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Quality certification by geographical indications, trademarks and firm reputation

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Abstract

We develop a reputation model to study the concurrent use of trademarks and certification for food products with a geographical indication (GI). The model extends Shapiro's (1983) approach to modelling reputation to a situation in which two technologies for the production of quality are available, one of which is available only in the GI region. In this setting, trademarks capture firm-specific reputations, whereas GI certification captures a notion of collective reputation. The model shows that GI certification improves the ability of reputation to operate as a mechanism for assuring quality linked to some inherent attributes of a particular production area.

Keywords: asymmetric information, certification, geographical indications, quality, reputation, trademarks

JEL classification: D23, D82, L14, L15, Q1

1. Introduction

Some of the challenges in delivering quality products in the agricultural and food sector are rooted in the possible market failure identified by Akerlof (1970) in situations characterised by asymmetric information and moral hazard problems. An interesting market-based solution to this problem is possible when a product's quality attributes are not observable to the buyer prior to purchase but they are readily determined at consumption, and it relies on the notion of firm 'reputation,' which here refers to the buyers' beliefs about the quality associated with a firm's product. Key instruments for supporting a firm's reputation are trademarks. Specifically, when firms can identify themselves to consumers through trademarks, thereby effectively defining their

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own brand of the product, they can build a reputation about their quality by consistently supplying it over time. This notion is due to the seminal treatment of Klein and Leffler (1981), with Shapiro (1983) providing an early, insightful modelling structure. The emergence of this information about quality is achieved in competitive markets through an equilibrium price structure that provides the necessary incentives for competitive firms to develop and maintain reputation for producing a given quality. It is also shown that reputation is an imperfect mechanism for assuring quality and that high-quality items can only be provided at a premium above production costs.

Trademarks are essential tools for most modern firms; their functions are well understood and supported by established legal statutes in most developed countries, and established trademarks constitute an extremely valuable intangible asset for many businesses (Landes and Posner, 2003). In agricultural and food industries, however, a related but distinct notion is that of geographical indications (GIs). Like trademarks, GIs are a form of branding, and they specifically focus on the use of names connected with the geographic origin of the product. The use of GIs has a long history in the European Union (EU), and GIs enjoy growing popularity in emerging markets and developing economies (WIPO, 2007; EU, 2008). As a form of intellectual property (IP), GIs figure prominently in the 1994 TRIPS agreement of the World Trade Organization (WTO). Unlike trademarks, which are quintessentially private goods, GIs provide common labels that are typically accessible to a large number of firms producing similar (and competing) products. Furthermore, it is very common to observe the concurrent use of GIs and trademarks for branding products of the agricultural and food industries (Bramley and Kirsten, 2007). For example, many European wines labelled with a particular GI (e.g. Chianti) are supplied by a large number of firms, each with its own distinctive trademark. But if a firm's reputation for quality can be sustained by its own private trademark, as the strand of literature following Shapiro's (1983) seminal work suggests, what exactly is the role of GIs? The public-good nature of GI labels inevitably raises the issue of a collective aspect to the reputation enjoyed by groups of like firms. In the context of reputation mechanisms, the challenge is to understand how private and public elements can profitably coexist in this setting, and to elucidate the specific informational roles of trademarks and GIs. This is the main objective of our analysis and we do so by proposing an innovative extension of Shapiro's (1983) reputation model.

In this paper we extend the theory of firm reputation as a mechanism to assure quality in competitive markets to a context in which both GI certification and trademarks are available to firms as quality indicators. We argue that our focus on quality is fully justified in the context of GIs by the presumption of a quality-geography nexus, an element that is explicitly codified in many forms of GIs and implicit in virtually all of them. The model we propose in this paper relies on Shapiro's (1983) notion of reputation, which we extend to reflect both collective and firm-specific reputations in competitive markets. By casting the analysis in such a framework, we naturally assume that quality attributes in the agricultural and food products of interest to us are best understood as experience goods. A related implication, therefore, is that consumers do not have a preference for geography *per se*, but care about the geographical attribute noted in many GIs because of their ability to signal intrinsic quality. We also note that Shapiro's (1983) modelling framework, with its insistence on competitive equilibrium conditions, is particularly suited to being extended to study GIs, as these markets are typically characterised by the presence of numerous autonomous firms that make independent business decisions and retain their own profits but share a GI label while acting in competitive conditions (Fishman *et al.*, 2008; Moschini, Menapace and Pick, 2008).

The model that we develop presumes that an initial investment via the production of high-quality product is necessary for a firm to gain private reputation. Collective reputation is obtained through certification and is determined by the conditions required for certification (e.g. minimum quality, production technology etc.). In equilibrium, quality in excess of the minimum commands a premium above marginal costs, which, as in Shapiro (1983), represents a fair return on the private investment in reputation. In our setting, GIs and trademarks turn out to be complementary means for signalling quality in agricultural and food markets. In particular, GI certification reveals some information regarding the origin (and indirectly the quality) of the product and, by constraining the moral hazard behaviour of producers, reduces the cost of building reputation and leads to lower equilibrium prices and welfare gains. The effect of the revelation of a product's geographical origin on the efficiency of the market is similar in spirit to that due to the introduction of a minimum quality standard (MQS) in Shapiro's original paper (1983).

The reputation approach to the problem of moral hazard also draws attention to the fact that the type of GI certification scheme used might matter. Specifically, our model can differentiate the two primary certification schemes currently used for GIs, the European-style *sui generis* scheme and the American-style scheme based on certification marks. These schemes differ substantially with regard to the requirements for individual firms to obtain certification. In a second-best world with asymmetric information, it turns out that these differences are relevant because they affect the collective reputation of certified products and hence the cost of providing quality.

Several instructive aspects of the role of certification in quality provision and reputation formation emerge from the model. First, we show that GI certification reduces the divergence between the reputation equilibrium and the equilibrium that would prevail under perfect information by lowering the cost of establishing reputation compared with a situation with only trademarks. Hence, GI certification improves the ability of reputation to operate as a mechanism for assuring quality, even when a fully functioning trademark system already exists. Second, the model suggests that the impact of GI certification on producers depends on whether or not they have already committed resources towards building a (private) reputation via their own trademarks. This is because GI certification raises the price that entrants can command, which reduces the cost of reputation building but also reduces the value of established reputation. Our model also has interesting implications for the current debate and negotiations over alternative forms of protection for GIs at the WTO (Fink and Maskus, 2006) and the ongoing consultations on product quality policy reform within the EU. The results we derive provide a rationale for favouring an EU-style *sui generis* scheme over certification marks.

GIs have recently attracted the interest of academics in economics, marketing, law and sociology. In particular, the economics literature on GIs has analysed various aspects of their ability to work as a certification tool in alleviating market failures due to the presence of asymmetric information when quality cannot be credibly signalled otherwise (Anania and Nisticó, 2004; Zago and Pick, 2004; Lence *et al*., 2007; Moschini, Menapace and Pick, 2008). The role of collective reputation for agricultural goods is investigated by Winfree and McCluskey (2005) in a setting where market price depends on the industry average quality (and where, unlike the model we develop, all firms sell the same quality). To the best of our knowledge, two of the main areas of emphasis of our analysis – the concurrent use of trademarks and GIs in a reputation model, and the comparison of alternative forms of GIs – have not been investigated in any of the existing theoretical studies.[1]

In what follows, we first provide a brief review of the institutional setting for GIs and then introduce the model and the reputation formation mechanism. Next, we define and derive a long-run, rational-expectation, stationary Nash equilibrium under three different scenarios characterised by the use of trademarks and (i) the absence of a certification scheme, (ii) the presence of a *sui generis* GI certification scheme and (iii) the presence of a certification mark scheme. We characterise the equilibrium price–quality schedules that apply to the various scenarios and discuss the main economic implications and associated welfare effects.

