Are You a Doctor or a Quack?
Provision of Quality and Self-Regulation
in a Market for Professional Services [§]

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Abstract

This paper aims at analysing the behaviour of sellers in a market for an experience good where it is not feasible to credibly signal quality through prices. Due to a different level of the initial investment in human capital, firms are distinguished into low-type and high-type ones. Along the lines of Bagwell and Riordan, (1986), and Gehrig and Jost, (1995), it is assumed that consumers may migrate after the first time period. The novelty of this paper is that the probability of migration is endogenized being dependent on producers' types. We find that with asymmetric information, both low-type and high-type firms choose an optimal quality strictly lower than under full information. Under quite general conditions equilibrium profits and consumers' welfare are reduced too. It is therefore reasonable that producers face an incentive to improve upon this equilibrium. A Self-Regulating Organisation (SRO) is introduced with the aim of setting a common minimum quality standard. A SRO represents a self-enforcing credible mechanism if there is an incentive for each member to punish eventual deviant members. It is found that a SRO is always enforceable for low-type firms, provided there is consumers' mobility, while it is such for high-type firms if the population of sellers is not too heterogeneous in terms of skill levels.

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1. Introduction

What is the nature of the market for physician services or lawyers services? Does licensing serves producers' interest by creating barriers to entry into the regulated professions? Or rather, it serves the interest of consumers by providing them with a guaranteed level of quality in markets characterised by informational asymmetry? And finally what are the advantages, if any, of a self-regulatory agreement between producers over statutory regulation?

Even though these questions are widely discussed in the current policy debate, there is paucity of studies (theoretically as well as empirically) dealing with the role and the functioning of a self-regulatory organisation.

There is no universally accepted definition of what the professions are. A quite narrow definition refers to those occupations that can legally be practised only by holders of specific qualifications, acquired by examinations (licensing), and where there usually exists a code of behaviour (professional ethics) enforceable in the last instance by the loss of licence. Traditionally medicine and law have not been subject to competitive forces, since, due to the nature of the good being traded, free competition would not guarantee a socially optimal outcome. In the regulatory practice, regulation of the medical and of the legal profession has entailed a combination of direct government regulation and, to a large extent, of rules adopted by professional associations. The self-regulatory powers they enjoy have enabled them to fix both entry requirements and rules on conduct. In recent years it has been doubted that self-regulating organisations have acted with the aim of protecting professional integrity and assuring services' quality. Rather, professional ethics rules may just have promoted the interests of sellers substantially hindering competition, by imposing restrictions on advertising and by fixing fee schedules, without evident benefit for consumers.

These concerns have led to efforts by policy-makers to liberalise markets for professional services[1]. Moreover, alternatives to the actual self-regulatory system have received some attention. In some countries there have been proposals to shift from self-regulation towards other instruments of control, such as certification[2]. Besides the concern on self-regulation having the effect of restricting competition, 'some studies have found that quality-based restrains on entry may have the effect of lowering quality overall' (OECD, 2000).

One of the major concerns in the economic literature has been to ascertain if occupational licensing is designed to assure quality of the services or rather it serves only to prevent a "reduction of price, and consequently of wages and profit, by restraining that free competition which would most certainly occasion it"[3]. This issue has first been tackled in a context of context of adverse selection and exogenous quality levels, starting from the well-known result by Leland (1979), where the minimum quality standard set by a professional group is too high with respect to the social optimum. Since quality levels of each member are exogenously given, in that set-up imposing a MQS cuts the left tail of the quality distribution. Therefore, as the profession

[1] For instance, regulation of fees by professional bodies has been found to violate EU competition laws.

[2] In the Netherlands there has recently been a proposal to adopt for the medical profession a system based on certification which reserves the exclusive right to use the title only to members of the profession but does not exclude others from offering a similar service. In the UK quite radical reforms took place to broaden the supply of legal services, as several monopoly rights of the most traditional legal professions, barristers and solicitors, were abolished (Courts and Legal Services Act, 1990).

[3] A. Smith (1776).

behaves as a monopolist it is clearly led to set too high a standard[4].

Turning our attention from the adverse selection problem to the moral hazard one, that is, focusing on scenarios where quality levels can be altered through actions undertaken by sellers, the result above reviewed is overturned. In Shapiro's (1983) model, the problem of quality deterioration may be mitigated by taking into account the role of reputation formation. Since the relationship between firms and consumers is not one-shot but rather is bound to last over time, in the long-run an equilibrium where qualities become fully known to consumers and producers earn a quality premium (pricing above marginal cost) is achieved. In this model, a self-regulating association may on one side accelerate the detection of quality and, on the other, it may increase the minimum allowed quality level. Clearly in both respects high-quality firms are hurt, being the quality premium reduced. Therefore, a self-regulating organisation (SRO) is led to set too low a standard. This is quite intuitive since quality is an endogenous variable in this set-up and hence it is costly to produce.

