Strength of Protection for Geographical Indications: Promotion Incentives and Welfare Effects

Luisa Menapace and GianCarlo Moschini

Abstract

We address the question of how the strength of protection for geographical indications (GIs) affects the GI industry's promotion incentives, equilibrium market outcomes and the distribution of welfare. GI producers engage in informative advertising by associating their true quality premium (relative to a substitute product) with a specific label emphasizing the GI's geographic origin. The extent to which the names/words of the GI label can be used and/or imitated by competing products—which depends on the strength of GI protection—determines how informative the GI promotion messages can be. Consumers' heterogeneous preferences (vis-à-vis the GI quality premium) are modeled in a vertically differentiated framework. Both the GI industry and the substitute product industry are assumed to be competitive (with free entry). The model is calibrated and solved for alternative parameter values. Results show that producers of the GI and of the lower-quality substitute good have divergent interests: GI producers are better off with full protection, whereas the substitute good's producers prefer intermediate levels of protection (but they never prefer zero protection because they benefit indirectly if the GI producers' incentives to promote are preserved). From the point of view of consumers and aggregate welfare, the preferred level of protection depends on the model's parameters, and an intermediate level of protection is optimal in many circumstances.

Key Words: competitive industry, geographical indications, informative advertising, labeling, promotion, quality, trademarks, vertical product differentiation.

JEL codes: D23, L15, M37, Q13.

This draft: January 7, 2014

Luisa Menapace is an assistant professor and BayWa endowed chair in Governance in International Agribusiness at Technische Universität München (Germany). GianCarlo Moschini is Professor and Pioneer Chair in Science and Technology Policy, Department of Economics and Center for Agricultural and Rural Development, Iowa State University.

Introduction

Geographical Indications (GIs) are names of places or regions used to brand goods with a distinct geographical connotation. Many GIs pertain to wines and agricultural and food products. The characterizing feature of GI products is that some quality attribute of interest to consumers is considered to be inherently linked to, or determined by, the nature of the geographic environment in which production takes place (e.g., climate conditions, soil composition, local knowledge, traditional production methods), what is sometime referred to as the "terroir" (Josling 2006). GIs are similar to trademarks in that they identify the origin or the source of the good and help differentiate individual products among similar goods by communicating the "specific quality" that is due to the geographical origin (Kireeva 2009). This suggests that GIs might also share some of the key economic functions recognized for trademarks: to reduce consumers' search costs for the desired product by avoiding confusion between goods that might appear identical before purchase (e.g., experience goods); and by providing firms with an incentive to supply the attributes that consumers of the trademarked product demand, i.e., a tool to facilitate reputation effects (Economides 1998; Landes and Posner 2003). As a result of these perceived important economic functions, GIs have gained recognition as a distinct form of intellectual property (IP) rights in the TRIPS (Trade Related Aspects of Intellectual Property Rights) agreement of the World Trade Organization (WTO) (Moschini 2004).

Whereas the TRIPS agreement requires WTO member countries to provide a minimum level of protection for GI names,[1] the form and strength of IP protection granted to GIs varies greatly among countries. In the European Union (EU), Regulation 1151/2012 provides strong protection for GIs (EU 2012). Only products genuinely originating in a given area can be labeled with the area's geographic name (i.e., the rights over the use of GI names for branding are exclusive to the producers operating in the designated production areas). Moreover, to comply with EU regulations, even the "evocation" of GI names by similar competing labels is not permitted. On this basis, for example, the trademarks Cambozola for blue cheese and Grana Biraghi for parmesan have been challenged for their similarities with the GIs Gorgonzola and Grana Padano (Kireeva 2009; Bainbridge 2006). In many other

---

[1] Specifically, the TRIPS agreement requires WTO member countries to provide legal means to prevent any use of GI names "which constitutes an act of unfair competition" (TRIPS Art.22.2).

countries, however, it is legally permissible to use GI names to label products that do not originate within the denoted geographical region. For example, in the United States it is permitted to label sparkling wines produced in California as Champagne and to label as Romano a cheese made in Wisconsin.[2] These conflicting strengths of IP protection are a source of ongoing controversy among WTO members (Fink and Maskus 2006). Some countries, such as those of the EU, are in favor of stronger protection for GIs, whereas other countries, including the United States, oppose the strengthening of IP provisions for GIs.

Because IP rights attempt to provide a second-best solution to complex market failures, the notion of an optimal strength of protection naturally arises.[3] Given the prominent role played by the strength of protection in policy discussions concerning GIs, it is disappointing to find that, despite a number of contributions studying various economic aspects of GIs,[4] this concept has not been modeled explicitly. Consequently, the main purpose of this article is to develop an economic model wherein the effects of the "strength" of IP protection for GIs can be analyzed. Our approach relies on postulating a critical link between the strength of GI protection and the effectiveness of promotion efforts meant to inform consumers on the value of GI products. In turn, the latter is presumed to depend on the extent to which GI names and/or concepts are allowed to be used by non-GI products, i.e., on the permissible similarity between GI and non-GI labels. GI names can be thought of as collective trademarks (Menapace and Moschini 2012) and, as noted earlier, the economic value of trademarks is rooted in their ability to improve consumer information.

To investigate what we perceive as the relevant information issues in this setting, GI promotion is modeled as "informative advertising," following one of the main strands of economic analysis of firms' promotion activities (Bagwell 2007). Specifically, when consumers lack information regarding the existence or the features of a product, there is scope for producers to expand market demand through promotion. GI promotion, in this context,

---

[2] This branding practice is subject to some restrictions including the fact that the "real origin" of the product must be specified on the label.

[3] The strength of patents, for example, is typically related to patent length and patent breadth (Clancy and Moschini 2013).

[4] Studies include Anania and Nistico (2004); Zago and Pick (2004); Lence et al. (2007); Moschini, Menapace, and Pick (2008); Costanigro, McCluskey, and Goemans (2010); Mérel and Sexton (2012); Menapace and Moschini (2012).

attains the "extending reach" function of advertising discussed by Norman, Pepall, and Richards (2008). By affecting the information effectiveness of GI labels, the strength of IP protection indirectly affects the ability of promotion to inform consumers in two possible ways. First, weak IP rights favor spillovers of information about features that are common across products. For example, a promotional effort that informs consumers that "Pecorino Romano" is a "hard, salty, and sharp" cheese also informs consumers that all Romano-labeled cheese is "hard, salty, and sharp." Hence, promotion by either GI or non-GI producers expands the demand facing all firms when products share similar labels. Other things equal, the presence of spillovers can increases the demand impact of the information generated by each dollar spent in promotion. Second, weak IP protection might favor the dilution of the specific informational content of GI promotion. When the GI product and its substitutes share important name similarities, it might be more difficult for GI producers to successfully inform consumers about the distinctive (superior) features of their product. In such a case, with some probability, the piece of information regarding the GI's specific quality goes unnoticed or is erroneously attributed to the generic substitute. *Ceteris paribus*, dilution reduces the amount of correct information produced from each dollar spent by GI producers, which may reduce their incentive to promote.

In this market environment, producers of the GI-like product have at least two types of incentives to use brand names that resemble the GI. One consists of the counterfeiting motive, i.e., firms producing lesser quality products have the incentive to pass them off as that of a better quality competitor in order to capture the price premium associated with the better quality. In the analysis that follows we will ignore the possibility of counterfeiting: the economic consequences of fraudulent behavior are fairly clear, and such activities are illegal and presumably can be discouraged with appropriate penalties. A second motive for non-GI goods to use GI-like brand names is that firms can free ride on the information spillovers that may arise from the promotion efforts of other firms.[5] These effects constitute the focus of

---

[5] In reality there is a continuum of imitation strategies, running from pirating/counterfeiting to developing actually innovative products that are, however, inspired by pioneering brands (Schnaars 1994). To illustrate the distinction that is relevant here, compare and contrast two hypothetical cases: (i) a soft-ripened cheese produced in Wisconsin but marketed with the exact copy of a French Brie label; and (ii) the use of the word "Brie" for a soft-ripened cheese that clearly and truthfully discloses Wisconsin as its origin in the label. Case (i) is an obvious instance of counterfeiting, whereas case (ii) illustrates an imitation situation enabled by the lawful use of a GI-like label.

this paper and, accordingly, our analysis will assume that promotion/advertising is truthful. Still, as we will show, when producers of the substitute products are legally permitted to choose labels similar to those of GIs, the information spillover and dilution effects turn out to play important roles.[6]

The supply side of our model develops a structural representation of production that is consistent with key GI institutional features. We stress the competitive nature of the production setting, which at the farm level typically involves many small producers, and we provide a vehicle for these producers to collectively promote their GI product to consumers. Our representation admits positive aggregate returns to producers, even in an equilibrium with free entry, so that welfare distributional questions associated with the debate surrounding the strength of GI protection can be meaningfully addressed. The novelties of the paper are perhaps more apparent in how the demand side is handled. The model implements a vertical product differentiation (VPD) demand structure. Following Gabszewics and Thisse (1979) and Shaked and Sutton (1982), this has become the natural framework of analysis when, as in our case, the presumption is that (fully informed) consumers rank the quality of GI products higher than that of their generic counterparts. But for reasons articulated in what follows, we find the common unit-demand specification of Mussa and Rosen (1978) unappealing in our context, and thus a major part of the paper is devoted to the development of a new parameterization of VPD demand functions, based on the approach of Lapan and Moschini (2009). Furthermore, we propose a novel way to parameterize the strength of GI protection in terms of the permissible similarity between GI and non-GI labels, and show how this features affects the information content of informative advertising, leading to a segmentation of the market according to whether consumers are fully or partially informed.

