The welfare effects of the public provision of information: labelling typical products in the European Union

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The welfare effects of the public provision of information: Labelling typical products in the European Union

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Abstract
We consider the welfare impact of the EU regulation allowing producers of agricultural commodities with specific characteristics to differentiate their products. With a model of vertical differentiation we calculate the effects on equilibrium and welfare levels. The introduction of the regulation and the emergence of two distinct differentiated but competitive markets leaves consumers and high-quality producers better-off, while low-quality producers are worse-off. With high costs and low quality difference, the total welfare impact of the regulation can be negative. When high-quality producers can exercise market power, the regulation could be more easily accepted by producers.

1 Introduction
It is at least since the pioneering contribution of Akerlof (1970) that economists and policy makers are aware of the importance of information for the proper

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functioning of markets. Indeed, most are familiar with the many instances of market failures due to information problems and many agree on the need to overcome them in order to increase social welfare. What is more controversial though is which corrective would be most suitable, whether a public intervention (see, e.g., Stiglitz) or the emergence of a different institution, such as warranties, reputation, labelling, etc.

In this paper we consider the intervention of the European Union in agricultural markets for typical products, agricultural commodities or finished products with specific organoleptic characteristics related to a production area or technology, which are believed to be impaired by inadequate information. According to widespread beliefs, typical products of higher quality can not be recognized as such by consumers with higher willingness to pay, and hence producers in better production areas cannot have appropriate incentives.

The aim of the paper is to investigate the welfare effects of the EU regulation which grants producer groups the right to label typical products to make them easily recognizable by consumers. With the MacSharry reform of the Common Agricultural Policy (1992), the European Union has changed its approach to agricultural policies with a major emphasis on non distortionary policy interventions. At the same time, it has started a series of policies to increase the diversification of agricultural production to achieve a better balance between supply and demand and to benefit the rural economy, in particular of less-favored and remote areas.

One intervention following these broad objectives is Reg. no. 2081/92 on the protection of Products with Geographical Indications (PGI) and Designations of Origin (PDO). It recognizes that consumers are attaching greater importance to the quality of foodstuffs and that "... in order to be able to make the best choice they must be given clear and succinct information regarding the origin of the product ...". Its aim is to recognize, protect and foster trade among Member States of PGI and PDO products to secure higher incomes to farmers in return for a genuine effort to improve quality.\textsuperscript{1}

The regulation aims to increase both consumers and producers welfare.\textsuperscript{1}

\textsuperscript{1}The scope of the regulation is limited to commodities for which a link with geographical origin exists. The link and the specific quality, reputation, or other characteristics attributable to the area and the production-processing-preparation practices must be proven during the registration application and are evaluated by the EU. For more details on the regulation and its effects on the demand for a particular product, see, e.g., Loureiro and McCluskey (2000) on Galician Veal.
According to the regulator, consumers with higher willingness to pay would be sure to get what they pay for, while producers would find the incentives to provide the quality level sought by richer consumers and ensure themselves higher profits. In the paper we propose a welfare analysis of the regulation, and argue that although the motives are noble, the results may not be always welfare increasing.

In the next section we review some of the literature and provide some background information about the impact of the regulation, i.e., about some of the commodities and regions that have benefitted from it. We then introduce the model we use to evaluate the welfare impact of the regulation. By choosing the assumptions of the model, we are careful to always make the choices that are more optimistic about the impact of the regulation. In other words, we use a best case scenario approach for the regulator. That is to achieve optimal returns to the producers.

Indeed, we assume there is a market failure and a need for public intervention because we have a credence good, for which private or market institutions, e.g., branding, intermediaries, forward integration, etc., may not emerge. In addition, we allow the market regulation to work perfectly, in the sense that once introduced it is trusted and perfectly observed by consumers. We are aware that this best-case scenario may be not very realistic in many instances. However, we propose it because it is also clear that for those situations in which there is no need for the regulation, or it does not work properly, things would not improve compared to this benchmark scenario. This latter may thus be considered like an upper bound on the welfare effects of the regulation.

We find that the impact on consumer’s welfare is ambiguous and depends on the characteristics of the product, on technology conditions, and on the extent of market power. For producers, the result is ambiguous too, since those granted the label can do all but gain while the others lose. This result may not be surprising. However, we go a step further and show that depending on demand and technology parameters and on the costs of managing the regulation, the change in total welfare may be negative despite the potential gains to consumers and to those producers who are protected by the regulation. We also consider the possibility that the producers may exercise some market power following the introduction of the regulation. After dis-

\footnote{For example, many of the products now using the regulation were already well known by consumers, like for example French and Greek cheeses, Italian and Spanish hams, etc.}
cussing some policy implications, we conclude and suggest some extensions and further research areas.