In the present paper, in considering self-regulation as an alternative to other regulatory policies, such as statutory regulation or certification, we will not focus on the monopoly aspect of the self-regulating profession. Rather we are interested in the functioning of a self-regulating organisation and in its effectiveness to improve on average the quality level. As a matter of fact, introducing a SRO may help in dealing with a relevant issue, that of control of *behaviour*, not just of *innate characteristics*. Given the superior ability of self-regulation to condition its interventions on quality of its members, a SRO might be in principle more effective in punishing cheating with

[4] It should be pointed out the this result is not fairly robust, as it strongly depends on the assumption of exogenous quality levels as well as of the convexity of opportunity cost.

respect to an external regulatory body. In other words, if each member faces an incentive to punish eventual deviant members, then a SRO represents a self-enforcing credible mechanism. Only in this case would cheating be prevented and quality be improved on the whole.

Our model is quite close in spirit to the one by Gehrig and Jost (1995). In both set-ups signalling quality is not a feasible solution to the informational problem. Besides, given the time horizon assumed (i.e. a two period model), the possibility that agents may overcome this problem relying on reputational effects is *a priori* barred. In Gehrig and Jost's model a few interesting points are highlighted. The first one is the mobility of consumers. The second one is the relevance of reputation. The third one is the assumption that the learning process is imperfect, in that each firm faces in each time period at least some consumers who do not know the true quality supplied.

Among the novelties of the present model, we assume that sellers are heterogeneous: due to different levels of innate abilities and of human capital, they can be distinguished into low-type and high-type ones.

I introduce, along the lines of Bagwell and Riordan, (1986), and Gehrig and Jost, (1995), the possibility of migration between the two consumption periods. While in previous studies the proportion of mobile consumers is fixed and exogenously given, a key feature of this paper is that the probability of migration is endogenized being dependent on producers' types.

We find that with asymmetric information, both low-type and high-type firms choose an optimal quality strictly lower than under full information, provided that the probability of migration is positive and both low-type firms and high-type ones are present within the population of sellers. Under quite general conditions equilibrium profits and consumers' welfare are reduced too. It is therefore reasonable that, being average quality of services

suboptimal, there is scope to improve upon this equilibrium. A self-regulating organisation (SRO) is introduced: local monopolists can join the association to commit to some common minimum quality standard (MQS). Consumers now can observe membership and have beliefs about club's goods even if they migrate. It is shown that if all club members are correctly perceived to comply with the MQS, average quality in the market increases with respect to an unregulated environment with asymmetric information. Moreover a SRO represents a self-enforcing credible mechanism if there is an incentive for each member to punish eventual deviant members (for both types). It is found that a SRO is feasible as a regulatory mechanism provided there is some consumers' mobility. This happens as, in the presence of migration, the SRO reputation becomes extremely important for each obedient firm.

Moreover a self-regulatory agreement is always enforceable for low-type firms since they mostly gain from a collective reputation.

On the other hand, high-type firms have an incentive to expel deviant members and are likely to ensure compliance with the club agreement if the population of sellers is not too heterogeneous in terms of skill levels. This result is quite intuitive in that a high-quality producer is more eager to invest in a collective reputation the higher is the degree of homogeneity in the population of sellers on the whole.

The paper is organised as follows. Section 2 sketches the basic model and describes the main hypotheses. In section 3 we first analyse the model assuming that consumers can perfectly observe quality prior to consumption. Then the model is solved under the hypothesis of asymmetric information; the inefficiencies caused by the informational problem are assessed. Section 4 extends the analysis supposing that all producers can join a self-regulatory organisation. The conditions under which a self-regulatory agreement leads to an improvement with respect to the

asymmetric information equilibrium are studied. Finally the sufficient conditions under which a self-regulatory agreement may be enforceable are stated. The last section concludes with some final remarks.

2. The Basic Model

Consider a market for an experience good with a finite number of buyers and sellers. Firms and consumers are located across (n + m) isolated islands[5]. We assume that due to prohibitively high mobility and switching costs, firms supply their goods only in segmented local markets, where they behave as local monopolists. Given this assumption, any strategic interaction between suppliers is disregarded. Moreover, due to the nature of the good offered, there is in principle a gain for both buyers and sellers from having a long-term relationship.

The goods are provided in different qualities, known only after purchase.

We deal with a non-cooperative game with two consumption periods, characterised by the following order of moves.

Before the market game starts it is the nature that makes a first move determining a mix of innate ability and skills that we define henceforth as human capital.

At time t = 0 firms decide their quality levels (q) that are known to all firms before the market game starts, but unknown to consumers. This choice cannot be reversed. In other words, qualities cannot be changed over the two periods. In the market under analysis product quality is private information of the firms

[5] This feature of the market for professional services is also recognised in Shapiro (1986), where the fact that providers of services are often local suppliers is viewed as the source of a particularly acute informational problem, since 'publications such as *Consumer Reports* do not report on these services'.

at $t=0$ and becomes known to consumers only after first period consumption has taken place.