2. Institutional framework

GIs are typically names of places or regions used to brand goods. Many GIs pertain to wines (e.g. Burgundy), agricultural products (e.g. Thai Hom Mali rice) and foods (e.g. Parmigiano-Reggiano cheese), but non-food products such as handicrafts and textiles can also be covered by GIs, particularly those from developing countries (e.g. Mysore silk).[2] The distinctive feature of GIs is that the quality attributes of the goods they identify are considered to be inherently linked to the nature of the geographic location in which production takes place (e.g. climate conditions, soil composition, local

1 Landon and Smith (1998), and Costanigro, McCluskey and Goemans (2010), look at collective reputation empirically.

2 Other agricultural products not intended for human consumption are ornamental plants, flowers, cork, hay, cochineal, wool, wicker and essential oils.

knowledge), i.e. to the notion of '*terroir*' (Barham, 2003; Josling, 2006).[3] GIs are considered one of the earliest instruments used to counteract market failures resulting from asymmetric information (Rangnekar, 2004), and their protection has a long tradition in Europe dating back to the fifteenth century (O'Connor, 2004). However, following the EU's Common Agricultural Policy reform in 1992, which moved EU policies progressively away from price supports towards programmes to promote food quality and rural development, GIs have taken centre stage as the 'main pillar of the EU's quality policy on agricultural products' (EU, 2003). GIs can also be viewed as a distinct form of IP rights, and as such they figure prominently in the TRIPS agreement of the WTO and have also received significant international attention outside of the EU (Moschini, 2004). In particular, significant interest in GIs has emerged recently among developing countries.[4]

As for other types of branding (e.g. trademarks), the ability of GIs to alleviate market failures due to the presence of asymmetric information rests on their credibility, thus necessitating IP protection. While trademark protection is well established and relatively harmonised across countries, the protection of GIs varies to a large degree, and its implementation is a question of intense disagreement in ongoing WTO negotiations. The TRIPS agreement requires countries to provide legal means for protecting GIs against unfair competition, but it does not specify the means by which protection should be provided.

Two primary legal notions are used to protect GIs. Perhaps most common are *sui generis* schemes originally developed and used in Roman law countries and currently adopted in the EU (OECD, 2000) and in several Asian and a few North American and Latin American countries (WIPO, 2007).[5] Examples include protected designations of origin (PDOs) and protected geographical indications (PGIs), two *sui generis* GI schemes that are used widely for agricultural and food products within the EU. Regulations concerning these schemes are harmonised across all EU member countries and, since 2008, also cover wines (EU Reg. 479/2008, Art. 34). Well-known products that are registered as PDOs include Parmigiano Reggiano cheese and Chianti wine. Tuscany extra virgin olive oil instead represents an example of a GI registered as a PGI. The distinction between these two alternative *sui generis* GI schemes is based upon the nature of the quality-geography nexus (i.e. the notion of *terroir*), in which PDOs require a stronger link between the natural environment of production and the quality attributes of the product (for additional details regarding the distinction between PDO and PGI see EU Reg. 510/2006, Art. 2).

3 See the definition of GIs in the TRIPS agreement (Article 22.1).

4 For example, several countries are introducing or expanding their own GI laws, regulations and promotion programmes, including China (Xiaobing and Kireeva, 2007), India (Rao, 2006), South Korea (Suh and MacPherson, 2007) and Colombia (Teuber, 2010). Noteworthy is the Kenian-Swiss ongoing project aimed at establishing a functioning GI protection scheme in Kenya and at raising awareness on GIs in the East African Community member states (see the Swiss Institute of Intellectual Property's website at https://www.ige.ch/en.html).

5 These include China, Mongolia, North Korea, Thailand, Vietnam, Colombia, Venezuela, Cuba and Costa Rica.

The presence of a quality-geography nexus, i.e. the requirement of a specific link between a good's qualities and its geographical origin, represents the main distinctive characteristic of any *sui generis* scheme. In other words, for a geographic name that identifies a given good to be eligible to receive this *sui generis* IP protection, evidence must be provided that the quality or characteristics of the good are due to the natural and human factors (e.g. climate, soil quality, local knowledge) characterising the geographic area of origin (e.g. EU Reg. 510/2006 Art. 2 and Art. 4.2.f). In addition to the existence of a specific quality/geography link, the European *sui generis* scheme also requires the definition of a code of rules for each GI product (commonly referred to in the literature as the 'specification'). The specification details all the product characteristics, may restrict the admissible production process and identifies the geographic area in which production takes place (EU Reg. 510/2006 Art. 4).[6] Provided these conditions are met, *sui generis* schemes are not exclusionary in the sense that usage rights over a GI are granted to all producers within a designated production area who comply with the product specification (EU Reg. 510/2006 Art. 8).

Alternatively, in common law countries, including the United States, GIs are protected within the standard trademark system and are usually registered as certification marks.[7] Certification marks simply certify that products meet given conditions and, in the case of GIs, the only such condition is the geographic area of production. In the United States, for example, the US Patent and Trademark Office (USPTO) does not scrutinise certification mark applications based on the characteristics to be certified or require the definition of quality standards. Indeed, when a certification mark includes a geographic name, it is understood that the only attribute to be certified is the origin of the good (USPTO, 2007). It is critical to emphasise that, as for *sui generis* systems, the right to use a certification mark is collective in nature. All producers who operate within the geographic area indicated by the GI have access to certification and can use (subject to obtaining certification) the GI to label their products. This contrasts sharply with usage rights over trademarks, which are private and belong to a single entity or firm.[8]

3. Model

In the model we develop the presumption that consumers' interest in the geographical origin of products is due to the implication that this origin

6 The product characteristics include the physical, chemical, microbiological and organoleptic characteristics of the raw materials and of the final product.

7 In the United States, certification marks used for GIs are registered with the United States Patent and Trademark Office.

8 Only under special circumstances, specifically when a geographic term has acquired a 'secondary meaning,' can a GI be registered as a trademark. When the 'secondary meaning' of a geographic name is, in the consumers' minds, a production or manufacturing source (while the primary meaning is the geographic place), then it is possible under US trademark law to register a geographic name as a trademark, a private rather than collective IP right (USPTO, 2007).

might have for the quality of the product. This view is consistent with the quality/geography nexus that is explicitly invoked to rationalise GIs in the EU but it is also implicit for many other GIs, as discussed in the previous section. In other words, consumers do not have a preference for geography *per se* (e.g. interest in Napa Valley wines is predicated on the belief that they might enjoy superior quality and not because of quality-unrelated considerations pertaining to this valley). Furthermore, our reputation modelling approach treats quality as an experience attribute (as opposed to, say, a credence attribute). The idea that food products typically ought to be treated as experience goods can be traced back to Nelson's (1970) introduction of this concept and is well established in the economics literature (e.g. Ali and Nauges, 2007).[9] As for quality, we will model it as a one-dimensional attribute. This is, admittedly, a simplification of reality. But this approach permits considerable gains in terms of analytical tractability while allowing us to provide a useful characterisation of the joint use of trademarks and GIs.