2 The regulation and related literature

Since 1992, many products were proposed by producers and their organizations to be recognized as Products with Geographical Indications (PGI) or with Designations of Origin (PDO). By the end of 1999, approximately 530 products were granted the right to use these labels. The major countries benefitting from the regulation are France (22% of granted labels), followed by Italy (20%), Greece and Portugal (both 14%), and Germany (11%). While for France and Germany the majority of products labelled were local breads and beers, for Italy and other Southern Europe countries the products included cheeses, meat products, fruits and vegetables and olive oil.

The importance of information for the proper functioning of markets is well known and documented. Since the pioneering work of Akerlof (1970) and Klein and Leffler (1981), economists have investigated the causes and remedies to market failures due to the lack of information on product quality. It has been shown that the suboptimal equilibria resulting from these information problems may be improved through the emergence of different institutions in the form, for example, of warranties, certification (De and Nabar, 1991), signalling and reputation (Kreps et al., 1982; Shapiro, 1983), and various intermediaries (Spulber, 1999).

It is common in the economic literature to distinguish goods according to the extent at which their quality can be identified by consumers. The quality of search goods is easily detected before consumption. For experience goods, consumers need to actually consume the good before being able to discern its intrinsic quality. For credence or trust goods, quality can never be known by consumers with certainty (Nelson, 1970). While for search and experience goods the emergence of market ”remedies” for quality assurance can be relatively effective and enough to avoid market failures, in the case of credence goods the instances in which suboptimal equilibria exist are more common (Darby and Karni, 1973).

In the food industries, recent contributions recognize that many aspects of food quality and safety can be considered credence attributes (Caswell and Mojduszka, 1996; Antle, 1996). Although the theoretical contributions that deal with credence goods in general are relatively few, their applications
to food industries are increasing. Bureau et al. (1998), consider the case of the dispute over hormone-treated beef between the EU and the US and the effects of trade liberalization with and without the possibility for the consumers to recognize different beef qualities. They find that the positive effect on welfare, following the trade liberalization, may be offset by the increase in imperfect information about product quality.

In a related paper, Marette et al. (1999) investigate the impact of common labelling by a cartel of producers able to restrict output when there is asymmetric information about product quality. They find that with high cost of labelling, a cartel which provides information about product quality, may improve total welfare even in the case of producers colluding to reduce output. Anania and Nisticò (1999) consider different scenarios for a public regulation, according to which degree of "trust" or credibility the regulation can obtain from consumers. Using political economy arguments, they explain the relative weakness of regulations aimed at providing consumers with assurance regarding product quality. A fully credible regulation is preferred by producers with high quality products, while a regulation that is only partially credible may be profitable also for low quality producers since it allows them to mimic high quality producers and obtain higher prices.

Auriol and Schilizzi (1999) consider the quality signaling through certification with fixed certification costs, and find that the extent of fixed costs determine market structure. They also compare welfare levels that result from public and private certification programs and find that the costlier the certification the higher is the need for public intervention. Kirchhoff (1999) and Ibanez (1998) consider the case of environmental labelling, i.e., the certification of technology "greenness". Kirchhoff, using a two period game with monitoring of firms’ claims, finds that firms may voluntarily over-comply, that is produce high quality even when doing so implies giving up short-run profits. She explains why in many cases firms that pretend to be producing high quality products may have an incentive to lobby for stricter monitoring.³

³Ibanez extends previous results in the literature, considering the case of competition in environmental labelling and shows that "... the market is able to generate the inefficiency [...] if the population has a certain pro-social behavior ..." (Ibanez, 1998: 24).
3 The model

Our model builds on Bureau et al. (1998) and considers a vertically differentiated market. The starting point of the analysis is a situation in which a good may present different quality levels but appears undifferentiated to consumers. Indeed we assume a credence good for which consumers are not able to distinguish between different variants of the same commodity. We also assume that the producers who are granted the label by the regulator are really producing a superior good, i.e., a good for which the characteristics are not inferior to the ones of the remaining variant of the commodity. In other words, the regulator is unbiased and can perfectly detect the quality of the commodity.

By introducing the labelling, the superior version of the good becomes recognizable by consumers and can be distinguished from the lower quality variants. In practice, the regulation creates two distinct products: the one with the label, with higher quality, sold to consumers with the higher willingness to pay; and the other with a lower quality level.