The Model

We consider a market with two goods, a GI product (labeled G) and a substitute good (labeled S). This market is considered in isolation, i.e, a partial equilibrium setting in a closed economy. On the production side, the two goods are provided by two industries that engage in truthful

---

[6] The informative nature of advertising, in principle, can solve the information problem of consumers, provided they are reached by advertising messages, and subject to the aforementioned implications of labels that are too similar. In this setting, therefore, the question of whether one is dealing with credence or experience goods, often of interest in food markets (e.g., Roe and Sheldon 2007; Lapan and Moschini 2007), is not germane.

promotion of their goods (informative advertising), and display features consistent with the competitive structure of agricultural and food sector, as well as institutional attributes of GI product organizations (EU 2008). On the demand side, as noted, it is assumed that these two goods are vertically differentiated.

Production

The presumption is that producers of good G, located in the GI region, are endowed with a collective organization that develops their label and promotes their product. On the other hand, all producers in the region are presumed free to produce the good G as long as they meet the obligations specified by the GI organization (see, e.g., EU 2008). Thus, as in Moschini, Menapace, and Pick (2008), we model the GI industry as competitive and with free entry. Furthermore, we wish to represent a situation where there are economic returns to GI producers over and above their production costs, i.e., there are diseconomies of scale at the industry level. This is accomplished by postulating heterogeneity of GI producers, which is *per se* an attractive attribute for agricultural productions regions typically associated with GI products. Specifically, individual GI firms have a cost function $C_G(q, \eta_G)$, where q is the firm's output and η_G is an (in)efficiency parameter. The firms' cost function is strictly increasing and convex in output, and it is strictly increasing in the firm-specific inefficiency parameter, such that $\partial C_G(q, \eta_G)/\partial \eta_G > 0$. The firms' heterogeneity parameter η_G is assumed to follow some distribution on the support $[\ell_G, \bar{\eta}] \subseteq [0, \infty)$, with density $\delta_G(\eta_G)$ (which measures how many firms of type η_G there are).

A critical feature of our analysis is that promotion of the GI good is required in order to enhance consumer demand, and this is a costly activity paid for by GI producers. We presume that the institutional setup of GI products allows such promotion to be coordinated, and specifically posit that a GI organization raises the required promotion funds by levying a fee $f > 0$ per unit of GI output produced. Apart from that, GI firms act as independent profit maximizers when deciding whether or not to produce (i.e., whether to join the GI industry) and how much output to produce. Active firms therefore choose a production level $q_G^* = q_G(p_G - f, \eta_G)$ that solves the standard optimality condition of profit maximization. Because of free entry and the presumed firm heterogeneity, as in Panzar and Willig (1978), for

6

a given price p_G there exists a marginal firm with inefficiency parameter $\hat{\eta}_G$ such that only firms with $\eta_G \leq \hat{\eta}_G$ find it profitable to join the industry, where the marginal firm is identified by the zero-profit condition $(p_G - f)q_G^* = C_G(q_G^*, \hat{\eta}_G)$. Note that inframarginal firms (i.e., with $\eta_G < \hat{\eta}_G$) make strictly positive profit. The supply function of the GI industry is thus defined by

$$(1) \qquad Q_G(p_G - f) = \int_{\ell_G}^{\hat{\eta}_G} q_G(p_G - f, \eta_G)\delta_G(\eta_G)d\eta_G \,.$$

The best way to model the production sector of the substitute good is perhaps less clear. In reality the nature of such products may encompass various situations, including other lower-ranked GI products (e.g., Grana Padano vs. Parmigiano Reggiano) or products developed to imitate a successful GI (e.g., Wisconsin Brie cheese fashioned after French Brie). In some cases of very successful GIs (e.g., Champagne), substitute goods may themselves constitute a set of imperfectly substitute products suggestive of a monopolistically competitive structure (Dixit and Stiglitz 1978). Consistent with the latter, we want to allow free entry in the production of the substitute good, as well as scope for promoting the substitute good. But we wish to avoid the (rather intractable, in our context) monopolistic competition presumption that each firm produces a differentiated product and faces its own downward-sloping demand. To proceed, we postulate that all firms in the S industry produce a similar good from the perspective of consumers, as per the postulated VPD preferences, and that, to be viable, firms in this industry need to incur a minimum level of promotion activity $a > 0$. Thus, here the promotion efforts of firms are specified as a per-firm fixed cost.

The fact that, unlike the GI industry, producers of good S lack an institutional structure that can coordinate promotion of their product makes this parameterization of their promotion activities more attractive than the per-unit of output formulation used for the GI industry. Similar to the GI industry, firms are presumed heterogeneous with cost function $C_S(q, \eta_S)$, where the inefficiency parameter η_S is distributed with density $\delta_S(\eta_S)$ on the support $[\ell_S, \bar{\eta}] \subseteq [0, \infty)$. Again, this cost function is strictly increasing and convex in output, and strictly increasing in the firm-specific inefficiency parameter. Profit maximization with free entry implies that, for a given price p_S, active firms' production level $q_S^* = q_S(p_S, \eta_S)$

7

satisfies the optimality condition of profit maximization, and all firms with $\eta_S \leq \hat{\eta}_S$ are active, where the marginal firm $\hat{\eta}_S$ is defined by the zero-profit condition $p_S q_S^* = C_S(q_S^*, \hat{\eta}_S) + a$. Hence, the supply function of the S industry is defined by

$$(2) \qquad Q_S(p_S, a) = \int_{\ell_S}^{\hat{\eta}_S} q_S(p_S, \eta_S) \delta_S(\eta_S) d\eta_S \ .$$

Demand

A common implementation of the VPD framework is to postulate unit demand in the simple parameterization of Mussa and Rosen (1978). The assumption that consumers purchase either zero or one unit of the product, however, is not a very appealing feature in the context of food demand. Furthermore, with this unit-demand specification of VPD utility, some results critically depend on whether, in equilibrium, one has the case of a covered market (i.e., all consumers buy one unit of the product) or that of an uncovered market. The uncovered market case should be of interest in many applications, but makes the analysis of the various information situations discussed below rather messy and awkward. This problem is exacerbated considerably when, as in our setting (to be detailed below), market demand is segmented according to the information that consumers obtain from informative advertising (when labels are less than fully distinct). To proceed, we develop a new demand specification based on Lapan and Moschini (2009).

Consistent with the VPD literature, demands for the products of interest are generated by a population of heterogeneous consumers whose preference for quality is captured by the individual parameter $\theta \in [0,1]$, the distribution of which follows the continuous distribution function $T(\theta)$. We abstract from income effects by assuming that preferences are quasilinear and, following Lapan and Moschini (2009), write the utility function of the θ-type consumer as

$$(3) \qquad U = y + u(x_G + x_S) - (p_G - \theta v_H) x_G - (p_S - \theta v_L) x_S$$

where y is a composite (numeraire) good, x_G is the quantity of the (high-quality) GI good, x_S is the quantity of the (low-quality) substitute good, v_H and v_L are the corresponding qualities ("v" for value) of the two goods (satisfying $v_H > v_L \geq 0$), and p_G and p_S are the

8

(strictly positive) consumer prices of the two qualities. Here, $u(\cdot)$ is a strictly increasing and strictly concave function. Preferences for quality in (3) are clearly of the VPD form: all consumers agree on the ranking of qualities (and they would all buy the same quality if all qualities were offered at the same price). As in Mussa and Rosen (1978), utility is linear in θv, implying that the marginal utility of quality is increasing in θ —this is the monotonicity assumption of Champsaur and Rochet (1989). But the specification in (3) relaxes the common unit demand assumption of VPD models, postulating instead a continuous demand responsiveness at the individual level.

Let the quality differential between the two goods be $h \equiv v_H - v_L > 0$, and without loss of generality let $v_L = 0$ (so that $h = v_H$). Given the utility function in (3), the consumer of type θ will consume only x_G if $(p_G - \theta h) < p_S$, consume only x_S if $(p_G - \theta h) > p_S$, and be indifferent if $(p_G - \theta h) = p_S$. Thus, the consumer with type θ will consume only x_G if $\theta > \hat{\theta}$, will consume only x_S if $\theta < \hat{\theta}$, and will be indifferent if $\theta = \hat{\theta}$, where

(4) $\qquad \hat{\theta} \equiv \max\left\{ 0, \min\left\{ \dfrac{p_G - p_S}{h}, 1 \right\} \right\}.$

Recalling that $T(\theta)$ denotes the distribution function of consumer types, market demand functions for the two qualities are

(5) $\qquad D_S\left(p_S, p_G\right) = \displaystyle\int_0^{\hat{\theta}} x\left(p_S\right) dT(\theta)$

(6) $\qquad D_G\left(p_S, p_G\right) = \displaystyle\int_{\hat{\theta}}^1 x\left(p_G - \theta h\right) dT(\theta)$

where the individual demand function $x(\cdot)$ satisfies $x^{-1}(\cdot) = u'(\cdot)$. Effectively, therefore, the price consumers bear for the high-quality good, that is $(p_G - \theta h)$, differs across individuals and depends on their type θ and on the quality premium enjoyed by the G good (relative to the S good).