Consider the market for an experience good (e.g. parmesan cheese, sparkling wine, dry-cured ham) that can be produced in a continuum of qualities indexed by $q \in [q_0, \infty)$, where q_0 is the MQS allowed in the market (e.g. the minimum quality necessary to meet consumer safety and sanitary conditions and/or other regulatory provisions necessary for lawful marketing of the product). The presumption is that this MQS is enforced by the government and it is common knowledge that all producers meet it. We assume that there are two production areas – the GI region and the other region – and that these two regions enjoy different production technologies *vis-à-vis* the production of quality. Specifically, the production of one unit of good of quality q costs $c^G(q)$ in the GI region and $c(q)$ in the other region. The GI technology is available only in the GI region, whereas the standard technology is available in the other region.[10] These technologies satisfy standard conditions; specifically, $c^G(q)$ and $c(q)$ are assumed to be continuous, (strictly) increasing and (strictly) convex functions of quality, that is, $c_q(q) > 0$, $c_{qq}(q) > 0$, $c^G_q(q) > 0$ and $c^G_{qq}(q) > 0$. Furthermore, we assume that the GI technology $c^G(q)$displays a cost advantage in the production of higher quality products, whereas the conventional technology $c(q)$ possesses a cost advantage in the production of lower quality products. More precisely, we assume that there

9 Whereas the quality attributes of interest here are best thought of as experience goods, we recognise that other attributes of food products (e.g. organic, non-genetically modified, pathogen-free) could alternatively fit Darby and Karni's (1973) notion of credence goods. Roe and Sheldon (2007) study labelling options for such goods. Whereas the existence of credence good attributes would undoubtedly expand the scope for GI labels, one of the interesting results of our model is to show that GI-certification is valuable even without assuming that consumers' value origin *per se*.

10 As will become apparent, in the context of our model it would make no difference to assume that the conventional technology $c(q)$ is available everywhere.

exists a threshold quality level $\tilde{q}$ such that

$$\begin{aligned} c^G(q) > c(q) \qquad & \text{for all}\, q < \tilde{q} \\ c^G(q) < c(q) \qquad & \text{for all}\, q > \tilde{q} \end{aligned} \tag{1}$$

and, of course, $c(\tilde{q}) = c^G(\tilde{q})$. This assumption, which mirrors the comparative advantage condition postulated by Falvey (1989) in an international context, is intended to capture the notion of *terroir*, that is, the fact that the nature and characteristics of the production conditions in GI regions facilitate the attainment of higher quality levels (the quality/geography nexus discussed earlier).

The condition in equation (1) can be supported by a number of real-world illustrations. Consider, for example, the case of some fruits and vegetables that have PDO status in the EU, such as Monteleone di Spoleto spelt and Val di Non apples. These GIs' production regions are located in mountain areas where topographic conditions drastically limit the possibilities for mechanisation, making standard mass-production unfeasible (i.e. standard qualities can be more cheaply produced elsewhere where mechanisation is possible).[11] At the same time, though, the natural environmental conditions of the production areas (e.g. including altitude, exposure, daily temperature swings etc.) favour the attainment of levels of quality that would be very costly to achieve elsewhere (e.g. in the limit one could artificially replicate the natural environmental conditions at a very high cost), making the GI technology competitive in the upper range of the quality spectrum.

We analyse a competitive setting where all producers are price-takers and where the industry (both in the conventional and GI product sectors) is characterised by free entry, consistent with the typical non-exclusionary nature of most GIs discussed earlier.[12] Each active firm is assumed to produce a fixed quantity of output per period, normalised to unity, and to choose the quality level of its product.[13] To capture the inherently dynamic nature of reputation, the model is dynamic and firms potentially operate for an infinite number of periods.

The demand side of the model arises from a population of consumers who are heterogeneous with respect to their taste for quality.[14] We assume that

11 Other possible explanations of why the non-GI area has a comparative advantage in producing low quality might include a greater potential to replace labour with capital (at a lower total cost) and a lower cost of less specialised labour.

12 The role of competitive markets and free entry into the GI sector is also discussed in some detail in Moschini, Menapace, and Pick (2008).

13 Fixing the size of the firm allows the model to abstract from whether there are economies or diseconomies of scale in establishing reputation. The issue of economies of scale in establishing collective reputation has been addressed by Fishman *et al.* (2008). The relationship between firm size, investment in quality and individual brand reputation is investigated by Choi (1997), Cabral (2000) and Rob and Fishman (2005).

14 It is taste heterogeneity with regard to quality that supports a range of different qualities in the market equilibrium. As noted by a reviewer, an alternative approach to the Mussa and Rosen's (1978) type of preferences used here to model the demand side would be to postulate a population of consumers with identical tastes for quality but differing income,

there is a continuum of consumer types, indexed by the parameter $\theta \in [0, \bar{\theta}]$ with distribution $F(\theta)$. Consistent with previous literature, we assume that consumers purchase one unit of the product with the quality that provides the highest positive surplus, or otherwise buy nothing, where the surplus from purchasing quality q at price p for a consumer of type θ is given by

$$U(q, \theta) - p. \tag{2}$$

For the purpose of deriving market price–quality relationships that can arise in a competitive equilibrium, we need only minimal assumptions on consumer preferences. Specifically, we postulate that $U_q > 0$ (consumers' value quality) and that $U_\theta > 0$ (consumers with higher values of θ value quality more). Note that, given this preference structure in equation (2), consumers treat brands of like quality to be perfect substitutes. Of course, as discussed earlier, the actual quality supplied to consumers is not observable prior to purchase. The assumption here, therefore, is that consumers form conjectures as to the actual quality they should expect from a given firm based on the firm's reputation.

3.1. Reputation and information structure

In the literature on the economics of information, the concept of reputation is formalised in various ways depending upon the source of the uncertainty regarding quality (Bar-Isaac and Tadelis, 2008). When quality uncertainty is due to unobservable characteristics (markets primarily characterised by adverse selection problems), reputation is commonly modelled as consumer beliefs regarding a firm's type and is assumed to evolve based on signals (e.g. the firm's performance). When, as in our case, the uncertainty regarding quality is primarily due to unobservable actions (markets characterised by moral hazard problems), reputation ultimately concerns the buyers' beliefs about a producer's equilibrium actions. Perhaps the most coherent modelling structure for that purpose is provided by the use of repeated games, where the expectation of repeated interaction between buyers and sellers provides both the means for a reputation for quality to be established and for deviation from equilibria to be punished.

It is well known that repeated games can give rise to a plethora of equilibria, and the case of reputation is no exception. Shapiro (1983), building on the earlier insight of Klein and Leffler (1981), provides an interesting equilibrium solution, and we follow his approach in what follows. The key idea is that consumers' beliefs about a seller's unobserved actions about quality are based on the producer's past quality choices, which are observed *ex post* (recall that we

as in Shaked and Sutton (1982). This would require an appropriate (and straightforward) re-specification of the utility function in equation (2), but the results of the paper (including those discussed in Section 5 below) would not change.

are dealing with an experience good). In principle, such a firm's reputation can be modelled as dependent on the entire history of its quality choices, but Shapiro (1983) shows that the qualitative insights to be garnered are robust to the actual mechanism of reputation formation that is postulated. Given that, we adopt the simplest form of reputation-building that captures the essence of the problem at hand and assume that the reputation for firm k at time t is given by $R_t^k = q_{t-1}^k$. In other words, at any given point in time, a firm is expected to provide the quality level that it supplied in the previous period. This naïve expectation turns out to be validated in the equilibrium that we characterise in what follows and thus, in this sense, consumers are rational. Because consumers cannot observe quality at the time of purchase and rely on reputation, by deviating from equilibrium producers could, of course, surprise consumers (for one period) with a lower quality than expected. Such a quality cut would be discovered by consumers (with a one-period delay), and consumers would punish sellers by boycotting the brand thereafter (Allen, 1984).[15]

For such a reputation to work as a mechanism for signalling a firm's quality, it is essential that consumers be able to clearly distinguish the identity of firms. Brand names, trademarks and, in our context, GI labels are tools that permit such a consumer recognition and are fundamental for reputation to arise in equilibrium.