Consider then an agricultural commodity as a credence good. Its quality can vary and is not known by consumers neither before nor after consumption. Some consumers would be willing to pay more for a certain variant of the commodity - which characteristics are linked to special features of the production technology and/or area of production - because they believe they would get higher utility from its consumption. The regulator can alleviate the problem of asymmetric information by granting a label to those producers who follow certain rules and by helping them to establish reputation for higher quality. We assume that the regulator knows with certainty which firm produces the high-quality product or from which production areas the commodity comes from. For this and other reasons, consumers trust the

\footnote{\textsuperscript{4}We consider credence goods first because it is reasonable to think that in many instances consumers are not able to discern whether a commodity is really from a particular area and/or has been produced with a particular technology. In addition, we are aware that some eligible commodities may also have some experience attributes, but with experience goods institutions may emerge to solve the information problem without government intervention. As explained in the introduction, we want to give the regulator the best conditions for the regulation be introduced and to work properly.}

\footnote{\textsuperscript{5}We do not consider political economy pressures, which could lead to a situation in which some differentiating qualities are exaggerated in the label. Again, we choose to give the regulation what we think are the best chances to be welfare enhancing.}
public provision of the certification.\footnote{For a paper that explicitly considers when the certification is only partially trusted see Anania and Nisticò (1999).}

We assume that the quality \( s \) of the good under consideration is exogenous. It depends on the peculiar climate and soil conditions, and on some traditional practices the regulation intends to preserve. Thus, the quality can be either low \( (s_L) \) or high \( (s_H) \).\footnote{In models with vertical differentiation it is also possible to have endogenous quality when firms may invest in quality improvement, incurring either in an increase of fixed or variable costs. For an in-depth analysis of endogenous quality in the food industries see Sutton (1991).} Assume there is an exogenous number of producers: \( n_L \) producers of the low-quality variety \( (s_L) \) of the commodity and \( n_H \) of the high-quality \( (s_H) \).\footnote{We believe it is reasonable to assume no entry for the high-quality producers, since here quality is linked to a particular area where the essential factors of production, e.g., land, are given. Different is the case of low quality products, which may be replicated somewhere else. We concentrate on the short run impact, and we leave the free entry case as a possible extension of the paper. The reader should be aware that with free entry different results could emerge.} Producers from different areas share different production technologies and costs of production. We assume that the producers specializing in the high-quality commodity use a more restrictive, i.e., costly, technology: because they follow traditional techniques or simply because even though they have a potential for high-quality this simply requires more efforts. We assume a quadratic functional form for the cost function: \( c_i(q_{ij})^2n_i \), where \( q_{ij} \in \mathbb{R}_+ \) is the quantity level of the type \( i = L, H \) commodity for the individual producer \( j \); \( c_i \) is a cost parameter such that \( c_L < c_H \), and \( n_i \) ensures a constant returns to scale technology.

To begin with, we assume that individual producers \( j \) are price takers. Their profit is given by the following:

\[
\pi_{ij} = q_{ij}p_i - c_i \frac{(q_{ij})^2}{2} n_i, \quad i = L, H. \tag{1}
\]

The optimal level of individual production is \( q_{ij} = \frac{p_i}{c_i} n_i \), while the aggregate supply is the summation of individual supplies:

\[
Q_i(p_i) = n_i q_{ij} = \frac{p_i}{c_i}. \tag{2}
\]

Note that \( Q(p) = Q_L(p_L) + Q_H(p_H) = \frac{p_L}{c_L} + \frac{p_H}{c_H} \).

\[\pi_{ij} = q_{ij}p_i - c_i \frac{(q_{ij})^2}{2} n_i, \quad i = L, H. \tag{1}\]

\[
Q_i(p_i) = n_i q_{ij} = \frac{p_i}{c_i}. \tag{2}\]
To represent consumer preferences we consider a demand structure à la Mussa-Rosen (1978). Consumers can choose one unit of the good with quality \( s \). If they consume it, they receive the following utility:

\[
V = \theta s - p,
\]

where \( \theta \) is a taste parameter which represents different intensity of preferences for quality and \( p \) is the price of the good of quality \( s \). Let us assume that the taste parameter \( \theta \) is distributed uniformly over the interval \( \theta \in [\overline{\theta}, \overline{\theta}] \), and normalize the distribution such that \( \overline{\theta} = 0 \) and \( \overline{\theta} = 1 \). The consumers will consume as long as \( \theta > \frac{p}{s} \).

The expressions for consumers and producers welfare are the following:

\[
CS = \int_{\underline{\theta}}^{\overline{\theta}} (\theta s - p) d\theta,
\]

\[
PS_i = \int_{\underline{q}}^{\overline{q}} (p_i - c_i q) dq,
\]

where \( [\underline{\theta}, \overline{\theta}] \) and \( [\underline{q}, \overline{q}] \) are generic integration intervals.