Promotion, Consumer Information, and the Strength of IP Protection

A critical element of the model being developed is to define the set of consumers who are informed of the GI product and/or the substitute product. Following the approach pioneered

by Butters (1977), the number of consumers reached by a promotional campaign is assumed to depend (with decreasing returns) on the resources spent on advertising. To illustrate, suppose that the promotion budget $F_G \equiv f \cdot Q_G$ buys a given number F_G/t of advertising messages that randomly reach one (and only one) consumer, where $t > 0$ is the unit cost of promotion. Then the probability that a given consumer remains uninformed after the GI promotion campaign (i.e., she does not get any of the messages) is $\left(1 - 1/M\right)^{F_G/t}$, where M is the total number of consumers (the market size). This approach to model informative advertising has been used extensively for differentiated products (Grossman and Shapiro 1984; Tirole 1988, ch. 7; Hamilton 2009). For a large market size, $\left(1 - 1/M\right)^{F_G/t} \cong e^{-F_G/tM}$, and so the fraction of the market reached by the GI promotion efforts, labeled ϕ_G, can be written as

$$\phi_G = 1 - e^{-F_G/tM}.$$

Similarly, the market reach ϕ_S of the substitute good is determined by the promotion activities undertaken by the producers of this good. From the postulated production structure discussed earlier, total promotion funds expended by the S industry are $F_S = aN_S$, where a is the per-firm expenditure and N_S is the number of active firms in the S industry. Thus, the market reach parameter for the S good is $\phi_S = 1 - e^{-F_S/tM}$.

To be more specific, the GI industry promotes its product by associating its overall quality level v_H with its GI label Λ_G. That is, the promotion messages of the GI industry consist of the pair $\{\Lambda_G, v_H\}$ which, by the foregoing, reaches a fraction ϕ_G of consumers. Correspondingly, the promotion messages of the substitute product consist of the pair $\{\Lambda_S, v_L\}$, which reaches a fraction ϕ_S of consumers. A fraction $\phi_G\phi_S$ of consumers is reached by both messages, whereas a fraction $(1 - \phi_S)(1 - \phi_G)$ of consumers receives neither of the two messages and thus remain unaware of either product.

What consumers know, in this context, is presumed to depend on the information conveyed by the labels. Because promotion is by assumption truthful, if the labels Λ_G and Λ_S were perfectly distinct, consumers would either be ignorant (if a promotion message was not received), or associate the correct quality to each label. The distinctiveness of the labels Λ_G and Λ_S, in turn, depends on the strength of protection afforded to GIs.

10

To fix ideas, consider the polar case where the label of the S product is identical to that of the G product, i.e., $\Lambda_S = \Lambda_G \equiv \Lambda$. Consumers who only get the message $\{\Lambda, v_L\}$ will associate quality v_L with the label, and consumers who only receive the message $\{\Lambda, v_H\}$ will associate quality v_H with the label. But what about consumers who get both messages? The presumption of our model (consistent with the informative advertising literature discussed earlier) is that all promotional claims are truthful, an attribute that we take to be common knowledge. Hence, consumers who receive both the $\{\Lambda, v_L\}$ and $\{\Lambda, v_H\}$ messages do become aware that there exist two products with quality attributes v_L and v_H, learn that the label Λ identifies either good, but obviously remain unable to distinguished which good is which based on the label. When deciding whether or not to purchase a good with the label Λ such a consumer would need to form beliefs on the quality $v \in \{v_L, v_H\}$ that is to be expected. Our assumption here is that a consumer in such a situation randomly associates one of the two qualities, with equal probability, with any good labeled Λ.[7] Thus, when the two labels Λ_S and Λ_G are identical, and given the market reach parameters ϕ_S and ϕ_G, a fraction $\phi_S(1 - \phi_G) + \phi_S\phi_G/2$ of the market will associate quality v_L with the label Λ; a fraction $\phi_G(1 - \phi_S) + \phi_S\phi_G/2$ of the market will associate quality v_H with this label; and a fraction $(1 - \phi_S)(1 - \phi_G)$ of the market will remain uninformed.

Generalizing the foregoing approach, we parameterize the strength of GI protection in terms of the parameter $\gamma \in [0,1]$, where $\gamma = 0$ denotes identical labels, and $\gamma = 1$ denotes perfectly distinct labels. Specifically, we postulate that if a consumer gets only one message, she associates the correct label to the quality stated in the message only with probability γ, and with probability $(1 - \gamma)$ she associates the quality in the message to both labels. Similarly, a consumer who receives both messages correctly associates qualities and

---

[7] Implicitly, therefore, we abstract from the possibility that consumers may try to infer the unknown quality from observed prices and/or from the intensity of advertising (the consumer may receive more than one message). Ignoring such signaling issues vastly simplifies the characterization of equilibrium and could be rationalized, in our setting, by appeal to a number of real-world considerations (e.g., the label/quality information from advertising is received separately from the price, which the consumer may only discover at the point of purchase where GI and non-GI goods might not be displayed side by side).

labels with probability γ while with probability $(1-\gamma)$ she associates one of the two qualities (with equal probability) to both labels. Hence, for given market reach parameters ϕ_G and ϕ_S, the shares σ_i of the market that associate which quality to which label are as defined in table 1.

Consumers' Choices

Given prices p_G and p_S of goods G and S, for consumers who are perfectly informed about the existence and attributes of both G and S products—which, from the foregoing, happens with probability $\gamma\phi_G\phi_S \equiv \sigma_2$—there is a meaningful choice between product G and product S, and they will maximize the utility function[8]

(7) $\qquad U = y + u(x_G + x_S) - (p_G - \theta h)x_G - p_S x_S$

and thus will buy either good G or good S, depending on whether their type θ is greater than or lower than $\hat{\theta}$.

Consumers who only receive the G message and correctly retain it—which happens with probability $\gamma\phi_G(1-\phi_S) \equiv \sigma_1$—will choose by maximizing the utility function

(8) $\qquad U = y + u(x_G) - (p_G - \theta h)x_G$

and thus will buy only the good G.

Consumers who only receive the S message and correctly retain it—which happens with probability $\gamma\phi_S(1-\phi_G) \equiv \sigma_3$—will effectively maximize the utility function

(9) $\qquad U = y + u(x_S) - p_S x_S$

and thus will buy only the good S.

Consumers who associate the same (low) quality to both labels—which happens with probability $\left[(1-\gamma)\phi_S(1-\phi_G) + (1-\gamma)\phi_G\phi_S/2\right] \equiv \sigma_4$—will effectively maximize the following perceived payoff function

(10) $\qquad \tilde{U} = y + u(x_G + x_S) - p_G x_G - p_S x_S$

and thus will buy the cheaper of the two goods.

---

[8] Recall that $h \equiv v_H - v_L$, and that we have normalized $v_L = 0$.

Consumers who associate the same (high) quality premium h to both labels—which happens with probability $\left[(1-\gamma)\phi_G\left(1-\phi_S\right)+\left(1-\gamma\right)\phi_G\phi_S/2\right] \equiv \sigma_5$—will choose according to the following perceived payoff function

(11) $\qquad \tilde{U} = y + u(x_G + x_S) - \left(p_G - \theta h\right)x_G - \left(p_S - \theta h\right)x_S$

and thus, again, will buy the good with the lowest price.

Equations (7)–(11) identify five separate market segments, with market shares defined by table 1, that effectively determine the aggregate demand for goods G and S. Note that, because a fraction $\left(1-\phi_S\right)\left(1-\phi_G\right)$ of the market remains uninformed of either product, GI promotion (i.e., an increase in ϕ_G) will obviously affect the total market reach; and, when $\gamma < 1$, such GI promotion will spill over to the S good. Hence, the strength of GI protection (i.e., the level of the parameter γ) will play a meaningful role in the analysis that follows.

Demand functions for each of the cases (7) to (11) can be derived similarly to the case of perfect information for all consumers discussed earlier (i.e., leading to demand functions (5)–(6)). But now, clearly, such demand functions depend on the market reach parameters ϕ_G and ϕ_S, which define the market segments σ_i $(i=1,2,\ldots,5)$. Thus, we write the resulting market demand functions as[9]

(12) $\qquad D_i\left(p_G, p_S, \phi_G, \phi_S | \gamma\right)$, $i = G, S$.

Equilibrium

Given the aggregate demand functions in (12) and supply functions in (1) and (2), the market clearing conditions of standard competitive equilibrium can be stated as:

(13) $\qquad D_G\left(p_G, p_S, \phi_G, \phi_S | \gamma\right) = Q_G(p_G - f)$

(14) $\qquad D_S\left(p_G, p_S, \phi_G, \phi_S | \gamma\right) = Q_S(p_S, a)$

Furthermore, in equilibrium it is necessary that the expenditures on promotion, for both sectors, be consistent with the revenue raised for this purpose, that is

(15) $\qquad \phi_G = 1 - e^{-f Q_G/tM}$

(16) $\qquad \phi_S = 1 - e^{-aN_S/tM}$

---

[9] More details on the derivation of these demand functions are provided below, in the context of the actual demand parameterization used in the analysis.

