accordance with their expected profits and how these are marginally affected by the public standard. We refer to Swinnen and Vandemoortele (2011) for a proof of the truthfulness of these contribution schedules. The contribution schedules are conditional on $s \geq s^R$ to reflect that the standard which effectively regulates the market is $s = \max\left\{s^G; s^R\right\}$. Contributions in favor of a public standard lower than the optimal private standard have no effect on the standard that regulates the market $\left(s^R\right)$, and thus have no impact on the interest groups' profits. Hence contributions in the interval $s < s^R$ would not be truthful and therefore the contribution schedule is restricted to $s \geq s^R$. However, because the government moves first in setting its public standard, this restriction of the contribution schedules does not imply that the government is not able to set a public standard in the interval $s < s^R$.

The government chooses the level of the public standard to maximize its objective function in (26). Each possible level of the public standard corresponds to a certain level of producer and retailer profits, and hence also to a certain level of producer and retailer contributions. This is driven by the functional form and the truthfulness of the contribution schedules which imply that the government receives higher contributions from the producers' (retailer's) interest group if the public standard creates higher producer (retailer) profits. Conversely, the government receives less producer or retailer contributions if the public standard decreases their respective profits. Therefore maximizing the contributions from the producers' (retailer's) interest group by choosing the level of the public standard is equivalent to maximizing their respective profits, i.e. $\frac{\partial C^k(s)}{\partial s} = \frac{\partial \Pi^k(s)}{\partial s}$ for $s \geq s^R$. The government thus chooses the level of the public standard to maximize the weighted sum of producer profits, retailer profits, and social welfare.[11] The government's optimal public standard, s^G, is therefore determined by the following first order condition, subject to $s^G \geq s^R$:

$$\alpha^P \left[x^*\left(s^G\right)\left(c_{xx}x_s^* + c_{xs}\right) - c_s \right] + \alpha^R \left[x^*\left(s^G\right)\left(u_{xs} - c_{xs}\right) \right] + \left[u_s - c_s + \frac{x^*\left(s^G\right)}{2}\left(u_{xs} - c_{xs}\right) \right] = 0. \tag{27}$$

First order condition (27) implicitly defines s^G as a function of the lobbying strengths of the different interest groups $\left(\alpha^k\right)$, the efficiency gain $\left(u_s\right)$, the implementation cost

[11] Because the retailer is a monopolist, strong interactions between the government and the monopolist may exist. In the extreme case that the retail sector is a 'state monopoly' and that the government is only concerned with the state monopoly's profits (i.e. the monopolist retailer's profits), the public standard would be set at the retailer's optimal private standard and the government's optimal public standard would coincide with the retailer's optimal private standard. Our assumption that the monopolist has some positive political power α^R – which could be large – is less extreme.

(c_s), the rent transfers $\left(x^*\left(s^G\right)u_{xs}\right.$ and $\left.x^*\left(s^G\right)c_{xs}\right)$, and the marginal change in producer revenues $\left(x^*\left(s^G\right)\left(c_{xx}x_s^* + c_{xs}\right)\right)$, all evaluated at s^G.

4.3. A Comparison of the Retailer's Optimal Private Standard to the Government's Optimal Public Standard

We now compare the government's optimal public standard, s^G, to the retailer's optimal private standard, s^R, and analyze which factors determine their relative levels. Since production costs are sufficiently convex and consumer utility sufficiently concave in s to ensure that both Π^G and Π^R are concave in s, it suffices to determine the sign of the standard's marginal impact on the government's objective function at s^R, $\left.\frac{\partial \Pi^G(s)}{\partial s}\right|_{s=s^R}$.