\section{Before the regulation: the undifferentiated market}

Consider the case before the regulation, when one indistinguishable variety of the good is offered. We assume that the equilibrium before the regulation is a market situation in which both types of the commodity are sold but the consumers are not able to distinguish between them. With a unique price in the market, consumers form expectations about the quality of the commodity they buy. Using rational expectations, we assume that consumers expect that the average quality of the undistinguished commodity is the weighted (by the

\footnote{This corresponds to a situation in which the market is not covered, that is some consumers prefer not to buy the commodity offered. The other case is when the market is covered, which we do not consider for the moment. When a market is covered, demand can not be inverted and so quantity-competition à la Cournot can not be used (Motta, 1993: 116).}
relative quantity) average of the quality levels of the two varieties of the good. The expected quality is then the following:

\[ s = \frac{Q_L(p_L)}{Q(p)} s_L + \frac{Q_H(p_H)}{Q(p)} s_H = \frac{s_{LCH} + s_{HCL}}{c_L + c_H}. \]  

(5)

Since consumers are implicitly risk-neutral, we may determine the demand for the good of quality \( s \) sold at price \( p \) by the following expression:

\[ D(s) = \theta - \frac{\theta_0}{\theta}, \]  

(6)

where \( \theta_0 \) represents the consumer that is indifferent between buying and not buying the good and it is such that \( \theta_0 = \frac{p}{s} \). Recalling that \( \theta = 1 \), we then obtain that the demand, when there is only one undistinguished good offered, is \( D(p, s) = 1 - \frac{p}{s} \).

We can characterize the equilibrium quantity and price by setting the (aggregate) supply equal to the demand: \( Q(p) = \frac{p_L}{c_L} + \frac{p_H}{c_H} = 1 - \frac{p}{s} = D(p) \). We then obtain the following:

\[ q_s = \frac{s}{s + c}, \]  

\[ p_s = \frac{s c}{s + c}, \]  

(7)

where \( c = \frac{c_H c_L}{c_H + c_L} \). Note that the superscript refers to an equilibrium, while the subscript refers to the different types, i.e., producers of the low-quality variety \( (s_L) \) of the commodity or of the high-quality variety \( (s_H) \).

The levels of consumers and producers welfare, avoiding to show the intermediate steps, are:

\[ CSB = \int_{\theta_0}^{1} (\theta s - p_s) d\theta = \frac{\pi^4}{2(\bar{\pi} + \pi)^2}, \]  

(8)

\[ PSB_H = \int_0^{q_H} (p_s - c_H q) dq = \frac{s^2 c^2}{2 c_H (\bar{\pi} + \pi)^2}, \]  

\[ PSB_L = \int_0^{q_L} (p_s - c_L q) dq = \frac{s^2 c^2}{2 c_L (\bar{\pi} + \pi)^2}. \]

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10 The letter \( B \) of \( CSB, PSB_L, PSB_H \) stands for Before the regulation.
The resulting level of total welfare, which we consider to be our benchmark to improve when evaluating the effects of the regulation, is the following:

\[ TWB = CSB + PSB_L + PSB_H = \frac{s^2 \tau (1 + \bar{s}\bar{c})}{2 (\bar{c} + \bar{s})^2}. \]

5 The effects of the regulation: the competitive case

Now let us consider the case in which, after the regulation, consumers can distinguish between two goods offered at quality \( s_L \) and \( s_H \), with \( s_L < s_H \), and at prices of \( p_L \) and \( p_H \), with \( p_L < p_H \). In this case we can consider two indifferent consumers. One, \( \bar{\theta} \), who is indifferent between the high-quality and the low-quality good: \( \bar{\theta} s_H - p_H = \bar{\theta} s_L - p_L \) such that \( \bar{\theta} = \frac{p_H - p_L}{s_H - s_L} \). The other, \( \theta_0 \), who is indifferent between buying the low-quality good and not buying at all: \( \theta_0 s_L - p_L = 0 \) such that \( \theta_0 = \frac{p_L}{s_L} \). We can express the demand for the two goods in the following way:

\[ D_H(s, p) = \frac{\bar{\theta} - \tilde{\theta}}{\bar{\theta}} = \frac{\bar{\theta} - \frac{p_H - p_L}{s_H - s_L}}{\bar{\theta}} = 1 - \frac{p_H - p_L}{s_H - s_L}, \] (9)

\[ D_L(s, p) = \frac{\tilde{\theta} - \theta_0}{\tilde{\theta}} = \frac{\frac{p_H - p_L}{s_H - s_L} - \frac{p_L}{s_L}}{\bar{\theta}} = \frac{p_H - p_L}{s_H - s_L} - \frac{p_L}{s_L}. \] (10)

Following the regulation, two competitive markets emerge: one for the high-quality type of the commodity, and the other for the low-quality variant of it. The aggregate supplies in the two markets are \( Q_L(p_L) = \frac{p_L}{c_L} \) and \( Q_H(p_H) = \frac{p_H}{c_H} \).