3.2. Branding options: trademarks and GI labels

Firms use brands to clearly identify their product in the eye of consumers. In our setting, a brand can be a trademark, a combination of a trademark and a GI label, or merely a GI label. Trademarks convey firm-specific reputation, whereas the GI label alone conveys collective reputation. A combination of a trademark and a GI label, of course, mingles firm-specific and collective reputations in a way that depends on the specific nature of the GI. We assume that each producer can, at any time, adopt and use a trademark at no cost (other than that needed to establish a reputation) and that there is an infinite supply of potential trademark names. Instead, to be able to use a GI label, a producer needs to obtain certification. To obtain certification, of course, producers need to produce within the GI area and meet other specific conditions eventually spelled out by the GI. We consider two alternative GI labelling systems in turn, certification marks and the EU-style *sui generis* system. Both system make an explicit claim on geography (i.e. only the product from the specific GI area can be GI certified) but, as noted, the latter also spells out detailed specifications that constrain the production process and the GI product's attributes. In our model we interpret this additional requirement of a *sui generis* GI system as mandating a GI-specific

15 Because brand ownership is not observable to consumers, a producer that has cheated and has lost all his customers could re-enter the market using a different brand, which of course would require a new reputation-building investment.

MQS, labelled q_0^G. We assume that $q_0^G \geq q_0$, that is, the MQS imposed by a GI scheme is at least as strict as the baseline standard that applies to all products.

Consistent with the collective nature of GI rights, we assume that all producers who satisfy the certification requirements for a given GI are entitled to its use. Finally, we postulate an economy with a fully credible trademark system and a fully credible certification scheme for GIs (i.e. there is no counterfeit product on the market and all certified products meet the requirements established by the certification scheme). To simplify the presentation of our results, we also assume no specific costs, over and above the production costs $c(q)$ and $c^G(q)$, associated with the use of trademarks or GI certification.

4. Long-run partial equilibrium

We consider a rational-expectation, stationary Nash equilibrium in a long-run partial equilibrium setting.[16] Specifically, the reputation equilibrium we consider is a steady-state configuration with a price function across qualities, $p(q)$, and a distribution of firms, $n(q)$, such that (i) each consumer, knowing $p(q)$, chooses his most preferred quality level or decides not to purchase anything; (ii) markets clear at every level of quality [thus determining $n(q)$]; (iii) any firm with reputation R finds it optimal to produce quality $q = R$ rather than to deviate and (iv) there is no further entry or exit.

Following Shapiro (1983), we focus on the case in which all other factors of production are in perfectly elastic supply. This is, admittedly, a restrictive condition for agricultural and food products where land is constrained in the aggregate (so that its supply to any individual industry is upward sloping).[17] Whereas such an upward-sloping supply could be accommodated in our context, it would considerably complicate the analysis without affecting the qualitative insights that we wish to characterise. Specifically, the assumption of perfect competition with free entry permits us to derive equilibrium price–quality schedules that depend only on the cost-of-quality structure, and the condition that all factors of production are in perfectly elastic supply makes such costs independent of factor market supplies and of the nature and extent of market demand for the specific product under consideration. The latter means that we can derive equilibrium price–quality schedules for very general demand conditions, i.e. for all consumer preferences satisfying basic postulates: (i) consumers are indifferent between products of equal quality; (ii) utility is strictly increasing in quality and strictly decreasing in

16 Consumer expectations of quality are adaptive but rational in equilibrium: consumers expect firms to maintain their reputation and firms do so.

17 For a number of GIs that individually account for a small share of a region's agricultural output, the assumption that all factors of production are in perfectly elastic supply might not be unreasonable. Moschini, Menapace and Pick (2008) discuss such examples. In any event, it will be readily apparent that some of the welfare implications of the analysis are predicated on the restrictive assumption that all factors of production are in perfectly elastic supply. This point will be discussed further in the concluding section.

the price paid for quality; and (iii) consumers have heterogeneous preferences regarding quality.[18]

In what follows, we consider three IP scenarios and derive the equilibrium market price–quality schedule for each scenario. The first scenario, our benchmark case, is one in which trademarks are the only branding option. In the second and third scenarios, we consider two alternative GI certification systems, the *sui generis* scheme and the certification mark scheme, respectively.

4.1. The benchmark case with trademarks only

Although the assumption here is that only trademarks can be used to sustain reputation, either of the production technologies – the standard technology $c(q)$ and the GI technology $c^G(q)$ – can be used to produce any given quality q. But the presumption is that when only trademarks are available, consumers cannot detect which technology is used in production. In equilibrium, therefore, it must be that a given quality q is produced by the technology that carries the lowest production cost. Hence, for qualities $q \leq \tilde{q}$ the standard technology is used, and for $q \geq \tilde{q}$ the GI technology is used.[19]

Consider first a representative firm that uses the standard technology $c(q)$ and whose brand's reputation in equilibrium is equal to $q \leq \tilde{q}$. At any point in time this firm can choose between two strategies: continue to supply the quality level q or produce a lower quality than its reputation (i.e. 'cheat'). If this firm remains honest (i.e. keeps producing quality q), it earns a discounted profit equal to $[(1+r)/r][p(q)-c(q)]$, where $r>0$ denotes the per-period interest rate. If the firm cheats by cutting quality, the most profitable avenue is to cut quality to the minimum level, thereby earning a one-period profit equal to $p(q)-c(q_0)$. The credibility constraint, which determines the range of prices for which the firm has no incentive to cheat, can therefore be written as

$$p(q) \geq c(q) + r[c(q) - c(q_0)]. \quad (3)$$

Next, consider a potential new entrant who wishes to establish a reputation for quality q. Being reputationless, this producer can only charge an entry price p_e for its product in the first (entry) period. As in Shapiro (1983), we argue that the presence of a potentially infinite supply of opportunistic (fly-by-night) sellers who could overrun the market with minimum quality q_0 implies that the entry price for a new brand is equal to the cost of producing minimum quality. Hence, $p_e = c(q_0)$. In equilibrium, a potential entrant incurs a sure

18 Assumptions (i) and (ii) rule out 'irrelevant' price–quality combinations. Assumption (iii) supports a range of different qualities to be exchanged in equilibrium.

19 Alternatively, because the production technology use cannot be credibly certified under a trademarks-only system, producers in the GI region wanting to sell qualities $q \leq \tilde{q}$ could outsource production to the other region while retaining their own branded trademark (and vice versa for producers in the non-GI region wanting to sell qualities $q \geq \tilde{q}$).

loss equal to $c(q_0) - c(q)$ in the entry period when the brand is still unknown and earns a profit equal to $p(q) - c(q)$ in any subsequent period. Free entry requires discounted profits of potential new brands to be non-positive, that is, $c(q_0) - c(q) + (1/r)[p(q) - c(q)] \leq 0$, and thus imposes a second restriction on the equilibrium price configuration, which can be written as

$$p(q) \leq c(q) + r[c(q) - c(q_0)]. \tag{4}$$

Together, the credibility constraint and the free-entry condition imply an equilibrium price–quality schedule for producers who use the standard technology equal to

$$A(q) \equiv c(q) + r[c(q) - c(q_0)] \quad \text{for } q_0 \leq q \leq \tilde{q}. \tag{5}$$

Similar conditions can be derived for producers who sell qualities $q \geq \tilde{q}$ using the GI technology $c^G(q)$. Here, however, because the technology of production is undetectable for consumers, and the cost of in-house production of minimum quality using the GI technology exceeds the cost of outsourcing production to firms that use the standard technology, $c^G(q_0) > c(q_0)$, the most profitable cheating option for producers who use the GI technology is outsourcing production at a cost equal to $c(q_0)$. The credibility constraint for producers who use the GI technology is then equal to

$$p(q) \geq c^G(q) + r[c^G(q) - c(q_0)]. \tag{6}$$

Being unable to detect the technology of production (recall that at this point only individual trademarks are allowed), consumers are willing to pay $c(q_0)$ for any reputationless brand independent of the actual technology used in production. The free entry condition for producers who use the GI technology is then equal to

$$p(q) \leq c^G(q) + r[c^G(q) - c(q_0)]. \tag{7}$$

Hence, for producers who use the GI technology, the credibility constraint and the free-entry condition together imply an equilibrium price–quality schedule equal to

$$B(q) \equiv c^G(q) + r[c^G(q) - c(q_0)] \quad \text{for } q \geq \tilde{q}. \tag{8}$$

Result 1

The market price–quality schedule that prevails in equilibrium when trademarks are the only available branding option is

$$P(q) \equiv \begin{cases} A(q) & \text{for } q \in [q_0, \tilde{q}) \\ B(q) & \text{for } q \geq \tilde{q} \end{cases}. \tag{9}$$

The market schedule, $P(q)$, as given in equation (9), is represented in Figure 1 by the bold curve. This equilibrium schedule reflects the assumption that consumers are indifferent between products of equal quality regardless of the underlying production technology (hence, they would purchase only brands with the lowest price for any given quality), and the fact that consumer utility is strictly increasing in quality (hence, consumers purchase only brands with the highest quality at any given price). As discussed earlier, in this setting it must be that qualities $q < \tilde{q}$ are produced with the standard technologies and qualities $q \geq \tilde{q}$ are produced with the GI technology, where $\tilde{q}$ is the quality level that separates the two ranges over which the technologies have a cost advantage. Hence, when trademarks are the only branding option, each quality level $q \geq q_0$ is produced using the technology with the lower production cost.