Because of concavity, if $\left.\frac{\partial \Pi^G(s)}{\partial s}\right|_{s=s^R} > 0$ then $s^R < s^G$, and vice versa. Inserting into Equation (27) the results of Equation (22) that $u_{xs} = c_{xs}$ and $x_s^* = 0$ at s^R, the expression for the standard's marginal impact on the government's objective function at s^R is

$$\left.\frac{\partial \Pi^G(s)}{\partial s}\right|_{s=s^R} = \underbrace{u_s - c_s}_{(1)} + \alpha^P \left[\underbrace{x^*\left(s^R\right)c_{xs} - c_s}_{(2)}\right], \tag{28}$$

which may be positive or negative. Part (1) of Equation (28) equals the marginal social welfare effect of the standard at s^R (see Equation (25)), and may be positive or negative depending on whether the efficiency gain, u_s, is respectively larger or smaller than the implementation cost, c_s. Part (2) represents the standard's marginal impact on producer

profits at s^R (see Equation (24)). It consists of the rent transfer from the retailer to producers, $x^*\left(s^R\right)c_{xs}$, minus the standard's implementation cost, c_s, and is weighted by the political power of the producers' interest group, α^P. Part (2) may be positive or negative as well. Hence, a priori, it is not determined which of the two standards is more stringent. The retailer's optimal private standard may thus be higher or lower than the government's optimal public standard. We are particularly interested in the case where Equation (28) is negative, i.e. when the retailer's optimal private standard is more stringent than government's optimal public standard $\left(s^R > s^G\right)$, and which factors affect this.[12]

The key factors that lead to private standards being more stringent than public standards, i.e. $s^R > s^G$, are summarized by Equation (28). First, the rent transfer from the retailer to producers, $x^*\left(s^R\right)c_{xs}$, plays an important role. If either c_{xs} or $x^*\left(s^R\right)$ is smaller, the standard's marginal impact on producer profits at s^R (part (2) of Equation (28)) is more negative or less positive such that Equation (28) is more likely to be negative, and $s^R > s^G$. The upward shift in the inverse supply function, c_{xs}, measures how much the retailer additionally compensates the producers for an increase in the standard and a given level of the equilibrium output. A lower c_{xs} thus means that the rent transfer from the retailer to producers is lower, ceteris paribus, and that producers bear a

[12] Naturally, these same factors – in opposite direction – lead to the reverse situation where the retailer's optimal private standard is less stringent, i.e. $s^R < s^G$. However, this situation is not relevant since a private standard is redundant if less stringent than the public standard. Because the retailer moves second in setting its private standard, the retailer has no incentive to set a private standard that is lower than the public one. Hence, either the retailer sets its private standard at a higher level than the government's optimal public standard, or the retailer refrains from setting a private standard. As a consequence, it are the same factors as the ones we discuss (but in opposite direction) that explain the absence of private standards in specific markets.

larger share of the implementation cost. The rent transfer is also smaller relative to the implementation cost when the market is smaller ($x^*\left(s^R\right)$ lower). Hence, if either c_{xs} or $x^*\left(s^R\right)$ is smaller such that the retailer's rent transfer to producers is smaller, the producers' interest group lobbies in favor of a lower public standard and Equation (28) is more likely to be negative, i.e. $s^R > s^G$.

Second, when producer profits are marginally decreasing in the standard at s^R, i.e. when part (2) in Equation (28) is negative, a larger political power of the producers' interest group, α^P, increases the likelihood that Equation (28) is negative and $s^R > s^G$. When the producers' preferred level of the standard is lower than the retailer's optimal private standard, producers lobby in favor of a public standard that is lower than the retailer's optimal private standard. With a larger political power producers lobby more successfully, ceteris paribus, so that they are able to reduce the level of the government's optimal public standard.

Third, the size of the efficiency gain matters. If u_s is smaller, the marginal social welfare effect at s^R (part (1) of Equation (28)) is less positive or more negative. Hence, with a lower efficiency gain, Equation (28) is more likely to be negative such that $s^R > s^G$, ceteris paribus. A lower efficiency gain induces the government to set a lower public standard because of social welfare considerations, while the retailer does not take social welfare effects into account.