13

where $N_S = \int_{\ell_S}^{\hat{\eta}_S} \delta_S(\eta_S) d\eta_S$ is the number of S firms that are active in equilibrium.

Equations (13)–(16) determine the equilibrium prices p_G and p_S, and the market reach levels ϕ_G and ϕ_S. They are conditional on γ, on the GI promotion fee f, and on the parameter a. The strength of protection γ is exogenous (an attribute of the institutional setting the formation of which is not modeled, although we will compare and contrast the implications of varying this parameter).[10] The parameter a is also exogenous, so that ϕ_S is determined by the free entry equilibrium condition in the substitute good. On the other hand, we think of f as actively chosen by the GI industry, as this parameter ultimately determines the industry's market reach via (15). Because GI firms share the GI label, the presumption is that the decision of how much to promote is made collectively by the producer association representing the GI industry so as to maximize the aggregate industry profit (Lence et al. 2007; Moschini, Menapace, and Pick 2008). The choice of f for the purpose of raising the optimal level of promotion funds F_G (which determine the industry's market reach ϕ_G), strictly speaking, requires perfect foresight of equilibrium outcomes.[11] If $\Pi_G(f)$ denotes the GI industry's equilibrium aggregate profit, then $f^* = \arg\max \Pi_G(f)$. Naturally, this optimal

---

[10] We should note the implicit assumption that γ is binding in determining the closeness of Λ_S to Λ_G. Whereas this assumption seems natural in the context of the competitive setting of this paper, it may not hold more generally, for example if S industry firms were endowed with market power and chose the label Λ_S strategically. In such a setting, in fact, the principle of differentiation suggests that firms may strategically want to differentiate as much as possible in order to relax the detrimental impacts of (price) competition (Tirole 1988).

[11] Although restrictive, the perfect foresight assumption is not uncommon in competitive equilibrium settings where, as done here, sequential interactions are simplified to fit into a timeless equilibrium notion. A more elaborate alternative would postulate several decision stages whereby the GI consortium first decides on the promotion fee, competitive GI producers then commit to production, the GI consortium carries out promotion, producers of good S enter the market (and carry out the required level of promotion), aggregate demands are realized based on the promotion levels of both industries, and finally competitive equilibrium prices are determined to clear the market. Our chosen equilibrium formulation would then emerge by postulating a form of rational expectations by all decision makers at the various stages.

solution will depend on the strength of GI protection parameterized by γ. In what follows we provide some evidence on this and related effects.

Model Parameterization

To make the proposed VPD demand model operational, we postulated a specific form for the demand function $x(\cdot)$, or equivalently for the utility function $u(\cdot)$. Lapan and Moschini (2009) show that, in a competitive setting, whether producers prefer a higher quality standard than consumers hinges critically on whether the demand function $x(\cdot)$ is log-convex or log-concave.[12] For this reason, in what follows we will rely on the semi-log demand function $x(p) = e^{\alpha - \beta p}$ which, as it is readily verified, is both log-concave and log-convex. Note that demand is bounded when price goes to zero (that is, $x(0) = e^{\alpha}$), and demand converges to zero as $p \to \infty$. The utility function $u(x)$ in (3) that yields the semi-log demand function is $u(x) = (1 + \alpha - \ln x)(x/\beta)$.

Consistent with many VPD studies, we assume that the preference type $\theta \in [0,1]$ is uniformly distributed. Given the assumed semi-log form, market demand functions can then be readily obtained. For example, performing the integration in (5) and (6), we find that the (full information) demand functions for the interior case $0 \leq (p_G - p_S)/h \leq 1$ are:

$$(17) \qquad D_S(p_S, p_G) = \frac{Me^{\alpha - \beta p_S}}{\beta h} \beta (p_G - p_S)$$

$$(18) \qquad D_G(p_S, p_G) = \frac{Me^{\alpha - \beta p_S}}{\beta h} \left(e^{-\beta(p_G - p_S - h)} - 1 \right)$$

But in our context we need to take into account the market segmentation induced by the market reach parameters, as captured by the market segments σ_i (i=1,2,…,5) defined in table 1 (which are conditional on the strength of protection γ). Doing so reveals that there are four demand cases, depending on the configuration of prices that arises in equilibrium (Figure 1 illustrates).

---

[12] Both such properties can be found in commonly used demand functions. For example, the linear demand function $x(p) = \alpha - \beta p$ is log-concave, whereas the constant elasticity demand function $x(p) = \alpha p^{-\varepsilon}$ is log-convex.

Case 1. When prices satisfy $0 \le p_S < p_G$, and $p_G - h \le p_S$, implying $(p_G - p_S)/h \in (0,1]$, which is perhaps the most general case of interest, market demands are:

$$(19) \quad D_S = \frac{Me^{\alpha - \beta p_S}}{\beta h} \left[\beta \sigma_2 (p_G - p_S) + \beta h (\sigma_3 + \sigma_4) + \sigma_5 (e^{\beta h} - 1) \right]$$

$$(20) \quad D_G = \frac{Me^{\alpha - \beta p_G}}{\beta h} \left[\sigma_2 (e^{\beta h} - e^{\beta (p_G - p_S)}) + \sigma_1 (e^{\beta h} - 1) \right]$$

Case 2. When prices satisfy $0 \le p_S = p_G \equiv p$, implying and $(p_G - p_S)/h = 0$, then total demand is

$$(21) \quad D_G + D_S = \frac{Me^{\alpha - \beta p}}{\beta h} \left[(\sigma_1 + \sigma_2 + \sigma_5)(e^{\beta h} - 1) + \beta h (\sigma_3 + \sigma_4) \right]$$

provided that the demand of consumers who know only label Λ_G, or who know both labels (and thus prefer good G because it is offered at the same price as good S), is satisfied, which requires:

$$(22) \quad D_G \ge Me^{\alpha - \beta p} \left[\frac{1}{\beta h} (\sigma_1 + \sigma_2)(e^{\beta h} - 1) \right]$$

Also, the demand of consumers who only know label Λ_S needs to be satisfied, which requires

$$(23) \quad D_S \ge Me^{\alpha - \beta p} \sigma_3$$

Case 3. When prices satisfy $0 \le p_G < p_S$, consumers who know only label Λ_S will buy the S good, and everybody else will buy the G good. Thus,

$$(24) \quad D_S = \sigma_3 Me^{\alpha - \beta p_S}$$

$$(25) \quad D_G = \frac{Me^{\alpha - \beta p_G}}{\beta h} \left[(\sigma_1 + \sigma_2 + \sigma_5)(e^{\beta h} - 1) + \sigma_4 \right]$$

Case 4. When prices satisfy $0 \le p_S < p_G - h$, consumers who know only label Λ_G will buy the G good, and everybody else will buy the S good:

$$(26) \quad D_S = \frac{Me^{\alpha - \beta p_S}}{\beta h} \left[\sigma_5 (e^{\beta h} - 1) + \beta h (\sigma_2 + \sigma_3 + \sigma_4) \right]$$

$$(27) \quad D_G = \frac{Me^{\alpha - \beta p_G}}{\beta h} \left[\sigma_1 (e^{\beta h} - 1) \right]$$

The parameterization of the supply side can be derived in a similar manner, by postulating explicit forms for the firms' cost functions and the distributions of producer types. To simplify the analysis, we assume that individual firms have an inverted L-shaped cost function (implying they produce at a fixed scale q_i^0 ($i = G, S$), if they are active). Further assuming a uniform distribution of the efficiency parameters (the densities δ_G and δ_S are constant), it can be shown that the industry supply functions can be written in (essentially) constant-elasticity form:[13]

$$(28) \quad Q_G = \begin{cases} k_G(p_G - f)^{\zeta_G} & \text{if} \quad p_G \geq f \\ 0 & \text{if} \quad p_G < f \end{cases}$$

$$(29) \quad Q_S = \begin{cases} k_S\left(p_S - \overline{a}\right)^{\zeta_S} & \text{if} \quad p_S \geq \overline{a} \\ 0 & \text{if} \quad p_S < \overline{a} \end{cases}$$

where $k_G \equiv q_G^0 \delta_G$, $k_S \equiv q_S^0 \delta_S$ and $\overline{a} \equiv a / x_S^0$, and where ζ_G and ζ_S are the supply elasticities (with respect to the "net" producer price) of the G and S goods, respectively. The calculation of the promotion expenditures required for equilibrium is straightforward; for the G industry we have $F_G = f \cdot Q_G$, and for the S industry we have $F_S = a \cdot N_S = \overline{a} \cdot Q_S$.

It is apparent that the assumption that individual firms have an inverted L-shaped cost function, so that they produce at a fixed scale q_S^0 if they are active, implies that the aggregate supply functions in the two sectors are isomorphic. This observation might make the different structural rationalization of the promotion efforts of the two industries, proffered earlier, somewhat moot. But the important fact to observe is that, in our context, only the G industry is presumed to actively choose the promotion level F_G, and this choice is affected by the institutional setting (i.e., the strength of protection afforded to GIs).