The equilibrium quantities and prices in both markets are the following:

\[ p_L^e = \frac{c_L c_H s_L}{\sigma}, \] (11)

\[ p_H^e = \frac{c_H (s_L \Delta s + c_L s_H)}{\sigma}, \]

\[ q_L^e = \frac{c_H s_L}{\sigma}, \]

\[ q_H^e = \frac{s_L \Delta s + c_L s_H}{\sigma}. \]
where $\sigma = c_L c_H + c_H s_L - s_L^2 + c_L s_H + s_L s_H$ and $\Delta s = s_H - s_L$. Note that the superscript $c$ refers to the competitive scenario equilibrium, while the subscript refers to the different quality levels, high and low.

Given the equilibrium quantities and prices, the level of consumer’s welfare in the competitive scenario is the following:\(^{11}\)

$$CSA^c_H = \int_0^1 (\theta s_H - p_H) d\theta,$$
$$CSA^c_L = \int_{\hat{\theta}}^{\tilde{\theta}} (\theta s_L - p_L) d\theta.$$

The regulation allows producers of high quality commodity to differentiate from the other producers and production areas. The costs of the administration of the program, i.e., the expenditures for the process of getting the EU recognition, for drawing and administering the rules for production and trade, etc., are to be borne by those producers that benefit from it, that is the high quality producers. We believe that it is reasonable to consider these costs fixed, as common practice in the literature (see, e.g., Auriol and Schillizzi, 1999; Ibanez, 1998), and we set them equal to $F$. Welfare levels for producers, taking into account the equilibrium quantities and prices that emerge and the fixed expenditures for the program, are the following:

$$PSA^c_H = \int_0^{q_H^c} (p_H^c - c_H q) dq = \frac{c_H (c_L s_H + s_L \Delta s)^2}{2\sigma^2} - F;$$
$$PSA^c_L = \int_0^{q_L^c} (p_L^c - c_L q) dq = \frac{c_L c_H^2 s_L^2}{2\sigma^2};$$
$$PSA^c = PSA^c_H + PSA^c_L = \frac{c_L c_H^2 s_L^2 + c_H (c_L s_H + s_L \Delta s)^2}{2\sigma^2} - F.$$

\(^{11}\)The letter $A^c$ of $CSA^c, PSA^c_H, PSA^c_L$ stands for After the regulation with the Competitive scenario. The equations for $CSA^c, CSA^c_H$ and $CSA^c_L$ are rather complicated and not reported here due to space limitations. They are available from the authors upon request.
6 Regulation and market power

One of the effects of the regulation is that it may allow the group of high quality producers to initiate the process of recognizing the specific products to be labelled and to regulate and control the enforcement of the granted products. It may happen that this group of producers is also able to exercise some market power. The group may behave like a cartel, and it would likely be more stable than the usual cartels à la d’Aspremont et al. (1983), because the non-complying firms would go back to the competitive low-quality market with a lower price.

We are dealing with differentiated products for which quantity and market volumes are often limited, and it seems plausible to think that in some situations the group of producers is able to coordinate its activities and decide jointly some strategic variables, say the price at which to sell the higher quality commodity. When producers have the possibility to jointly determine the price of the high quality commodity, they behave like a monopolist that fixes the optimal price at which to sell the commodity. The profit maximization problem for the choice of optimal price level becomes:

$$\max_{p_H} \pi = p_H D^H (s, p) - n_H (c_H q_H^2 n_H).$$

Note that the constant returns to scale technology parameter $n_H$ in the cost function implies that the aggregate supply of high quality producers is just the summation of individual supplies, i.e., $n_H q_H = Q_H(p_H)$. For market equilibrium we have $D^H (s, p) = Q_H(p_H)$ and the maximization problem becomes the following:

$$\max_{p_H} \pi = [p_H - \frac{c_H}{2} D^H (s, p)] D^H (s, p).$$

After deriving the first order conditions, we solve for the optimal price and we obtain the following:

$$p_H = \frac{(\Delta s + c_H)(\Delta s + p_L)}{(2\Delta s + c_H)},$$

$^{12}$Recently, the Italian Antitrust Authority investigated the producer groups of Parma and San Daniele hams and of Gorgonzola cheese because they allegedly imposed quantity restrictions to their members. Here we consider the case of price determination, and not that of quantity determination, because it would likely be more difficult to detect and sanction for the Antitrust. With vertical differentiation models the qualitative nature of the analysis is very similar when considering quantity or price competition (see, e.g., Motta, 1993).
where again $\Delta s = s_H - s_L$. Following the regulation, we have two different markets emerging: the high-quality one, in which producers have some monopoly power, and a competitive market for the low-quality producers. The aggregate supply in the competitive market is, as in the previous section, $Q_L(p_L) = \frac{p_L}{c_L}$. Note that with respect to the case of competitive market, the inverse demand for the high quality product would stay in the same position, but decisions by the group would be made according to the marginal revenue curve, like in the case of a standard monopoly.