Fourth, the size of the implementation cost, c_s, affects both social welfare and producer profits. Equation (28) is more likely to be negative with a higher implementation cost, such that $s^R > s^G$. The intuition behind this result is that a higher

implementation cost causes the government to set a lower public standard, not only because of social welfare considerations but also because the producers' interest group lobbies in favor of a lower public standard. In contrast, the retailer is not concerned with social welfare effects, so that the retailer's optimal private standard is not affected by a change in the implementation cost. Due to producer lobbying, a change in the implementation cost has a larger impact on Equation (28) than a similar change in the efficiency gain (but in opposite direction), ceteris paribus.

To summarize, the retailer's optimal private standard is more likely to be higher than the government's optimal public one for markets and standards where (a) the retailer's rent transfer to compensate producers for the standards' implementation cost is smaller ($x^*\left(s^R\right)c_{xs}$ small); (b) the producers' interest group has a relatively large political power (α^P high) given that producers prefer lower standards than the retailer ($c_s > x^*\left(s^R\right)c_{xs}$ at s^R); (c) standards generate a small efficiency gain (u_s small); and (d) standards entail a large implementation cost (c_s high). Under these conditions, it is more likely that the retailer sets its optimal private standard at a higher level than the government's optimal public standard. Hence these factors may explain the observation that in some sectors, private standards are more stringent than public ones.

4.4. Retailers' Market Power

In this section, we analyze to what extent retailers' market power is important to our results. So far, for the sake of reducing complexity, we have modeled retailers' market power by assuming that only one firm is active in the retail sector. To analyze how the

results change when retailers have no market power we now consider a retail sector that is characterized by perfect competition.

The assumption of perfect competition among retailers has consequences for both the government's and retailers' optimal standard-setting behavior. First, in a perfectly competitive retail sector, each retailer i is identical and faces the same consumer and producer prices, respectively $p(x,s)$ and $w(x,s)$, where x is the sum of all quantities transferred by retailers, i.e. $x=\sum_i x_i$. An individual retailer i's profits are thus equal to $\Pi_i^R(s)=\left[p(x,s)-w(x,s)\right]x_i$. However, a retailer's average revenues $p(x^*,s)$ must equal average costs $w(x^*,s)$ in a stable and perfectly competitive market equilibrium, because of free entry and exit. As a consequence, retailers' profits are zero at market equilibrium for any potential level of the standard s. It then follows from the truthful contributions schedules specified above that under perfect competition the retailers' interest group never offers strictly positive contributions to the government. Therefore perfectly competitive retailers have no influence on the government's public standard-setting and the government's first order condition which determines s^G reduces to:

$$\left(1+\alpha^P\right)\left[x^*\left(s^G\right)\left(c_{xs}+c_{xx}x_s^*\right)-c_s\right]+u_s-x^*\left(s^G\right)\left(u_{xs}+u_{xx}x_s^*\right)=0. \qquad (29)$$

Second, retailers face additional constraints when setting private standards in a perfectly competitive retail sector. Retailers can only set individual private standards, i.e. there is no collusion in private standard-setting possible because this would be inconsistent with the perfect competition assumption that retailers have no market power. Moreover, perfect retail competition prevents a retailer from introducing an individual private standard with which producers are not willing to comply, i.e. a standard that

reduces producers' profits, because then producers would only sell to other retailers that set a lower or no individual private standard. In other words, a retailer can only set an individual private standard, s_i^R, that has a positive marginal impact on producers' profits. Formally, the producers' incentive compatibility constraint is

$$\left.\frac{\partial \Pi^P}{\partial s}\right|_{s=s_i^R} = x^*\left(s_i^R\right)\left(c_{xs} + c_{xx}x_s^*\right) - c_s \geq 0\,. \tag{30}$$