Calibration

To investigate the effect of the strength of protection, parameterized by γ, we would need comparative statics analysis of the competitive equilibrium developed in the foregoing. Unfortunately, we are unable to do so analytically, a consequence of the various nonlinearities in demand and supply relations that were deemed necessary to provide a

---

[13] More details about this derivation are provided in the online appendix.

realistic representation of the problem. To proceed, we propose to analyze the model numerically. That is, we first calibrate the parameters of the model to a *baseline* situation with some appealing properties. Given such parameters, the equilibrium conditions are solved numerically (using Matlab) to provide qualitative and quantitative results on the impact of the strength of protection parameter γ. By changing the calibrated parameters of the model, a sensitivity analysis is then carried out to study the impact of various structural parameters on equilibrium outcomes.

Calibration in our setting consists of choosing a set of parameters that fully determines demand and supply relations, and such that the equilibrium conditions, given such parameters, reproduce a situation of interest. Throughout the analysis it is assumed that consumers' monetary income is large enough to guarantee that maximization of the quasilinear utility function in (3) yields interior solutions. Furthermore, the baseline scenario is calibrated to *Case 1* demand functions and full strength of protection, i.e., $\gamma = 1$. Given that, a few parameters can be determined by harmless normalizations. Hence, the size of the market is set to $M = 10,000$, and the price of good S in the baseline is set to $p_S = 1$. This normalization provides a benchmark for the parameter h, which indexes the quality premium of good G relative to good S. In the baseline we set $h = 1$, meaning that the consumer with the highest preference for quality (i.e., with $\theta = 1$) is willing to pay twice as much for a unit of good G than for a unit of good S. With $p_S = 1$ we also see that consumers who elect to buy good S in equilibrium will demand the quantity $\ln x = \alpha - \beta$, and so by normalizing this quantity to $x = 1$ we can restrict the parameters of demand to $\alpha = \beta$.[14] To understand the implications of the calibrated value of this parameter, note that β controls the elasticity of the demand functions. From the semi-log demand function of the individual consumer, $\ln x(p) = \alpha - \beta p$, the demand elasticity is $\varepsilon = -\beta p$. Specifically, this will be the demand elasticity of consumers who are only informed about the existence of one product, be that the G or the S good. Thus, postulating a value for β amounts to

---

[14] Given the preference structure in (7), different consumer types will purchase a different amount of the GI good, whereas all consumers who purchase good S buy the same amount (which is normalized to 1 in the baseline case).

assuming a value for the demand elasticity. In the baseline case we assume $\varepsilon = -1$ for the aforementioned demand elasticity evaluated at $p_S = 1$.

On the supply side, the relevant parameters include the aggregate supply elasticities (with respect to the net producer price) ζ_G and ζ_S, and the industry scale parameters k_G and k_S. In the baseline we neutrally assume that both sectors have similar production capacity with upward sloping supply function, and put $\zeta_G = \zeta_S = 1$ and $k_G = k_S$. To complete the calibration procedure one needs to consider the promotions levels of the two sectors, which, being endogenous in equilibrium, are bound to be affected by the model's parameters. For the baseline case we postulate a scenario where the GI sector engages in more promotion than the imitating S-good sector: the equilibrium market reach parameters of the baseline case are $\hat{\phi}_G = 2/3$ and $\hat{\phi}_S = 1/3$. Given this, the numerical value of the model's other parameters (β, $\bar{a}$, k_G and t), along with the remaining endogenous variables Q_S, Q_G, and p_G, can be determined with the model's equilibrium conditions. The full set of calibrated parameters of the baseline case is summarized in table 2.[15]

Computational Results

Given the parameters of the baseline case, table 3 reports some equilibrium results that emerge for (a coarse grid of) alternative levels of the strength of protection. Specifically, table 3 reports the equilibrium promotion levels of the two industries, as indicated by individual market reach variables ϕ_G^* and ϕ_S^*, as well as the total market reach $\phi_M^* \equiv (\phi_G^* + \phi_S^* - \phi_G^* \phi_S^*)$ and the demand case that applies in equilibrium. This table also reports the aggregate profits of the two industries, Π_G and Π_S (net of the cost of promotion, of course), as well as total producer surplus $PS \equiv \Pi_G + \Pi_S$. For each value of γ

---

[15] The calibration procedure is described in more detail in the online appendix. The model's equilibrium in the calibrated baseline case can be easily inspected in the results that follows because it is associated with the strength of promotion parameter $\gamma = 1$.

, table 3 also report consumer surplus CS ,[16] as well as aggregate welfare as defined by the Marshallian surplus $W \equiv CS + \Pi_G + \Pi_S$.

We note at this juncture that, when advertising shifts demand for a given good, it might be unclear which of the two demands functions (pre- and post-advertising) is relevant as a representation of preferences for the purpose of welfare evaluation (Dixit and Norman 1978; Shapiro 1980). This is particularly an issue for persuasive advertising.[17] In our context, promotion is informative, but the dilution effect that arises when $\gamma < 1$ implies that some consumers might purchase the S good believing that it has quality attribute v_H , when in fact it only has quality v_L , (this pertains to consumers in the market segment labeled σ_5), and some consumers might purchase the GI good believing that it has quality attribute v_L when in fact it has quality v_H (this pertains to consumers in the market segment labeled σ_4 and can happen only when the equilibrium prices of the two goods are the same). In computing welfare for such consumers we attribute to them the consumer surplus associated with the true quality level of the good consumed.[18]

Two main results emerge from table 3.

Result 1: In the baseline case, GI profits are maximized at the full level of protection, whereas profits in sector S are largest with an intermediate level of protection.

Result 2: In the baseline case, consumer surplus is maximized at the full level of protection, whereas aggregate producer surplus (the combined profits of sectors S and G) is maximized at an intermediate level of protection. Total welfare is also maximized at less-than-full protection.

---

[16] The computation of consumer surplus for the parameterization of this paper requires some tedious calculations, which are detailed in the online appendix. In the tables below, the reported values of CS are computed net of the unidentified constant Mm .

[17] Bagwell (2007, section 4) provides an extensive discussion.

[18] Thus, consumers are implicitly imputed the "cost of ignorance" that arises from making suboptimal decisions under incorrect information. Such a cost is not unlike that considered in the distinct strand of literature originated with Foster and Just (1989).

Quite clearly, in this setting the two producers groups have conflicting interests: GI producers prefer the highest possible protection level, whereas firms in the S industry benefit from an intermediate level of protection. Interestingly, though, even from the narrow perspective of the S sector, the optimal level of protection is bounded away from zero. At an intermediate level of protection, S producers are best positioned to exploit the information externalities generated by the promotion in the GI sector. Indeed, when the value of γ is less than 1, promotion by the GI sector generates information externalities that benefit producers in sector S. The lower the value of γ, the larger the information externalities generated by promotion (e.g., the likelier are consumers who received a promotional message from the GI sector to associate the message to both goods). But, as the value of γ drops away from full protection, it affects the incentive of the GI industry to engage in promotion. This industry's equilibrium market reach, ϕ_G^*, actually increases initially as the strength of protection drops from $\gamma = 1$: the dilution effect of such a drop negatively affects the market segment that patronizes the GI good, and the industry attempts to counter that by increasing promotion efforts. But eventually lower values of γ discourage promotion, such that ϕ_G^* decreases and the diminished information externalities negatively affect S producers. For the baseline case, when the protection parameter gets close to $\gamma = 0.5$, the GI promotion efforts ϕ_G^* fall off considerably, an effect associated with the equilibrium where both goods are sold at the same price (note that the equilibrium price configuration changes to Case 2 demand). The fact that total producer surplus is maximized at $\gamma = 0.7$ in table 3 suggests that the S industry has more to gain from the spillover of information than what is lost by the G industry. This consideration would matter, in a policy setting, if producers in both the G industry and the S industry belonged to the same constituency (e.g., all are domestic producers). In such a case, advocating the strengthening of GI protection may not be in the interest of producers *in toto*.

Consumer surplus in table 3 is maximized at $\gamma = 1$, indicating that the net effect of information externalities adversely affects utility in the baseline. In other words, the positive effect that arises because the aggregate quantity exchanged in the market increases as γ decreases from unity is more than offset by the fact that information externalities also induce suboptimal choices. The CS effect, however, is not large enough to counterbalance the gains

in aggregate producer surplus that arises from intermediate levels of protection, such that welfare in the baseline case is maximized at less-than-full protection.

Sensitivity analysis

How does the impact of the strength of GI protection on welfare, and on the distribution of welfare among consumers and producers, change when parameter values depart from the baseline case? To address this question, in table 4 we report the computed optimal protection level γ^* for alternative possible objective functions, and several sets of the model's key parameter values. Specifically, the rows labeled $\max W$ report the values of γ that maximize Marshallian surplus, given the ensuing actual market equilibrium outcome. Similarly, the rows $\max \Pi_G$ and $\max \Pi_S$ report the value of γ that would be preferred by the producers in the G and S industries, respectively. The rows $\max PS$ display the values of γ that maximize total producer surplus, and the rows $\max CS$ report the values of γ that maximize consumer surplus. For each of the model's parameters considered in this table, we report the computed optimal protection level for a grid of values ranging from 0.25 to 3 times the parameter's baseline value. For example, in the case of h (the baseline value of which was $h = 1$) the range goes from 0.25 to 3, whereas for t (the baseline value of which was $t = 0.16105$) the range is from 0.04026 to 0.48315.