On the other hand, low quality producers now face a higher (inverse) demand for their commodities which, with respect to the competitive case, shifts outwards. The shift in demand is due to the now higher price in the high-quality market, which enters into the low-quality demand as a cross-elasticity effect.

The equilibrium quantities and prices in both markets, when there is market power in the high-quality segment, are the following:

$$p^m_L = \frac{c_L(c_H + \Delta s)s_L}{\nu},$$
$$p^m_H = \frac{(\Delta s + c_H)(c_Ls_H + \Delta s s_L)}{\nu},$$
$$q^m_L = \frac{(\Delta s + c_H)s_L}{\nu},$$
$$q^m_H = \frac{s_L\Delta s + c_LS_H}{\nu},$$

where $\nu = c_L(\Delta s + s_H) + 2\Delta s s_L + c_H(c_L + s_L)$ and $\Delta s = s_H - s_L$. Note that the superscript $m$ refers to the scenario with monopoly power for the high-quality producers, while the subscript refers as usual to the quality level.

The level of consumers welfare is the following:\textsuperscript{13}

$$CSA^m_H = \int_{\tilde{\theta}}^{1} (\theta s_H - p^m_H) d\theta,$$
$$CSA^m_L = \int_{\tilde{\theta}}^{\theta_0} (\theta s_L - p^m_L) d\theta.$$

\textsuperscript{13}The equations for $CSA^m_H$, $CSA^m_L$ and $CSA^m_L$ are complicated and not reported here. They are available upon request.

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Welfare for producers is the following:

\[ PSA_H^m = \int_0^{q_H^m} (p_H^m - c_H q^m) dq = \frac{(2\Delta s + c_H) (c_L s_H + s_L \Delta s)^2}{2\nu^2} - F, \]  

\[ PSA_L^m = \int_0^{q_L^m} (p_L^m - c_L q^m) dq = \frac{c_L (\Delta s + c_H)^2 s_L^2}{2\nu^2} \]

\[ PSA^m = PSA_H^m + PSA_L^m = \frac{c_L (\Delta s + c_H)^2 s_L^2}{2\nu^2} + \frac{(2\Delta s + c_H) (c_L s_H + s_L \Delta s)^2}{2\nu^2} - F. \]

where \( \nu = c_L (\Delta s + s_H) + 2\Delta s s_L + c_H (c_L + s_L) \) and \( \Delta s = s_H - s_L \).

7 On the welfare impact of the regulation

The regulation aims to improve both consumers and producers welfare. In the choices regarding the model, as explained in the introduction, we chose the ones that represented the best case scenario from the point of view of the regulator, e.g., the regulation is needed, besides being trusted and recognized by consumers. To evaluate the welfare impact of the regulation we perform a simulation, mainly because analytical solutions, not reported here, are complicated and not informative. We use the equations for consumer and producer’s welfare reported in the text.

To start with, we calibrate the model to produce an initial situation in which there is a functioning market even with uncertain quality, which is the case for many labelled products prior to the regulation (see footnote 2). Being unable to demonstrate analytically how the welfare impact depends on technology, demand and labelling establishment conditions, we change the parameter values for cost, quality differences, and size of fixed costs, to generate some unintended (by the regulator) results. Our simulation’s aim

\[^{14}\text{To derive the results given in table 1, we use Mathematica 4, Wolfram Research Inc. We normalize (c_L = 1) and (s_L = 1), and change (c_H) and (s_H) to have differences of 10, 30, 50 percent. Given the normalization of consumer’s taste parameter, such that } \theta = 0 \text{ and } \bar{\theta} = 1, \text{ the quantities, prices, and welfare levels are between 0 and 1. For ease of exposition, the values reported in the tables have been multiplied by a factor of 10,000. Notice that the values in these models do not have a precise meaning in terms of the usual utility, dollar, or elasticities values.}\]
is to show that there are cases in which the effects of the regulation are detrimental to welfare.\footnote{Our simulation has only an illustrative purpose. One referee kindly pointed out that arguing that a regulation could have negative welfare effects is far short from saying that it will have a negative impact. We are aware of it, and furthermore, we believe that on these matters regulators should base their decisions on a careful cost-benefit analysis. Mussa-Rosen models, while useful for theoretical analysis, can not easily be translated in terms of parameters such as demand elasticities, preferences, etc. In addition, we are not aware of any empirical work that estimates the parameters for technology, preferences and labelling programs that we assume. As for the linear supply functions, their slope is related to the cost parameter \(c_i\).}

The simulation results are reported in table 1. The first set of results (first three columns) is the base scenario of no regulation in place. The second set of columns includes the regulation in a competitive market. The third set of columns also includes the regulation, but in a market power setting. Within each case we consider low costs and high costs of administering the regulation in calculating the welfare effects. Also notice, that for each simulation scenario we consider quality differences between the high and low quality products of 50\%, 30\%, and 10\% as well as differences in the costs of producing these two types of products of 50\%, 30\%, and 10\%. Let us begin with the case of competitive markets after the regulation (the central set of columns). It is reasonable to expect that consumers’ welfare should be greater after the regulation. Indeed, \(CSA^c > CSB\), and in aggregate the quantity consumed and the welfare levels for consumers are higher after the implementation of the regulation.