The same reasoning can be applied to consumers. Consumers are only willing to buy from a retailer that imposes an individual private standard if that private standard has a positive marginal impact on consumer surplus – otherwise consumers would only make purchases with other retailers who impose a lower or no individual private standard. The consumers' compatibility constraint is thus

$$\left.\frac{\partial \Pi^C}{\partial s}\right|_{s=s_i^R} = u_s - x^*\left(s_i^R\right)\left(u_{xs} + u_{xx}x_s^*\right) \geq 0\,. \tag{31}$$

Inserting the producers' and consumers' incentive compatibility constraints (respectively Equations (30) and (31)) into the government's first order condition (29) implies that $\left.\partial \Pi^G \big/ \partial s\right|_{s=s_i^R} \geq 0$. Because of concavity, it unambiguously follows that $s^G \geq s_i^R$. This result implies that perfectly competitive retailers have no incentives to impose individual private standards that are higher than the government's optimal public standard, and that retailers will therefore refrain from imposing private standards.[13]

[13] This result would be different in an oligopolistic retail sector where several retailers have some market power. This situation has been extensively analyzed in the literature on vertical differentiation and minimum quality standards, for example by Spence (1976), Ronnen (1991), and Valletti (1995), and their results would carry over to our analysis. In an oligopolistic retail sector, retailers would be able to set different individual private standards – with some higher than the public standard – as strategic tools to create market segmentation and softening competition.

This analysis shows that retailers' market power is a necessary condition for retailers' optimal private standards to be more stringent than the government's optimal public standard. Market power allows retailers to unilaterally impose private standards that violate producers' and/or consumers' incentive compatibility constraints, and that are potentially higher than the government's optimal public standard. We continue the remainder of this paper under the assumption of a monopolist retailer, i.e. that retailers have market power.

5 Application: Developing Countries' High Value Crop Exports

We use the example of developing countries' high value crop exports to developed countries to illustrate how the model's results and implications may carry over to real-world situations. Private standards are increasingly important in these export sectors. For example, Maertens and Swinnen (2009) document that the fresh and processed fruits and vegetables (FFV) sector is one of the most dynamic export sectors in developing countries and that FFV exports are increasingly confronted with tightening food standards set by large retailing companies. Maertens and Swinnen (2009) also argue that these private standards are frequently more stringent than their public counterparts.

In such high value crop export sectors as the FFV sector, consumers and the multinational retailer are typically located in the importing, developed country, and producers in the exporting, developing country. This has implications for the governments' objective functions in both countries. In the developed country, the government maximizes the sum of contributions from the retailer's interest group and social welfare, which comprises consumer surplus and the retailer's profits. In the developing country, the government maximizes the sum of contributions from the

producers' interest group and social welfare, which only consists of producer profits.[14] The standard's marginal impact on the governments' objective functions at s^R, for respectively the developed (DC) and less-developed (LDC) country, is

$$\left.\frac{\partial \Pi_{DC}^{G}(s)}{\partial s}\right|_{s=s^R} = u_s - x^*\left(s^R\right)u_{xs}; \tag{32}$$

and

$$\left.\frac{\partial \Pi_{LDC}^{G}(s)}{\partial s}\right|_{s=s^R} = \left(1+\alpha^P\right)\left[x^*\left(s^R\right)c_{xs} - c_s\right]. \tag{33}$$

If both Equations (32) and (33) are negative, the retailer's private standard is more stringent than both the developed and developing countries' public standards. From Equation (22) it follows that at the retailer's optimum $x^*\left(s^R\right)c_{xs} = x^*\left(s^R\right)u_{xs}$. Hence a necessary and sufficient condition for both Equations (32) and (33) to be simultaneously negative is that

$$u_s < x^*\left(s^R\right)c_{xs} < c_s. \tag{34}$$

Equation (34) demonstrates that the retailer's optimal private standard will be more stringent than the governments' optimal public standards in both the developed and developing countries if the efficiency gain (for the developed country's consumers) is smaller than the consumers' rent transfer to the retailer, and the implementation cost (for the developing country's producers) is larger than the retailer's rent transfer to producers.