  Three main results emerge from table 4:

Result 3: For the whole range of parameter values explored in table 4, GI producers prefer full protection and S producers prefer an intermediate level of protection (just as in the baseline case).

Result 4: Full protection is not always optimal from the point of view of consumers—less-than-full protection is more likely to be optimal when: (i) the fixed promotion cost in sector S is low; (ii) the quality premium of the GI is low; (iii) the unit cost of promotion is high; (iv) the supply in industry S is elastic.

Result 5: Less-than-full protection is more likely to be optimal from the point of view of total welfare when: (i) the scale of the GI industry is small, relative to that of the S industry;

22

(ii) the supply of the GI product is inelastic; and (iii) whenever consumer surplus is maximized by less-than-full protection (as per Result 4).

Thus, table 4 confirms the fact that the two producers groups typically have conflicting interests: GI producers are better off with maximum protection whereas S producers prefer an intermediate level of protection.

The level of protection affects consumer surplus in two ways: by altering the information received by the consumers who are reached by promotion (i.e., the information externality), and by affecting the incentives of producers to promote (which affects the share of consumers reached by promotion). With regard to the latter, a large drop in the level of protection typically has a large negative effect on the promotion effort exerted by sector G. But a small drop in protection can result in a positive change (as the GI sector tries to counteract the ensuing dilution effect). For sector S, on the other hand, a reduction in the level of protection typically leads to an expansion of its market reach. With regard to the information externalities, their impact depends upon the specific demand case that applies, which in turn depend upon parameter values. Under the assumption that everything else remains constant (including the values of the market reach variables ϕ_G^* and ϕ_S^*), in demand case 1 information externalities affect consumer surplus by a reallocation of consumers from market segments σ_1 (i.e., consumers who only receive the G message and correctly retain it but ignore the existence of good S) and segments σ_2 (i.e., consumers who are perfectly informed about the existence and attributes of both G and S products) to market segment σ_5 (i.e., consumers who associate the same high quality premium h to both labels). When, as happens in demand case 1, equilibrium prices are such that $p_G > p_S$, consumers in market segment σ_5 purchase good S. Had they been in market segment σ_1 they would have purchased the GI good. These consumers who are reallocated from segments σ_1 to market segment σ_5 because of a change in γ can be better or worse off depending upon the value of their individual taste parameter θ (that is, the "matching" between consumer taste and quality can improve or decline as γ changes). Consumers who are reallocated from segments σ_2 to segment σ_5, on the other hand, are very likely to be worse off: because their information becomes less precise (dilution effect), the matching of taste and quality for

23

these consumers deteriorates relative to full protection. Of course, the foregoing are *ceteris paribus* effects, but one ought to remember that the full impact of a change in γ includes the additional effects it has on the endogenous market variables, including the market reach variables ϕ_G^* and ϕ_S^*.

Given the foregoing discussion it is easy to see that consumer surplus is more likely to increase with a reduction in the level of protection when either γ has a positive effect on market reach and/or has a positive matching effect. Thus, as summarized in Result 3, CS is more likely to increase as the level of protection declines when the fixed promotion cost in sector S is low, when the quality premium of the GI is low, when the unit cost of promotion is high, and when the supply in industry S is elastic. In addition, from the point of view of aggregate welfare, less-than-full protection is optimal when consumers are more likely to gain from the information externality, but also when sector S is likely to significantly grow in the presence of information externalities (its relative scale o supply elasticity is large).

In what follows we provide more discussion on the instances where either consumer surplus or aggregate welfare is maximized by less-than-full protection.

Fixed cost of promotion

Values of the fixed per-firm cost of promotion for the S industry, $\bar{a}$, smaller than the baseline value can lead to a situation in which $\gamma < 1$ maximizes consumer surplus (and welfare). Small values of $\bar{a}$ capture a situation in which sector S has a low ability to expand demand on its own. In this setting, the information externalities generated by a reduction in the level of protection are more likely to increase consumer surplus and welfare by increasing consumers' market participation (i.e., the quantity exchanged in the market), and by improving matching of the consumers' tastes with the appropriate quality good. In equilibrium, when industry S does little advertising, sector S is quite small under full protection and consumers' market participation is relatively low. Indeed, few consumers are informed about good S, and they either purchase the GI or stay out of the market. In such a situation, consumer surplus and welfare can be increased by expanding the number of consumers who are informed about good S, which can be achieved by a (small) reduction in the value of γ away from 1. As γ moves away from 1, more consumers learn about good S (by associating the promotional message of the GI sector to both labels), and end up buying

good S (in the competitive market segments σ_4 and σ_5). Thus, a small reduction in the level of protection can improve matching of the consumers' tastes with the appropriate quality good as consumers learn about the existence of good S.

GI quality premium

Consumer surplus and welfare tend to be maximized by less-than-full protection when the GI quality premium h is small. Intuitively, from the point of view of consumers (and welfare), information externalities that (although imperfectly) inform consumers about good S are more valuable when the degree of differentiation of the two good is small (i.e., when goods are close substitutes). In such a case, a reduction in the value of γ away from $\gamma = 1$ tends to increase market reach and market participation with a positive effect on consumers and S producer surplus. A reduction in the value of γ also has a negative effect on GI producer surplus, and a net positive effect on welfare.

Promotion cost

Values of γ below unity tend to be optimal from the point of view of consumers and welfare when unit promotion costs (as parameterized by t) are high. Expensive promotion is generally associated with lower level of promotion and hence fewer informed or partially informed consumers. In particular, expensive promotion increases the barrier to entry in sector S, which tends to be small. Under these conditions, information spillovers generated by a reduction in the level of protection have the potential to increase consumer surplus (and welfare). At the other end of the value spectrum of t, i.e., when promotion is cheap, full protection tends to be optimal from the point of view of consumers and welfare. When promotion is cheap, promotion levels tend to be high regardless, and consumers tend to be (at least partially) informed. It is then unlikely for information externalities to significantly contribute to welfare or consumer surplus.

Supply parameters

The relative scale of the industries (as parameterized by k_G / k_S) and the elasticity of the supply of good G (as parameterized by ζ_G) appear to have no impact on the preferred value of γ from the point of view of consumers. The higher the elasticity of the supply of good S

(as parameterized by ζ_S), however, the lower is the value of γ that maximizes consumer surplus. From the point of view of welfare, values of γ below unity tend to be optimal when the scale of industry G is relatively small compared to the scale of industry S, when the supply elasticity of industry G is small and when the supply elasticity of industry S is large.

In the baseline case the two sectors have the same production scale parameters, that is $k_G = k_S = 3,519$. In table 4, we vary the value of k_G to capture different relative scales of production holding the value of k_S constant (moving from left to right, the relative scale of the GI sector increases). Consumers are better off with full protection, but welfare is higher with an intermediate level of protection (except when the relative scale of the GI industry is large). When the scale of the GI industry is relatively small, the industry's equilibrium market reach under full protection is relatively low ($\phi_G^* = 0.33$ for $k_G / k_S = 0.25$) so that the potential to improve matching between consumers and quality by reallocating consumers between markets segments σ_1 and σ_5 is quite limited and consumers stand to lose from a reduction in the level of protection.

When the elasticity of the supply ζ_G is (relatively) small or the elasticity of the supply ζ_S of good S is (relatively) high, spillovers of information increase market reach and market participation, and both welfare and consumer surplus have the potential to be maximized by less than full protection.

Elasticity of demand
Changing the parameter β (holding α at the baseline value) says something about the sensitivity of the results to alternative demand elasticity scenarios. This parameter does not affect much the preferred γ for producers or consumers. Stronger protection is called for to maximize welfare as the demand elasticity moves to either of the extremes considered in table 4.

Full protection or no protection?
So far we have seen that welfare can be increased by a reduction in the level of GI protection in a variety of cases, under appropriate parametric conditions. Indeed, from the perspective of welfare maximization, the optimal protection is lower than the largest possible

level for many of the parameter combinations explored in table 4. The policy debate surrounding GIs, on the other hand, is often polarized with advocates of the strongest possible protection pitted against supporters of no special protection at all. If the policy choice were restricted to the extremes of strongest possible GI protection ($\gamma = 1$) or no GI protection at all ($\gamma = 0$), is it the case that the strongest protection level is to be preferred? If so, how sizeable are the welfare losses associated with no protection? To address these questions table 5 reports the welfare changes associated with $\gamma = 0$, relative to the case $\gamma = 1$, expressed as a percent of the welfare level achieved with $\gamma = 1$. As the entries of this table make clear, from the perspective of aggregate welfare strongest protection dominates no protection, as indicated by the negative percent welfare change. The welfare losses associated with zero GI protection could be quite high: for the benchmark parameters the loss is 10.7%, and it can be substantially higher (up to 40%) for other parameter combinations explored in table 5. What table 5 does not say directly is whether the individual groups would actually prefer $\gamma = 1$ or $\gamma = 0$. It turns out that, for the parameter range encompassed by table 5, consumers and GI producers always prefer strongest protection to no protection at all. Producers in the S industry, on the other hand, generally (but not always) prefer $\gamma = 0$ if the only alternative is $\gamma = 1$.