Before the implementation of the regulation, due to imperfect information, consumers are "constrained" to consume a commodity for which the quality level is not certain. Once a well functioning regulation is introduced and markets remain competitive, consumers can choose according to the quality they prefer and are willing to pay for. For the high quality consumers, given that quality level is higher after the regulation, consumption and total welfare increase. For low quality consumers, the quality level and the quantity consumed are lower, since they were the ones who benefitted from the uncertainty about quality prior to the regulation.\footnote{This result is very similar to that of Bureau et al. (1998).}

For producers, the impact of the regulation is less clear-cut and depends on parameter values. For low quality producers, welfare decreases unambiguously, because only low quality consumers prefer their products and thus face a lower demand. The restriction in demand decreases both the quantity
demanded and the price they can receive, i.e., \( p^s > p^s_L \). For high quality producers, the regulation is welfare increasing. Indeed, both quantity and price are greater than before the regulation, i.e., \( p^s < p^s_H \). Void of the fixed costs, the impact of the regulation is positive, but its size depends on preferences and technology conditions. We can isolate two effects. The first is due to the uncertainty about quality, which penalizes high quality producers and in part also high quality consumers, reducing their quantity purchased when there is no labelling. The other is related to the different production costs which are lower with aggregate supply before the regulation compared to the high quality production after the regulation.

The total impact on producer welfare however depends on parameter values and on the size of fixed costs. If the fixed costs are high enough, the increase in profits of the high quality producers is not enough to cover the decrease in the profits of the low quality producers.\(^{17}\) Indeed, if between producers there are small quality differences which are relatively expensive to obtain, i.e., relatively high cost differences between the two types, the total effect on producers can be negative (see table 1). If the fixed costs are particularly high, the decrease in welfare for low quality producers may outweigh the increase of welfare for high quality producers and consumers, and the total welfare effect of the regulation may be negative (bottom rows of the middle set of columns in table 1). In other words, there may be instances in which the regulation would not pass the Kaldor-Hicks (potential) compensation test (Just \textit{et al.}, 1982) in a hypothetical cost-benefit analysis.

The welfare decreasing results obtained can be attributed to the fact that we are dealing with credence goods, and before the regulation is introduced markets are working. They may be working only sub-optimally, but still working. In addition, what may make the total impact on welfare negative is the presence of fixed costs. Fixed costs may be low enough to make the investment profitable for the high quality producers, but still too high to have their welfare increase outweighing the decrease for consumers and low quality producers. Notice that with typical products we are often dealing with local markets, that is markets of limited size where fixed costs can be high in relative terms.

With market power after the regulation, the total welfare results are lower

\(^{17}\)Fixed costs are chosen to be smaller than the increase in profits for the high quality producers following the regulation. We use a value of 50 and 100, which represents, depending on other parameters values, a fraction of 5-67% of the increase in profits for high-quality or 1-3% of the total economic welfare before the regulation.
and the welfare distribution shifted. We obtain a familiar result where with market power, producers gain at the expense of consumers. This is also true with the model of vertical differentiation, where \( p_H^m < p_H^A \), \( p_L^C < p_L^A \), and thus \( CSA^m < CSA^c \). Also, consumers’ welfare is lower, and \( PSA^m > PSA^c \), i.e., producers’ welfare is higher. Consumers are now able to make informed choices, but the exercise of market power by producers makes them worse-off (last set of columns, table 1).\(^ {18} \)

With market power, the welfare impact is thus more beneficial for high-quality producers and less detrimental for low-quality producers. High-quality producers face the same inverse demand, but their market power allows them to make decisions based on a marginal revenue schedule, ensuring them a mark up over marginal cost. This translates into an upward shifting of the demand for low quality producers, who may now sell a higher quantity at a higher price but without the mark-up above marginal cost.\(^ {19} \) These results confirm that "... the interests involved in the introduction of a regulation [...] go well beyond those of the producers of the high quality good and involve other interests which may easily be stronger and more widespread ..." (Anania and Nisticò, 1999: 10) and show that, with a fully credible certification, the distribution of benefits depends on the market structure and other policy details.