Typically the implementation cost is relatively large in developing countries (c_s high), due to low human capital, imperfect capital markets, underdeveloped institutions,

[14] We thus assume that an interest group can only contribute to its own government, and that a government is only concerned with domestic welfare.

etc. Additionally, process standards such as for example traceability standards imposed by the GLOBALG.A.P. have a relatively low direct impact on consumers, i.e. u_s is low. If both factors are such that Equation (34) holds, the private standard set by the retailer will be more stringent than the public standards set by the developed and developing countries' governments. In combination, these factors may contribute to explaining why retailers' private standards are more stringent than public standards on developing countries' high value crop exports.

6 Extension: Side Payments

So far we have assumed that producers cannot directly influence the retailer's private standard-setting behavior. However, if producers are able to form into an interest group that influences the government's public standard-setting process, it is possible that they are also able to directly influence the retailer's private standard-setting behavior. In general, as Equation (24) shows, the producers' interests do not coincide with the retailer's interests. Therefore, producers may make side payments to convince the retailer of setting a private standard that is more aligned with the producers' interests.[15] This section analyzes how side payments from producers to the retailer may affect the results of our model, i.e. how the level of the retailer's optimal private standard compares to the level of the government's optimal public standard when side payments are possible.

To analyze the impact of these side payments, we need to make some additional assumptions. We assume that, after the public standard has been set by the government, the producers' interest group offers the retailer a truthful side payment schedule that

[15] This is of course conditional on the retailer's optimal private standard being more stringent than the public one.

specifies how much producers are willing to pay the retailer for each potential level of the private standard. The producers' truthful side payment schedule is of the form $S(s) = \max\left\{0, \Pi^P(s) - \Pi^P\left(\max\left\{s^G, s^R\right\}\right) \mid s \geq s^G\right\}$. The schedule implies that producers are willing to make side payments equal to at most the difference between their profits under a private standard s and their profits under the standard that regulates the market in the absence of side payments, i.e. $\max\left\{s^G, s^R\right\}$, where s^R and s^G are defined by respectively Equations (22) and (27). The side payments are restricted to the interval $s \geq s^G$ because, given that the market is regulated by the most stringent standard, side payments for a private standard that is lower than the public standard $\left(s < s^G\right)$ would have no impact on producers' profits, and would not be truthful.

Taking into account the producers' potential side payments, the retailer now maximizes $\Pi^R(s) + S(s)$ when setting its private standard. The retailer's optimal private standard with side payments, s^{RP}, is then determined by the following first order condition, subject to $s^{RP} \geq s^G$:[16]

$$x^*\left(s^{RP}\right)\left(u_{xs} + c_{xx}x_s^*\right) - c_s = 0. \tag{35}$$

Equation (35) is equivalent to setting the sum of the standard's marginal impact on the retailer's and producers' profits (respectively Equations (17) and (18)) equal to zero at s^{RP}. Hence, when setting a private standard with potential side payments, the retailer also takes the standard's marginal impact on producer profits into account. By making side payments to the retailer, producers obtain that the retailer internalizes the effect of a

[16] The standard that effectively regulates the market is now $s = \max\left\{s^G; s^{RP}\right\}$, and again the retailer has no incentive to set a private standard that is lower than the public one.

private standard on producer profits in its private standard-setting behavior. This implies that, when producer profits are marginally decreasing (increasing) in the standard at s^R, the optimal private standard with side payments s^{RP} is lower (higher) than s^R, given that s^{RP} is larger than s^G. In other words, the side payments induce the retailer to set a private standard that is more aligned with producers' interests.