Conclusions

How strong GI protection ought to be is a widely discussed policy question, but explicit economic analyses of this issue have been lacking. To make progress in this context, this paper develops a model rooted in the structure of informative advertising, where the degree of GI protection is parameterized such that the strength of protection affects how informative the GI message can be. The model maintains some common attributes of recent GI studies, such as a VPD demand structure and a competitive GI sector with free entry. In this setting, we analyze how the strength of GI protection affects the incentives of GI producers to provide information to consumers and, in turn, how this affects the distribution of welfare among producer groups and consumers.

The results show that the conventional wisdom that GI and non-GI producers have divergent interests is only partly supported. We do find that GI producers are better off with strong IP protection and, hence, would benefit from a strengthening of weak GI provisions.

But we also find that some GI protection also benefits the producers of the substitute good, as they gain significantly from an above-zero level of GI protection that is sufficient to provide GI producers with incentives to invest in promotion (which has beneficial spillover effects). As expected, however, substitute good producers never prefer the strongest GI protection level: as protection improves and the promotion messages of the two industries are increasingly differentiated, the degree of substitutability between GI and substitute goods declines in the eyes of consumers (there is less dilution of information), and thus the information provided by GI producers is less likely to expand the demand for the substitute good (the information spillover effect is reduced). When considering the production sector as a whole, aggregate profits tend to be maximized by an intermediate level of protection, but which specific level of protection is optimal depends strongly upon the relative size of the sectors.

Consumers might also be better off with a less-than-full level of GI protection. This is the case when there is relatively poor knowledge of the existence and the basic features of the good under full protection. When, under full protection, good S is little known (for example because the S sector has limited ability to expand demand on its own or when promotion is expensive), such that few consumers participate in the market, consumer surplus in aggregate reaches its highest value with less-than-full levels of GI protection because of the positive effect of information spillovers (which informs consumers of the existence of a lower-priced generic good that is affordable to a large share of consumers reached by promotion). This is also the case when the goods are close substitute (information externalities are relatively more valuable to consumers) and when sector S can easily expand (e.g., the elasticity of sector S supply is high). Although both consumers and producers of the substitute good may be better off with intermediate levels of GI protection, the optimal protection level is not the same for the two groups and, in general, consumers prefer more protection than producers of the substitute good. Welfare, in the aggregate, can also be maximized by less-than-full GI protection. The conditions that lead to such an outcome are similar to those that induce consumer surplus to be maximized by less-than-full protection, but in general the range of values for which this is true is larger than it is in the case of consumer surplus. This is because welfare also reflects the impact of aggregate producer surplus (which, through the returns to the producers of the substitute good, can benefit from less than strongest protection).

The model that we have developed is very stylized, and more specific implications of our analysis and results must account, *inter alia*, for the jurisdiction of residence of GI and non-GI producers. In any case, the fact that GI producers always prefer the strongest level of protection suggests that they are likely to benefit from a strengthening of current GI provisions in important markets (such as the United States) where relatively weak protection is currently afforded to GIs, regardless of where they are located. But from the perspective of a country whose endowment of traditional GI is low (the United States, perhaps), the returns to GI producers might not be considered too important. Yet, as our model has emphasized, consumer welfare is central and it can be significantly affected by the dilution of information that arises with weak GI protection. This effect is further compounded by the fact that weak GI protection adversely affects the incentive of GI producer to provide informative promotion (which, *ceteris paribus,* benefits consumers). A balanced approach that provides non-negligible, yet less than strongest, protection would appear to be vindicated. Our results might have even more direct implications for a region, such as the EU, where both GI and non-GI food products are domestically produced. In particular, our result that aggregate producer surplus is not maximized by full protection is relevant, even when political economy considerations might privilege producer welfare over consumer welfare. The implication is that insisting on the highest possible level of GI protection might have significant redistribution effects among EU producers themselves, pitting GI producers against local non-GI producers, and adversely affect overall welfare.

The model that we have presented relies on a number of restrictive assumptions, and further work to generalize it is desirable. In particular, we have not explicitly modeled the labeling choice of the industry producing the GI-substitute good, and we have abstracted from possible strategic considerations that may arise in such a setting. Our timeless equilibrium notion also eschews the possible dynamic interactions between promotion choices in the GI and substitute product industries. Future research that extends the analysis to such more general settings should provide a fuller representation of market outcomes under different levels of strength of GI protection and yield improved insights on the question at hand.

Table 1. Consumer information and market reach

	Perceived quality	Label Λ_G		
		$\varnothing$	v_L	v_H
Label Λ_S	$\varnothing$	$(1-\phi_S)(1-\phi_G) \equiv \sigma_0$	-	$\gamma\phi_G(1-\phi_S) \equiv \sigma_1$
	v_L	$\gamma\phi_S(1-\phi_G) \equiv \sigma_3$	$(1-\gamma)\phi_S(1-\phi_G) + (1-\gamma)\phi_G\phi_S/2 \equiv \sigma_4$	$\gamma\phi_G\phi_S \equiv \sigma_2$
	v_H	-	-	$(1-\gamma)\phi_G(1-\phi_S) + (1-\gamma)\phi_G\phi_S/2 \equiv \sigma_5$

Table 2. Parameters for the baseline case

Parameter	Baseline value	Parameter description
h	1	GI quality advantage
M	10,000	Market size (mass of consumers)
ζ_G	1	Elasticity of supply in the GI sector
ζ_S	1	Elasticity of supply in the sector S
k_G	3,519.4	GI industry scale parameter
k_S	3,519.4	S industry scale parameter
β	1	Demand parameter
α	1	Demand parameter
$\bar{a}$	0.24612	Fix cost of promotion in sector S
t	0.16105	Unit cost of promotion

Table 3. GI protection, promotion levels, and welfare outcomes (baseline scenario)

γ	ϕ_G^*	ϕ_S^*	ϕ_M^*	Demand case	Π_G	Π_S	PS	CS	W
1	0.66	0.33	0.78	1	**3,021**	998	4,019	**7,261**	11,280
0.9	0.67	0.38	0.80	1	2,838	1,374	4,212	7,101	**11,313**
0.8	0.67	0.41	0.80	1	2,618	1,697	4,315	6,907	11,222
0.7	0.66	0.44	0.81	1	2,359	2,003	**4,362**	6,692	11,054
0.6	0.66	0.46	0.81	1	2,056	**2,290**	4,346	6,448	10,795
0.5	0.49	0.44	0.72	2	1,854	2,054	3,908	6,357	10,264
0.4	0.49	0.44	0.71	2	1,835	2,034	3,869	6,364	10,233
0.3	0.48	0.43	0.70	2	1,816	1,977	3,793	6,373	10,166
0.2	0.47	0.43	0.70	2	1,798	1,958	3,756	6,379	10,134
0.1	0.47	0.43	0.70	2	1,780	1,938	3,718	6,385	10,103
0	0.47	0.43	0.70	2	1,762	1,919	3,681	6,391	10,072

Notes: See text and table 2 for baseline parameter values.

Table 4. Optimal protection level γ for alternative objective functions and parameter values

Parameter	Objective function	Multiple of baseline value				
		0.25	0.5	1	1.5	3
$\bar{a}$	max W	0.77	0.80	0.91	1	1
	max CS	0.91	0.97	1	1	1
	max PS	0.57	0.59	0.68	0.76	1
	max Π_G	1	1	1	1	1
	max Π_S	0.43	0.47	0.55	0.62	0.79
h	max W	0.75	0.86	0.91	1	1
	max CS	0.91	1	1	1	1
	max PS	0.68	0.68	0.68	0.68	0.66
	max Π_G	1	1	1	1	1
	max Π_S	0.68	0.62	0.55	0.50	0.43
t	max W	1	1	0.91	0.88	0.88
	max CS	1	1	1	0.96	0.88
	max PS	0.81	0.74	0.68	0.66	0.79
	max Π_G	1	1	1	1	1
	max Π_S	0.53	0.55	0.55	0.54	0.51
k_G/k_S	max W	0.66	0.79	0.91	0.98	1
	max CS	1	1	1	1	1
	max PS	0.49	0.57	0.68	0.77	0.88
	max Π_G	1	1	1	1	1
	max Π_S	0.37	0.43	0.55	0.63	0.77
ζ_S	max W	1	0.98	0.91	0.90	0.88
	max CS	1	1	1	0.99	0.79
	max PS	0.56	0.57	0.68	0.76	1
	max Π_G	1	1	1	1	1
	max Π_S	0.56	0.55	0.55	0.55	0.55
ζ_G	max W	0.83	0.86	0.91	0.97	1
	max CS	1	1	1	1	1
	max PS	0.75	0.72	0.68	0.61	0.56
	max Π_G	1	1	1	1	1
	max Π_S	0.54	0.54	0.55	0.55	0.56
β	max W	0.97	0.88	0.91	0.97	1
	max CS	0.97	1	1	1	1
	max PS	0.61	0.66	0.68	0.68	0.74
	max Π_G	1	1	1	1	1
	max Π_S	0.54	0.54	0.55	0.55	0.54

Note: See table 2 for baseline parameter values.