8 Some policy implications

To summarize, the introduction of the regulation followed by the emergence of two distinct competitive markets, for low and high quality, leaves unambiguously both consumers and high quality producers better off. Producers of the low quality commodity are unambiguously worse-off. In some cases, in particular when quality differences are low and fixed costs and cost differ-

\(^ {18} \)We therefore obtain a different result than Marette \textit{et al.} (1999), who find that in many instances the welfare increase following the provision of information by the cartel of high quality producers more than offset the reduction in welfare due to output reduction by the cartel itself. Note that Marette’s paper considers a cartel of only two high-quality firms competing with a competitive fringe of low quality firms.

\(^ {19} \)One may wonder whether there could be such parameter values that lead to collusion so profound which translate into a demand shift for low quality so high to actually increase profits compared with before the regulation. We checked with extremely low quality differences (0.1%) and very high cost differences (500%), confirming that the welfare level for low quality producers is always lower after the regulation.
ences are relatively high, the total impact of the regulation on producer and total welfare can be negative. If high quality producers have some market power the impact on total welfare is worsened, with the effect on producers more positive, but that on consumers negative.

A few things which may represent further caveats of the regulation are worth noting. First, the regulation is intended to benefit also rural communities of less developed areas of the EU. This of course can be true only if producers of high quality commodities are located in these marginal areas. We believe this is not always the case. These typical products, probably the most famous ones, are located in the Padana Valley, certainly not a marginal area in terms of rural development. In other words, in some instances the regulation under examination could give the opposite results than expected by those fostering rural development in marginal areas.

A second point is that for political economy constraints, the policy makers and the antitrust authorities at the EU and national levels could be more lenient towards monopolistic behavior of producers. With the exercise of market power by high quality producers, the negative impact of the regulation on the low quality producers would be attenuated. This could make the regulation more accepted by the EU producers in less favorable production areas.

A related point is that national Antitrust authorities may have a different attitude in different EU countries. The different attitudes of national authorities may depend on the political clout and relative importance of the agri-food sector in each country. In addition, the concern for national consumers may avoid the antitrust intervention for those typical products with a larger share of exports. But all these pose the problem of a different treatment for a possibly similar behavior, and the effect of the allocation of

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20 In Italy, for example, over 70% of turnover for high quality meats is from Prosciutto of Parma (Parma’s ham); and over two thirds of high quality cheeses turnover come from Parmiggiano Reggiano (Parmesan cheese) and Grana Padano (Nomisma, 2000: 34).

21 Only consumers would be worse off, but as it is often the case they are not very well organized to make their voice to be heard, especially for products that are often considered gourmet delicatessen with a restrict and often local market. Also, to qualify for EU Antitrust’s intervention, a case of supposedly dominant position must reach a considerable size, well beyond the extent of these local products markets.

22 For example, in Italy, after the intervention of the national Antitrust Authority against the output restrictions in some producer groups for typical products, the Minister of Agriculture complained that a similar intervention never happened and would never happen in other EU countries, like France for example.
jurisdiction at national or international level (see, e.g., Neven and Roller, 2000).

9 Concluding remarks

In this paper we consider the welfare impact of the introduction of the EU regulation that allows producers of agricultural commodities with specific characteristics to differentiate and label accordingly their products. With a model of vertical differentiation we compare the situation before the regulation, in which consumers are unable to distinguish between the different quality levels of the commodities and can only form expectations about it, to a situation in which the distinction is made possible by the regulation. With a fully credible certification system, we find that the introduction of the regulation and the emergence of two distinct competitive markets for the differentiated commodity leaves unambiguously better off both consumers and high quality producers, while producers of low quality are unambiguously worse-off.

In addition, when fixed costs are relatively high and quality differences low but still relatively expensive to obtain, the total impact of the regulation on economic welfare can be negative. With market power, the impact on consumers is negative, worsening total welfare effects, but more positive for producers, thus making the regulation more acceptable by producers in less favorable production areas. We believe that to avoid potential negative welfare effects decisions on these matters should pass a cost-benefit analysis. Empirical work in this area is scarce, but applied economists should be well equipped to estimate the critical pieces of information on consumer and producer’s welfare, together with programme costs.

We also discuss the links between the regulation and rural development. In some instances the regulation under examination could give the opposite results than expected by those fostering rural development in marginal areas of the EU, clearly whenever the low-quality producers are located in these less developed regions. To conclude, we must add that some citizens, and hence policy makers, may attach a value to typical products per se. For example, some may want to buy a typical product because they care about a particular region or production process, or because they are afraid of losing bio-diversity in the form of those animal and vegetable species or cultivars deemed to extinction in developed countries. We do not take into account
this sort of externality, but believe that it would deserve a thorough analysis
and may change both the magnitude and the nature of the results presented.

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