As a consequence, these side payments may also have an impact on how the levels of the government's optimal public standard and the retailer's private standard compare to one another. Before we compare these levels, we first determine the government's optimal public standard, s^G, in the presence of side payments. To account for the potential side payments, the truthful contribution schedules of the producers and the retailer are adjusted to respectively $C^P(s) = \max\left\{0, \Pi^P(s) - S\left(s^{RP}\right) - b^P \mid s \geq s^{RP}\right\}$ and $C^R(s) = \max\left\{0, \Pi^R(s) + S\left(s^{RP}\right) - b^R \mid s \geq s^{RP}\right\}$. The government's optimal public standard, s^G, is then determined by the following first order condition, subject to $s^G \geq s^{RP}$:

$$\alpha^P\left[x^*\left(s^G\right)\left(c_{xx}x_s^* + c_{xs}\right) - c_s\right] + \alpha^R\left[x^*\left(s^G\right)\left(u_{xs} - c_{xs}\right)\right] + \left[u_s - c_s + \frac{x^*\left(s^G\right)}{2}\left(u_{xs} - c_{xs}\right)\right] = 0. \tag{36}$$

Because the interest group's contribution schedules are truthful, i.e. because the interest groups set their lobbying contributions in accordance with how their expected profits are *marginally* affected by the public standard, the side payments have no impact on the government's optimal public standard and the first order condition in (36) is the same as without side payments in (27).

As in Section 4.3, to determine whether the retailer's optimal private standard with side payments is stricter than the government's optimal public standard, we need to determine the sign of the standard's marginal impact on the government's objective function at s^{RP}, i.e. $\left.\frac{\partial \Pi^G(s)}{\partial s}\right|_{s=s^{RP}}$. If $\left.\frac{\partial \Pi^G(s)}{\partial s}\right|_{s=s^{RP}} < 0$ then $s^{RP} > s^G$, and vice versa. Using Conditions (35) and (36), the expression for the standard's marginal impact on the government's objective function at s^{RP} is

$$\left.\frac{\partial \Pi^G(s)}{\partial s}\right|_{s=s^{RP}} = \underbrace{u_s - c_s + \frac{x^*(s^{RP})}{2}(u_{xs} - c_{xs})}_{(1)} + (\alpha^P - \alpha^R)\left[\underbrace{x^*(s^{RP})(c_{xx}x_s^* + c_{xs}) - c_s}_{(2)}\right], \tag{37}$$

which may be positive or negative. Part (1) of Equation (37) is the standard's marginal impact on social welfare at s^{RP}, and can be positive or negative (see Equation (21)). Part (2) of Equation (37) represents the standard's marginal impact on producer profits at s^{RP} which may also be positive or negative (see Equation (17)). The retailer's optimal private standard with side payments, s^{RP}, may thus be higher or lower than the government's optimal public standard, s^G.

To examine whether the retailer's optimal private standard compares differently to the government's optimal public standard with and without side payments, we need to compare Equations (28) and (37). If Equation (37) is more negative than Equation (28), then, because of concavity, the retailer's optimal private standard with side payments will be further away from the government's optimal public standard than the retailer's optimal private standard without side payments, i.e. $s^G < s^R < s^{RP}$; and vice versa. Comparing

these equations is not straightforward since they are evaluated at different levels of the standard. However, in general Equation (37) will be less negative than Equation (28) (or even positive) if producer profits are marginally decreasing at s^R; and vice versa. To understand why this is the case, take the example where producer profits are marginally decreasing at s^R, and assume for simplicity that $u_s = c_s$ for any value of s. Then Equation (28) is negative and $s^R > s^G$. If producer profits are marginally decreasing at s^R, it also follows that $s^{RP} < s^R$ because of the producers' side payments to the retailer. Since s^{RP} is necessarily closer to the producers' preferred level of the standard than s^R, it follows from the concavity of the producers' profit function that the marginal decrease in producer profits is less negative at s^{RP} than at s^R. Hence part (2) of Equation (37) is less negative than part (2) of Equation (28). Moreover, the weight attached to part (2) is lower in Equation (37) than in Equation (28), i.e. $\alpha^P - \alpha^R < \alpha^P$, which reinforces the previous effect. Additionally, because $s^{RP} < s^R$, it follows from the concavity of the retailer's profit function that the standard's marginal impact on retailer profits is positive at s^{RP}, and thus that part (1) of Equation (37) is positive. Together these factors render Equation (37) less negative than Equation (28), such that, because of concavity, s^{RP} is closer to s^G than s^R to s^G. In the extreme, if these effects render Equation (37) positive, s^{RP} would be lower than s^G and thus the private standard would not be imposed if side payments are allowed. In contrast, if no side payments are possible, the private standard is set at a higher level than the public standard $\left(s^R > s^G\right)$.