Table 5. Percent welfare change from having $\gamma = 0$ relative to $\gamma = 1$, for alternative parameter combinations

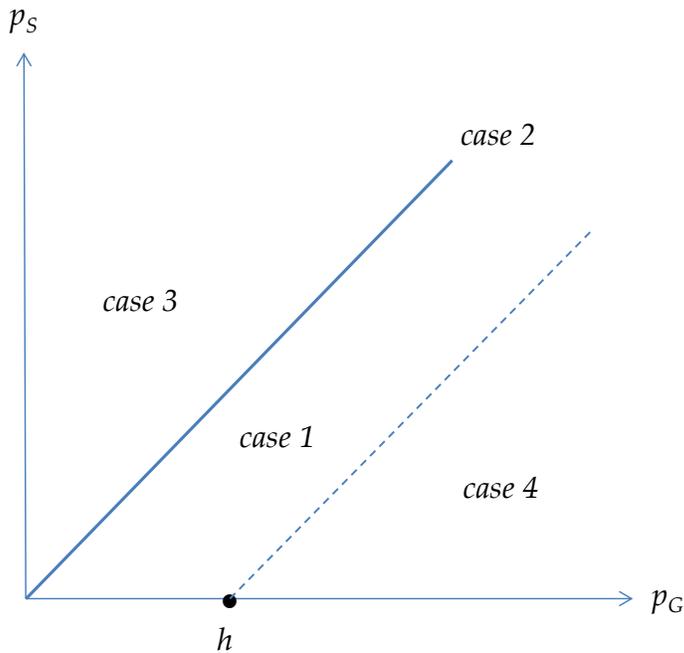|	$\bar{a} = .1231$			$\bar{a} = .2461$			$\bar{a} = .4922$		
	$h = .5$	$h = 1$	$h = 2$	$h = .5$	$h = 1$	$h = 2$	$h = .5$	$h = 1$	$h = 2$
$t = .0805$	-4.7%	-8.9%	-23.6%	-4.8%	-9.4%	-25.0%	-2.4%	-6.9%	-23.7%
$t = .1611$	-7.2%	-9.6%	-22.4%	-7.2%	-10.7%	-24.7%	-5.0%	-8.7%	-23.1%
$t = .3221$	-40.4%	-23.2%	-27.8%	-19.1%	-18.6%	-27.3%	-9.1%	-12.0%	-24.5%
$k_G/k_S = .5$	-13.2%	-12.7%	-26.6%	-10.4%	-13.4%	-27.0%	-7.5%	-9.2%	-23.1%
$k_G/k_S = 1$	-7.2%	-9.6%	-22.4%	-7.2%	-10.7%	-24.7%	-5.0%	-8.7%	-23.1%
$k_G/k_S = 2$	-4.8%	-7.3%	-18.1%	-4.4%	-8.8%	-20.3%	-3.4%	-7.4%	-19.7%

Figure 1. Price configurations and demand cases

References

Anania, G., and R. Nisticò. 2004. "Public Regulation as a Substitute for Trust in Quality Food Markets: What if the Trust Substitute cannot be Fully Trusted?" *Journal of Institutional and Theoretical Economics* 160: 681-701.

Bainbridge, D.I. 2006. Intellectual Property, 6th ed. Harlow: Longman.

Bagwell, K. 2007. "The Economics Analysis of Advertising." In M. Armstrong and R. Porter, eds., *Hanbook of Industrial Organization*, Volume 3. Amsterdam, Elsevier B.V., pp. 1701-1844.

Butters, G. 1977. "Equilibrium Distributions of Sales and Advertising Prices." *Review of Economic Studies* 44: 465-491.

Champsaur, P., and J-C. Rochet. 1989. "Multiproduct Duopolists." *Econometrica* 57:533-557.

Clancy, M.S. and G. Moschini. 2013. "Incentives for Innovation: Patents, Prizes, and Research Contracts." *Applied Economics Perspective and Policy* 35(2): 206-241.

Costanigro, M., J.J. McCluskey and C. Goemans. 2010. "The Economics of Nested Names: Name Specificity, Reputations, and Price Premia." *American Journal of Agricultural Economics* 92(5): 1339-1350.

Dixit, A. and V. Norman. 1978. "Advertising and Welfare." *Bell Journal of Economics* 9:1–17.

Dixit, A. and J. Stiglitz. 1977. "Monopolistic Competition and Optimum Product Diversity." *American Economic Review* 67(3):297-308.

EU. 2008. Geographical indications. Background Paper to the Green Paper on Agricultural Product Quality, DG Agriculture and Rural Development Working Document.

EU. 2012. Regulation (EU) No 1151/2012 of the European Parliament and of the Council of 21 November 2012 on quality schemes for agricultural products and foodstuffs. Official Journal of the European Union L343 55(14 December): 1-29.

Fink, C. and K. Maskus. 2006. "The Debate on Geographical Indications in the WTO." In R. Newfarmer, ed. *Trade, Doha, and Development: A Window into the Issues.*, Washington, D.C.: World Bank, pp. 201-211.

Foster, W., and R. E. Just. 1989. "Measuring Welfare Effects of Product Contamination with Consumer Uncertainty." *Journal of Environmental Economics and Management* 17:266–83.

Gabszewicz, J.-J. and J.-F. Thisse. 1979. "Price Competition, Quality, and Income Disparities." *Journal of Economic Theory* 20: 340–359.

Grossman, G.M. and C. Shapiro. 1984. "Informative Adverting with Differentiated Products." *Review of Economic Studies* LI: 63-81.

Hamilton, S.F. 2009. "Informative Advertising in Differentiated Oligopoly Markets." *International Journal of Industrial Organization* 27: 60-69.

Josling, T. 2006. "The War on Terroir: Geographical Indications as a Transatlantic Trade Conflict" *Journal of Agricultural Economics* 57: 337-363.

Kireeva, I. 2009. "European Case Law and the WTO Ruling on Conflicts between Geographical Indications and Trademarks." ERA Forum 10: 199-214.

Landes, W.M. and R.A. Posner. 2003. *The Economic Structure of Intellectual Property Law.* Cambridge, MA: The Belknap Press of Harvard University Press.

Lapan. H., and G. Moschini. 2007. "Grading, Minimum Quality Standards, and the Labeling of Genetically Modified Products." *American Journal of Agricultural Economics* 89: 769-783.

Lapan, H., and G. Moschini. 2009. "Quality Certification Standards in Competitive Markets: When Consumers and Producers (dis)agree." *Economics Letters* 104(3):144-147.

Lence, S.H., S. Marette, D. Hayes, and W. Foster. 2007. "Collective Marketing Arrangements for Geographically Differentiated Agricultural Products: Welfare Impacts and Policy Implications." *American Journal of Agricultural Economics* 89: 947-963.

Menapace, L. and G. Moschini. 2012. "Quality Certification by Geographical Indications, Trademarks and Firm Reputation." *European Review of Agricultural Economics* 39: 539-566

Mérel, P. and R.J. Sexton. 2012. "Will Geographical Indications Supply Excessive Quality?" *European Review of Agricultural Economics* 39(4): 567-587.

Miranda, M. and P. Fackler. 2002. *Applied Computational Economics and Finance.* Cambridge, MA: MIT Press.

Moschini, G. 2004. "Intellectual Property Rights and the World Trade Organization: Retrospect and Prospects." In G. Anania, M.E. Bohman, C.A. Carter, and A.F. McCalla, eds. *Agricultural Policy Reform and the WTO: Where Are We Heading*? Cheltenham, UK: Edward Elgar, pp. 474–511.

Moschini, G., L. Menapace and D. Pick. 2008. "Geographical Indications and the Provision of Quality." *American Journal of Agricultural Economics* 90(3):794-812.

Mussa, M. and S. Rosen. 1978. "Monopoly and Product Quality." *Journal of Economic Theory* 18(2): 301-317.

Norman, G., L. Pepall and D. Richards. 2008. "Generic Product Advertising, Spillovers, and Market Concentration." *American Journal of Agricultural Economics* 90(3): 719-732.

Panzar, J.C., and R.D. Willig. 1978. "On the Comparative Statics of a Competitive Industry with Inframarginal Firms." *American Economic Review* 68(3):474–8.

Roe, B., and I. Sheldon. 2007. "Credence Good Labeling: The Efficiency and Distributional Implications of Several Policy Approaches." *American Journal of Agricultural Economics* 89(4):1020-1033.

Schnaars, S.P. 1994. *Managing Imitation Strategies*. New York, NY: The Free Press.

Shaked, A. and J. Sutton. 1982. "Relaxing Price Competition through Product Differentiation." *Review of Economic Studies* 49: 3–13.

Shapiro, C. 1980. "Advertising and Welfare: Comment." *Bell Journal of Economics* 11:749–752.

Tirole, J. 1988. *The Theory of Industrial Organization*. Cambridge, MA: MIT Press, 1988.

Zago M.A. and D. Pick. 2004. "Labeling Policies in Food Markets: Private Incentives, Public Intervention, and Welfare Effects." *Journal of Agricultural and Resource Economics* 29(1): 150-165.