4.2. The *sui generis* GI certification scheme

Two features – the product specification and the collective nature – characterise the EU-type GI *sui generis* scheme and distinguish GI labels from trademarks. As discussed earlier, the specification details all the product characteristics, including the production process and the geographic area in which production takes place. We assume that the product specification is met when the product is produced with the GI technology (i.e. we abstract from enforcement issues, which are peripheral to the central point of our model). Thus, any GI-certified product has quality $q \geq q_0^G$, where q_0^G is the GI-specific MQS under the *sui generis* scheme. Given the collective nature of GI labels, we assume that all producers who use the GI technology and meet the GI-specific MQS can use the GI label, alone or in combination with a private trademark, to brand their products.

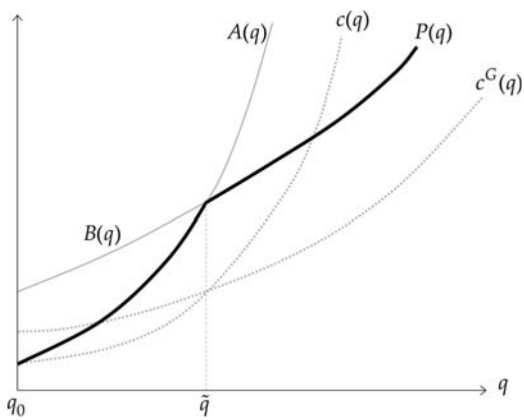

Fig. 1. Equilibrium price–quality schedule with trademarks only.

Note that a GI label alone cannot support a reputation for a quality level above $q > q_0^G$. Such a producer would be vulnerable to the competition (unrestricted, given free entry) of producers who would sell the lower (and cheaper to produce) quality q_0^G with the same label.[20] Hence, producers who want to service demand for qualities $q > q_0^G$, and thus are required to build a reputation for a quality strictly in excess of q_0^G, will need a private trademark in addition to the GI label. A firm that produces a quality in excess of q_0^G and uses a private trademark can in fact entirely capture the premium associated with the additional quality since consumers, through the trademark, can trace back the product's quality to the specific individual firm. If the firm uses only a GI label, it can only partially capture the premium associated with the additional quality (i.e. it can only capture the premium associated with the increase in the average quality of the GI labelled product) but will still bear the full cost of the additional quality. Hence, a firm is better off using a trademark in addition to the GI label whenever $q > q_0^G$. Knowing that, consumers also correctly infer that a product bearing the GI label alone is of quality q_0^G, the minimum quality that can be certified under the *sui generis* scheme.

The derivation of the equilibrium price–quality schedule for producers who certify under the *sui generis* scheme requires discussing the entry price that consumers are willing to pay for a GI-certified product when the accompanying trademark is new (i.e. it has no established reputation). We argue that the entry price for a GI-certified product with a reputationless trademark is $c^G(q_0^G)$. To this end, we note that consumers know that the quality produced by an entrant who certifies and wants to stay in business must be such that the entrant's brand is (at least weakly) preferred over alternative brands of equal quality once reputation is built and, hence, that the quality must be above a given threshold. Given this piece of information, a GI-certified product at an entry price equal to $c^G(q_0^G)$ is attractive to consumers. At the same time, any price above $c^G(q_0^G)$ would attract fly-by-night producers supplying unlimited quantity of quality q_0^G. Hence, there cannot be an equilibrium in which consumers pay more than $c^G(q_0^G)$ for an entrant's product of any quality.

In equilibrium, an entrant with a given quality q would incur a loss equal to $c^G(q_0^G) - c^G(q)$ in the (reputation-building) entry period and would earn a profit equal to $p(q) - c^G(q)$ in any subsequent period. Hence, free entry imposes the following restriction on the equilibrium price configuration for producers who use the GI technology and GI certification:

$$p(q) \leq c^G(q) + r[c^G(q) - c^G(q_0^G)]. \tag{10}$$

It is critical to observe that the presence of certification constrains the moral hazard behaviour of GI-labelled producers by limiting their ability to cut

20 This is essentially what happens in Winfree and McCluskey's (2005) model.

costs when they reduce quality. Once a trademarked product is known to consumers and it is GI-certified, the firm must continue certifying; otherwise, consumers would anticipate that the firm is cutting quality.[21] If, in equilibrium, a firm that certifies remains honest (i.e. continues producing the same quality), it earns a discounted profit equal to $[(1+r)/r][p(q) - c^G(q)]$. Also, conditional on certifying, the most profitable cheating avenue is to produce minimum quality q_0^G at cost $c^G(q_0^G)$, earning a one-period profit equal to $p(q) - c^G(q_0^G)$. Hence, the credibility constraint for a firm with a reputable trademark and that GI-certifies can be written as

$$p(q) \geq c^G(q) + r[c^G(q) - c^G(q_0^G)]. \tag{11}$$

The credibility constraint and free entry together imply that the price–quality schedule for certifying producers is equal to

$$G(q) \equiv c^G(q) + r[c^G(q) - c^G(q_0^G)] \quad \text{for} q \geq q_0^G. \tag{12}$$

Now suppose that a firm has built a particular reputation $R = q > q_0^G$. Could the firm maintain this reputation through the use of a trademark alone, i.e. dropping the use of the GI label? It turns out that that is not possible because if a firm were to stop certifying once its trademark is reputable, the firm's incentives to cut quality would change compared with the case in which the firm continues certifying. Without certification, the most profitable cheating avenue is to produce quality q_0 at cost $c(q_0)$, which earns a one-period profit equal to $p(q) - c(q_0)$. Hence, the credibility constraint for a firm that does not certify when its trademark is reputable is

$$p(q) \geq c^G(q) + r[c^G(q) - c(q_0)]. \tag{13}$$

It follows that, without GI certification, no price exists that would satisfy both the credibility and free entry condition (as long as $q > q_0^G$).

Producers who use the GI technology can also decide not to certify at all. In this case, the price–quality schedule for producers who use the GI technology but do not certify coincides with the schedule already derived under the benchmark case, as given by equation (8). Similarly, the presence of a *sui generis* scheme does not affect the price–quality schedule of producers who use the standard technology, for whom no certification is available under this scheme. For them, the price–quality schedule coincides with equation (5).

The equilibrium market price–quality schedule prevailing in the presence of the *sui generis* scheme corresponds to the lower envelope of the three schedules in equations (5), (8) and (12), but depending on the value of q_0^G, this schedule takes different forms. When q_0^G is suitably low, Result 2(a)

21 In the case of a firm using a pure GI label as a brand, discontinuing certification means selling an unbranded product, which is expected by consumers to be of baseline minimum quality q_0.

applies; for intermediate values of q_0^G, the condition in Result 2(b) is derived; and when $q_0^G$is large enough, Result 2(c) is obtained.