The intuition behind the previous result is that if producer profits are marginally decreasing at the retailer's optimal private standard without side payments, and if this

private standard is more stringent than the public standard $\left(s^R > s^G\right)$, producers have an incentive to make side payments to the retailer to lower its private standard. These side payments reduce the level of the private standard set by the retailer $\left(s^{RP} < s^R\right)$ and the private standard is set closer to the government's optimal public standard. If these side payments are sufficiently large, they may even withhold the retailer from setting a private standard. In that case, the standard that governs the market is the public standard, s^G, and retailers receive side payments equal to $\Pi^P\left(s^G\right) - \Pi^P\left(s^R\right)$. If side payments would not be allowed, the standard that governs the market would be s^R since $s^R > s^G$.

Vice versa, if producer profits are marginally increasing at the retailer's optimal private standard without side payments, producers have an incentive to make side payments such that the retailer sets a higher private standard $\left(s^{RP} > s^R\right)$. If $s^R > s^G$, then Equation (37) is more negative than Equation (28) and the private standard with side payments is further away from the public standard $\left(s^G < s^R < s^{RP}\right)$. Moreover, if $s^R < s^G$ (Equation (28) positive), i.e. the retailer does not impose a private standard without side payments, producers' side payments may induce the retailer to set a private standard at a higher level than the public one (Equation (37) negative), i.e. $s^R < s^G < s^{RP}$

In summary, side payments may affect the comparison between the government's optimal public standard and the retailer's optimal private standard in either way, depending on how producers' interests are affected by the standard at the retailer's optimal private standard without side payments.

7 Conclusions

It is well documented that retailers' private standards are increasingly important in the global economy. Empirical evidence shows that these private standards are frequently more stringent than their public counterparts. Several explanations have been offered to explain this stylized fact, and this paper adds an additional potential explanation by taking a political-economic perspective.

In the model, we assume three market players, namely consumers, producers, and a monopolist retailer. The retailer is a necessary intermediary agent that transfers goods from producers to consumers. A standard is assumed to positively affect consumer utility, while it also entails implementation costs. Private and public standards are assumed to have the same effect on consumer utility, and on production costs, ceteris paribus. We assume that the government sets a public standard to maximize, in line with Grossman and Helpman (1994), an objective function that is the weighted sum of interest group contributions and social welfare. Additionally, the retailer may set a private standard that regulates the same characteristics as the government's public standard.

Under these assumptions, we first show that all three market players may gain or lose from (a change in) a standard, and that this change involves rent transfer between the different market players. Likewise, social welfare may either increase or decrease with a change in the standard, depending on the relative size of the efficiency gain, implementation cost, and different rent transfers.

Second, we show that only under very specific circumstances the retailer's optimal private standard is also optimal from both the consumers' and producers' perspective. In any other case, the market players' interests differ.

Third, our analysis demonstrates that the retailer's optimal private standard only maximizes social welfare if the standard's direct welfare effects on consumers and producers cancel out. The reason is that the retailer only cares about the standard's net rent transfer effects, not about the direct welfare effects which the welfare calculus does take into account. However, even if the socially optimal standard and the private one are equal, this does not imply that this level of the standard is optimal for consumers and/or producers, since even the standard that maximizes social welfare involves rent transfers.

Fourth, by comparing the retailer's optimal private standard to the government's optimal public standard, we show that several factors may cause the private standard to be more stringent than the public one. We demonstrate that a retailer is more likely to set a more stringent private standard if (a) the rent transfer from the retailer to producers is smaller such that producers bear a larger share of the standard's implementation cost; (b) the producers' interest group has a larger political power when producers' interests are opposite to those of the retailer; (c) the standard creates a smaller efficiency gain for consumers; and (d) the standard entails larger implementation costs for producers. We also show that retailers' market power is crucial in this argument: if retailers have no market power, private standards are never set at higher levels than public standards. Hence when producers use their political power to obtain lower public standards, retailers may apply their market power to set higher private standards. In combination these factors may contribute to explaining why industry-wide private standards may be more stringent than their public counterparts.

Fifth, we illustrate our model with an application to developing countries' high-value crop exports to developed countries and show how our model may contribute to

explaining why in these sectors private standards are more stringent than public standards, both imposed by the developing (exporting) and the developed (importing) country.

Sixth, we extend our model to allow producers to influence the retailer's private standard-setting behavior by making side payments, which may induce the retailer to set a private standard that is more aligned with producers' interest. Depending on how the producers' interests are affected by the standard at the retailer's optimal private standard without side payments, these side payments may affect the comparison between the government's optimal public standard and the private standard in either way.

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Figures

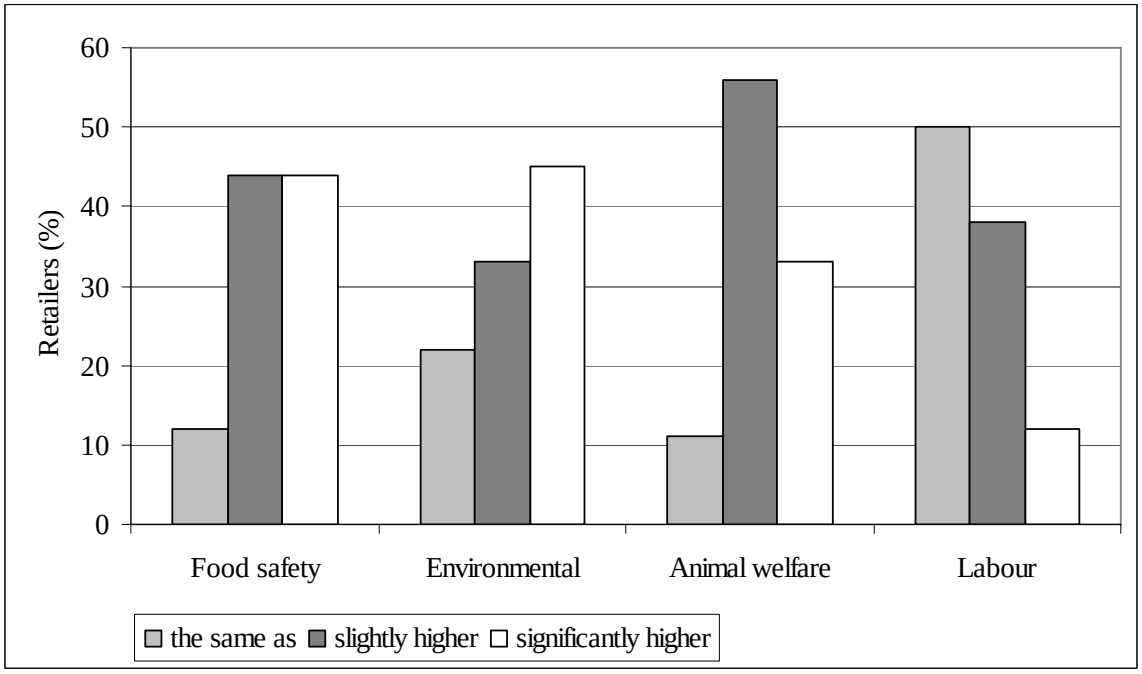

Figure 1. Retailers' self-assessed standards compared to those of government

(Source: Fulponi 2007)