Result 2(a)

When $q_0^G \in [q_0, q']$, the market price–quality schedule that prevails in equilibrium under a *sui generis* scheme is

$$P^G(q) \equiv \begin{cases} A(q) & \text{for } q \in [q_0, \hat{q}) \\ G(q) & \text{for } q \geq \hat{q} \end{cases}, \tag{14}$$

where we define $\hat{q}$ and q' as satisfying $G(\hat{q}) = A(\hat{q})$ and $A(q') = c^G(q')$.

Thus, when the GI-specific MQS is suitably low, the equilibrium price–quality schedule that prevails under the *sui generis* scheme is continuous, just as in the benchmark case (with only trademarks) discussed earlier. Moreover, similarly to the benchmark case, it corresponds to the schedule of the producers who use the standard technology in the bottom range of the quality spectrum (here, for q smaller than $\hat{q}$) and to the schedule for certifying producers using the GI-technology in the upper range of the quality spectrum (here, for q larger than $\hat{q}$). But unlike the benchmark case, here not all qualities are produced with the production technology that has the lower production cost. Specifically, qualities $\hat{q} \leq q \leq \tilde{q}$ are produced with the GI technology even if the standard technology displays a lower cost in this quality range. What remains true, of course, is that each quality $q \geq q_0$ is produced by the firms with the lowest total cost, where the total cost includes both the production and the information cost. The market price–quality schedule that prevails under the *sui generis* scheme when the GI-specific MQS is low is represented by the bold curve in Figure 2a. It is important to note that even when GI certification does not entail any higher minimum quality than that which applies generally (i.e. $q_0^G = q_0$), the availability of GI certification does affect the equilibrium price–quality schedule because, as discussed, it affects the information cost required to establish and maintain reputation.

Note that Result 2(a) applies only when $q_0^G \leq q'$ where q' is the quality level at which the price of the standard product, $A(q)$, is equal to the production cost with the GI technology, $c^G(q)$. For this range of values of q_0^G, there exists a range of qualities $q \in [q_0^G, q']$ that are more cheaply supplied without certification, using the standard technology, than with certification [i.e. $G(q)$ is above $A(q)$]. That is, in this range the saving in production costs due to the standard technology are larger than the savings in information costs due to GI certification (because, essentially, the value of q_0^G is too close to q_0, the MQS that applies to all products). When $q_0^G > q'$, on the other hand, all qualities above the GI-specific MQS can be more cheaply supplied with certification. This is the case of Results 2(b) and 2(c).

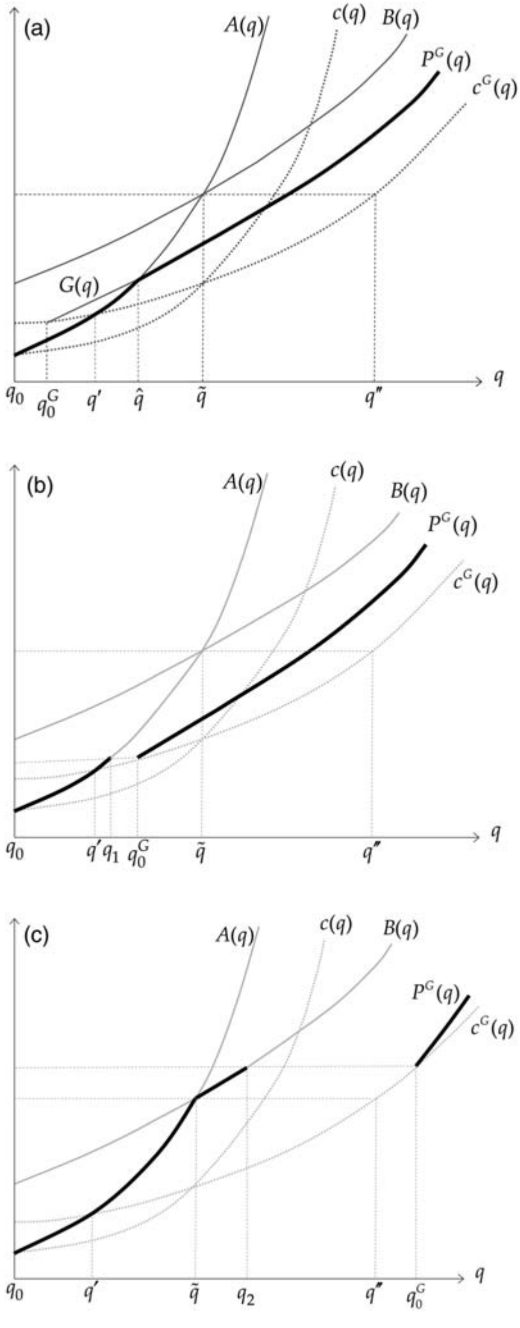

Fig. 2. (a) Price–quality schedule with trademarks and *sui generis* GI certification with $q_0^G \in [q_0, q')$. (b) Price–quality schedule with trademarks and *sui generis* GI certification with $q_0^G \in [q', q'')$. (c) Price–quality schedule with trademarks and *sui generis* GI certification with $q_0^G \geq q''$.

Result 2(b)

When $q_0^G \in [q', q'']$, the market price–quality schedule that prevails in equilibrium under a *sui generis* system is

$$P^G(q) \equiv \begin{cases} A(q) & \text{for } q \in [q_0, q_1) \\ G(q) & \text{for } q \geq q_0^G \end{cases}, \tag{15}$$

where we define q_1 and q'' as satisfying $A(q_1) = c^G(q_0^G)$ and $A(\tilde{q}) = c^G(q'')$.

Note that when the GI-specific MQS takes on a value in the given intermediate range, the market price–quality schedule under the *sui generis* scheme presents a discontinuity, i.e. we find a gap in the set of quality that can be supported by the market in equilibrium. Such a quality gap is typical in the presence of production technologies with comparative advantage over different quality ranges (e.g. Falvey and Kierzkowski, 1987 and in Flam and Helpman, 1987). Similar to the case of a low value of the GI-specific MQS, not all supplied qualities are produced by the firms with the lowest production cost: qualities $q_0^G \leq q \leq \tilde{q}$ are produced with the more expensive GI-technology instead of the cheaper standard technology.

The bold curve in Figure 2b represents the market price–quality schedule for intermediate values of the GI-specific MQS. The upper limit of this range, q'', corresponds to the quality level at which the production cost using the GI technology, $c^G(q)$, is exactly equal to the total cost (i.e. production plus information costs) of supplying quality $\tilde{q}$ (recall that $\tilde{q}$ can be produced at the same production cost with either technology). This also means that there is no quality level that can be produced with the GI technology without being certified that can be competitive on the market. When $q_0^G \geq q''$, on the other hand, there exists a quality range above $\tilde{q}$ and below q_0^G for which the GI technology that can be competitive on the market without certification (certification for this range is unavailable). This is the case of Result 2(c).

Result 2(c)

When $q_0^G \geq q''$, the market price–quality schedule that prevails in equilibrium under a *sui generis* system is

$$P^G(q) \equiv \begin{cases} A(q) & \text{for } q \in [q_0, \tilde{q}) \\ B(q) & \text{for } q \in [\tilde{q}, q_2) \\ G(q) & \text{for } q \geq q_0^G \end{cases}, \tag{16}$$

where we define q_2 as satisfying $B(q_2) = c^G(q_0^G)$.

A quality gap [over qualities $q \in [q_2, q_0^G)$] also characterises the equilibrium market price–quality schedule when the GI-specific MQS has high values, but in this case (as in the benchmark case) all supplied qualities are produced with the technology with the lower production cost. Here, we find that there exists a group of producers who use the GI technology but do not certify (i.e. they only use their own trademark), and this ends up supplying the quality range between $\tilde{q}$ and q_2. The bold curve in Figure 2c represents the market price–quality schedule for high values of the GI-specific MQS.[22]

4.3. GI certification based on certification marks

IP protection for GIs in the United States is provided through the standard trademark system, usually as certification marks. Certification marks for GIs only certify the origin of the product and provide no other quality-related claim or specification. For example, the certification mark ‘Washington Apples’ certifies that the apples are produced in the state of Washington, with no specific additional quality standard that needs to be met by producers (Winfree and McCluskey, 2005).

In our framework, certification under a certification mark scheme reveals to consumers the technology used in production, similar to the *sui generis* GI certification discussed in the foregoing sections. But, because certification marks do not envision any quality specification, it then follows that a certification mark system in our modelling framework is equivalent to a *sui generis* system with the minimal possible minimum quality, that is, $q_0^G = q_0$. Still, as illustrated in the foregoing analysis, the presence of such a GI certification is valuable because it curtails the moral hazard behaviour of producers by limiting their ability to cut costs were they to depart from equilibrium by supplying a quality lower than expected. The explicit graphical representation of the equilibrium market price–quality schedule with the certification mark scheme is omitted because of space limitations (it is essentially as in Figure 2a, but with $q_0^G = q_0$). Note that, again, with the certification mark scheme we find that there is a range of qualities that do not minimise production costs. Specifically, qualities $q' \leq q \leq \tilde{q}$ are produced with the GI technology despite the fact that the cost of producing them with the standard technology is lower.

5. Welfare implications

Relevant welfare questions for the problem at hand include the following: (i) What are the welfare implications of adding a GI certification scheme to a situation in which only private trademarks are used? and (ii) If GI certification is contemplated, which is best, a *sui generis* system or a certification mark system? Welfare impacts can arise for both consumers and producers. As we

22 As the foregoing discussion suggests, determining which of the three cases is relevant for a given real-world product would require information on the cost structure of both the GI and the standard technologies. If the matter were deemed of practical and/or policy interest, empirical work could in principle be brought to bear on these issues.

have shown, the availability of GI certification reduces the size of the reputation premium needed to support quality in the upper range of the quality spectrum, thereby taking the reputation equilibrium closer to the first best. This is illustrated in Figure 3 by the equilibrium price–quality schedule $P^G(q)$ (i.e. as Figure 2a–c shows, the equilibrium price–quality schedule moves closer to the marginal cost schedule). This reputation premium reduction is due to the revelation of some information regarding the GI-certified product to consumers. Specifically, both certification marks and certification via the *sui generis* scheme reveal the technology used in production and, in addition, certification via the *sui generis* scheme also informs consumers that the product is at least of quality q_0^G. By making these pieces of information common knowledge, certification limits the ability of producers to reduce costs by cutting quality and hence certification makes cheating a less attractive option to producers. At the lower end of the price distribution, on the other hand, the price–quality schedules with trademarks only and with trademarks plus GI certification coincide [as shown in Results 2(a)–2(c)].

For consumers, it is clear that the GI introduction effects discussed in the foregoing can only improve their welfare because they lead to a reduction in the equilibrium prices of some qualities. The welfare impacts on producers, however, are generally non-positive and depend critically on whether the introduction of GI certification is construed to happen *ex ante* (that is, before the investment in reputation-building is undertaken) or *ex post* (that is, after firms have already built up their reputation by the use of trademarks). From an *ex ante* perspective, perfect competition with free entry, coupled with the condition that all factors are in perfect elastic supply, means that, *ex ante,* the surplus of producers is nil. But the introduction of a GI system after firms have already built up their reputation by the use of trademarks can have

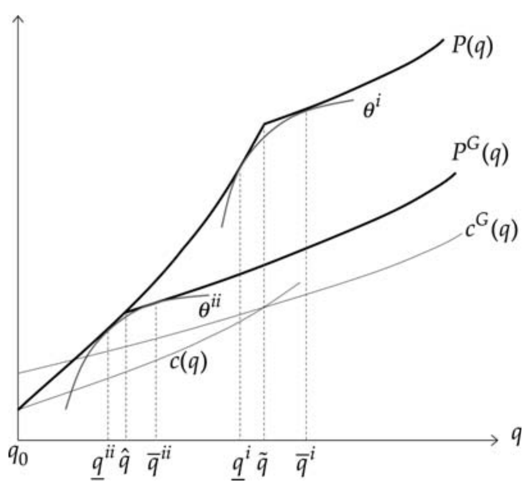

Fig. 3. Consumers' choices with trademarks only and with trademarks plus GI certification.

negative *ex post* impacts on producers' welfare. Exactly which producers (in terms of what quality they provide) are affected depends on the structure of demand. To discuss the possible welfare effects in more detail, a closer look at preferences is needed.

To put some more structure on the preference relation $U(q, \theta)$ in equation (2), assume that

$$U_q > 0,\ U_{qq} < 0,\ U_\theta > 0 \text{ and } U_{q\theta} > 0. \tag{17}$$

Thus, in addition to the assumptions that consumers value quality and that consumers with higher θ have a higher taste for quality, discussed earlier, we also assume that utility is concave in quality and that the marginal utility of quality is larger for consumers with higher values of θ. Note that, for each θ-consumer, $U(q, \theta) - p$ defines a set of convex indifference curves in the $p \times q$ space with a southeast preference direction. The slope of such indifference curves satisfies $dp/dq = U_q$ and thus it is increasing in θ (for any give q). For each consumer, optimality requires achieving the highest feasible indifference curve, which in a competitive equilibrium is constrained by the price–quality schedules derived in the foregoing analysis (and the requirement that $U(q, \theta) \geq p$).

Depending on the particulars of the utility function, we can have either that $U(q, 0) \equiv \underline{u} \geq P(q_0)$, in which case every consumer buys the product in question (i.e. the market is covered), or that $\underline{u} < P(q_0)$, so that some consumers at the lower end of the taste distribution are not consuming the product in question (i.e. the market is uncovered). Rather than discussing all possible cases, it is instructive to consider the situation in which there exists a consumer type θ^i who, under the trademarks-only system, is indifferent between consuming quality $\underline{q}^i$ produced by the standard technology and quality $\bar{q}^i$ produced by the GI technology. This is illustrated in Figure 3 where $P(q)$ is the equilibrium price–quality schedule with trademarks only and $P^G(p)$ is the equilibrium price–quality schedule with trademarks plus GIs, and where we are essentially considering the case of Result 2(a). Prior to the introduction of GI certification, consumers with type $\theta < \theta^i$ are served by the standard technology, if they buy the good at all, and consumers with $\theta > \theta^i$ are supplied by the GI technology. In this illustration the introduction of a GI certification system results in a new consumer type $\theta^{ii} < \theta^i$ being indifferent between consuming quality $\underline{q}^{ii}$ produced by the standard technology and a quality $\bar{q}^{ii}$ produced by the GI technology.

In Figure 3, consumers with low taste for quality, specifically with $\theta \leq \theta^{ii}$, are not affected by the introduction of the GI certification. But consumers with higher taste for quality, specifically with $\theta > \theta^{ii}$ and consuming qualities $q \geq \bar{q}^{ii}$ in the new equilibrium, are strictly better off under the GI certification scheme because they can take advantage of the lower price–quality schedule. As for producers, those serving the low end of the quality spectrum, that is, producing qualities $q \leq \underline{q}^{ii}$ in the illustration of Figure 3, are not affected by the introduction of GI certification as this market segment continues to be serviced by producers who do not certify. Standard-technology producers who, prior to the introduction of GI certification, are active in the quality range $\underline{q}^{ii} < q < \underline{q}^{i}$ lose their reputation premium. Specifically, producers in the range $\underline{q}^{ii} < q < \bar{q}^{ii}$ lose their investment in reputation because these qualities disappear from the market, whereas producers in the quality range $\bar{q}^{ii} \leq q \leq \underline{q}^{i}$ lose their reputation premium because these qualities are now provided by the GI technology with the lower price–quality schedule $P^G(q)$.[23] Producers in the quality range $q > \bar{q}^i$ also partially lose their investment in reputation because, although they are still relying on the same GI technology, the advent of GI certification has reduced the reputation premium. The introduction of GI certification illustrated in Figure 3 also gives rise to new production opportunities for the quality range $\underline{q}^i < q < \bar{q}^i$, which was not serviced with the trademarks-only system but is now serviced by GI producers after the introduction of GI certification.

It is apparent that the introduction of a GI certification scheme affects consumers and producers in radically different ways. Consumers, to the extent that they prefer high quality, are clearly better off with lower prices (otherwise, if they prefer low quality, they are just as well off). As for producers, if they have already sunk the investment in reputation before the introduction of the certification scheme, they are either indifferent (at the lower end of the quality spectrum) or are negatively affected by the introduction of GI certification because the premium they can charge for their established reputation is curtailed. Note that producers using either the standard or the GI technology can lose from the introduction of GI certification.

As for aggregate welfare – the sum of consumer and producer surpluses in this model – the overall effects are more subtle and depend critically on whether one takes the *ex ante* or *ex post* perspective. With zero discounted profits for new producers, it is clear that, *ex ante*, only consumer surplus matters. From this point of view, the introduction of GI certification always increases welfare because it further improves the efficiency with which reputable brands can supply quality to consumers.[24] But if the introduction of GI certification happens after reputation has been established by all firms, the losses to producers need to be balanced against the gains to consumers. It seems that no general conclusion can be obtained in this setting without making more assumptions about the distribution of consumers $F(\theta)$. To show that, indeed, GI introduction can cause a reduction in overall welfare, consider the case in Figure 3 and suppose that θ^{ii} is the largest value in the support of $F(\theta)$, and that there

23 In this quality range one can argue that the loss of the prior investment in reputation is only partial (instead of total) if these producers can relocate production to a GI region while keeping their own private trademarks, a scenario consistent with the assumed free entry condition of the model.

24 Of course, if the distribution of consumers $F(\theta)$ is such that all consumers are bunched at the low end of quality preferences (e.g. $\bar{\theta} \leq \theta^{ii}$ in the case of Figure 3), it is possible that GIs have no effect.

is a positive mass m of consumers with this type. Prior to GI certification, all consumers are served by the standard technology, with consumers of type θ^{ii} enjoying quality $\underline{q}^{ii}$. With GI certification, however, the consumers with type θ^{ii} can now be served by the GI technology (at quality $\bar{q}^{ii}$). In such a case, by construction, there is no welfare gain to consumers. But established producers suffer a reputation premium loss of $m[P(\underline{q}^{ii}) - c(\underline{q}^{ii})]$ per period, which is not balanced by any gain to GI producers (the present value of their reputation premium is dissipated in the reputation-building stage of the entry period). Of course, it is quite possible that $F(\theta)$ is such that consumer gains from the introduction of GIs exceed producer losses, but the fact remains that it does not appear possible to derive general conclusions as to aggregate welfare impacts of the *ex post* introduction of GI certification.

Finally, we wish to discuss which GI certification scheme – the *sui generis* system or that with certification marks – is to be preferred. From the foregoing discussion, the most meaningful setting for this question is from an *ex ante* perspective, in which case the certification scheme that maximises social welfare is the one that maximises aggregate consumer surplus. Because the two GI systems in our model differ by their MQS, it will prove useful to discuss how the GI-specific MQS, q_0^G, affects consumer surplus. As is evident based on Results 2(a)–2(c), the value of the GI-specific MQS determines the shape and position of the equilibrium market price–quality schedule and hence the price–quality combinations that are available to consumers. The available price–quality combinations, in turn, determine the surplus that each consumer type can derive in the market. Hence, the specific welfare-maximising value of the GI-specific MQS will generally depend on the distribution of consumer types. Specifically, the optimal value of the GI-specific MQS has to balance the welfare losses of consumers whose quality selection is constrained by the value of q_0^G and the welfare gains to consumers who purchase the GI-certified product. By raising the value of $G(q)$, $G(q)$ is pushed down towards production costs; hence, the prices of all qualities above q_0^G decline. But, by raising q_0^G above q', some qualities are no longer supplied in the market (i.e. consumers have less quality options to choose from).

With an exogenously determined q_0^G, a comparison between the price–quality schedules under the *sui generis* and certification mark schemes reveals that (i) for any given value of $q_0^G \leq q'$ every consumer type is at least as well off with the *sui generis* scheme as with certification marks (because of lower prices in the upper end of the quality range with the *sui generis* scheme); and (ii) for any given value of $q_0^G > q'$, the scheme that provides the largest welfare depends on the distribution of consumer types. For the latter case, in fact, some qualities in an intermediate range are not supplied under the *sui generis* scheme while the same qualities would be supplied with a certification mark scheme (hence, consumers with intermediate values of θ would be better off with certification marks). But the *sui generis* scheme leads to lower prices in the upper part of the quality spectrum compared with a certification mark, and hence consumers with relatively high values of θ would be better off with the *sui generis* scheme. Finally, if the value of q_0^G can be chosen optimally so as to maximise aggregate welfare, the *sui generis* scheme is obviously unambiguously better than the technology scheme for any given distribution of consumers (because it is always possible to set $q_0^G = q_0$).

6. Conclusions

In this paper we have developed a reputation model to assess the role of certification for agricultural and food products with a regional identity, known as GIs, in a context in which firms already have access to private trademarks to establish their reputation for quality. The model nests the concept of firm reputation that provides one of the traditional justifications for trademarks, with a meaningful definition of collective reputation that can be ascribed to GI labels. We have shown that trademarks and GI certification can be viewed as complementary instruments for the purpose of credibly signalling quality to consumers in a competitive equilibrium. Thus, our model provides a rationale for the concurrent use of GI certification and trademarks, a feature that is quite common for agricultural and food products that claim superior quality because of their geographical origin.

Several instructive aspects on the role of certification in quality provision and reputation formation emerge from the model. First, we show that certification reduces the divergence between the reputation equilibrium and the equilibrium that would prevail under perfect information by lowering the cost of establishing reputation compared with a situation with only trademarks. Hence, certification improves the ability of reputation to operate as a mechanism for assuring quality. Second, in our model the welfare gains that arise from GI certification accrue to consumers, especially those with a taste for higher qualities. This is because certification, by raising the price that entrants can command, reduces the cost of building a reputation and hence the value of an established reputation. In our model, producers are either unaffected or are negatively affected by the introduction of a GI certification scheme. This observation perhaps suggests that producers' support for the introduction of new GIs might be highest at an early marketing stage, before eligible producers have already committed resources towards building a (private) reputation via their own trademarks. But we should note that what our model can say about producer welfare is limited by our assumption that all factors of production are in perfectly elastic supply. If this condition were relaxed, it is certainly possible to envision benefits to GI producers that are not accounted for in our model. For example, if land supply to the industry of interest is upward sloping, expanding production would increase the returns to land (what is typically measured as producer surplus). And, in our setting, it is clear that GI certification tends to expand the output of the GI region. As production of the GI product increases, the price–quality schedule of the GI product would be pushed up towards the standard technology schedule, which represents an upper bound on equilibrium prices. Consumers would still gain (or at least be indifferent) from lower prices for some qualities due to certification, while GI producers would benefit as land owners.

Our model also considers the features of two major forms of GI certification schemes, the EU-style *sui generis* system and the US-style certification mark approach. We show that the type of GI certification matters, and that the features of the certification scheme play an important role in mitigating the informational problems connected with supplying quality for experience goods. Both of these types of GI certification work by making common knowledge some relevant information, which in turn mitigates the inherent moral hazard problem by limiting the ability of producers to operate opportunistically. In our model, a *sui generis* scheme discloses more information than a certification mark scheme and it is generally preferable to a certification mark scheme.

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