At $t=1$ firms set prices for the first consumption period. Afterwards consumption takes place. Only after consumption do consumers become aware of the quality of the product they have chosen. In this set-up direct or personal experience is the only means of learning, being communication on quality levels through 'word of mouth' ruled out. At the end of this period, dissatisfied consumers may migrate across islands.

At $t=2$ firms set prices for the second period, and then consumption decisions take place again. Thus the market game is repeated, but with an important change: due to consumers' mobility from one island to another, at time $t = 2$ in each market there are consumers who know the quality of the product, and others who have no experience of it. As a matter of fact, those migrant consumers entering a market at time $t=2$ cannot learn goods' quality through communication with inhabitants. Besides, they do not have the possibility to observe past trade and draw inferences from them. Therefore only people who have consumed during the first period have at $t = 2$ full information about quality.

Notice that migration is an unforeseen event at period $t=1$, both for consumers and for firms. This last assumption is crucial, as it will be clear in the subsequent analysis (treatment), since, without it, there would be an extreme lemons' problem in quality provision by low-type firms at time $t = 1$.

In this model a strategy for type i firm is a triple (p_1^i, p_2^i, q_i), where p_1^i, p_2^i represent prices set by the firm at the beginning of period 1 and of period 2 respectively, and q_i is the quality level chosen by type i firm, where $i = H, L$ denotes the high-type and low-type supplier respectively.

The equilibrium concept employed is that of perfect Bayesian equilibrium.

Let $p(q_i, p_1^i, p_2^i, q^e)$ denote firm's i profit function, and q^e be expected quality. Then in equilibrium it has to hold that:

- firm's i strategy is an optimal response for given beliefs of the consumers: $p(q^{i^*}, p_1^{i^*}, p_2^{i^*}, q^e) \geq p(q^i, p_1^i, p_2^i, q^e)$ for all (q_i, p_1^i, p_2^i);

- consumers' beliefs are consistent, in the sense that in equilibrium : $q^e(p_j^{i^*}) = q_i^*$, i= H, L, j= 1, 2.

DEMAND

In modelling demand we follow Shaked and Sutton (1982) in the interpretation provided by Gehrig and Jost (1995). We consider consumers with finite lifetimes who differ in terms of their preferences and taste for quality, and in their willingness to pay for professional services. Each consumer lives in a particular island and consumes at most one unit of the good supplied if his/her net benefit is non-negative.

Once an optimal combination of quality and price has been chosen, each consumer selects a supplier and will not change it unless true quality is below the expected level. More specifically, consumers are characterised by their income $y \in [0, \bar{y}]$, and reservation qualities $r \in [0, \bar{r}]$. They demand at most one unit of the good. Income and reservation quality are uniformly distributed over the support [0, $\bar{y}$] and [0, $\bar{r}$] respectively. A consumer characterised by the pair (y, r) derives utility from a good of quality q given by:

$$u\,(y, r) = max\,\{y(q - r), 0\} \qquad [1]$$

Denoting with p the price of a good of quality q, and due to the hypothesis of uniform distribution of y and r, we have that:

$$E(u(y,r)) = \begin{cases} (q-r)y & se \quad r \le q \quad y \ge p \\ 0 & otherwise \end{cases} \qquad [2]$$

Therefore the demand function is given by:

$$D\,(p, q) = \frac{1}{\overline{ry}} \int_{q \ge r} \int_{y \ge p} dr \quad dp = \frac{1}{\overline{ry}} q(\overline{y} - p) \qquad [3]$$

The idea expressed by [2] and [3] is that consumers trade off product quality against income. Notice also that the above demand function allows for heterogeneity of consumers preferences for quality due to different reservation qualities.

FIRMS

Each firm can supply in a single local market where it behaves as a monopolist. Goods can be supplied at different quality levels $q \in [0, \overline{q}]$. Quality is endogenous and determined by a once-and-for-all choice at time $t = 0$, that is before the market game starts. As quality is constant over the two periods, no moral hazard problem emerges within the current set-up.

Marginal cost is assumed to be independent of quality. Given that production requires only fixed costs, it is possible to envisage[6] that equilibrium prices will not be able to signal quality This

[6] Bagwell and Riordan, (1991) show that when the production technology involves only fixed costs and marginal costs are independent of quality, prices are not able to signal quality levels. This result holds also when marginal costs depend on quality but fixed costs are large enough.

feature is, in our view, quite appropriate for the market for professional services, in which prices are often fixed or constrained by a regulator[7].

In modelling fixed lifetime production costs, the present paper departs from the setting in Gehrig and Jost (1995), in that it considers the quality of professional services as subject to control by means of expenditure of effort and time, on one side, and by means of human capital, on the other side. We remind, however, that the initial level of human capital is not modelled as a costly endogenous choice. The key feature is thus the relation between training and quality provision, which is based on an intuition set forth in Shapiro (1986).

More specifically, fixed lifetime costs take the form:

$$C(q, K_i) = \frac{q^2}{K_i} \qquad i = H, L \qquad [4]$$

where K_i is human capital, subscripts H and L denote the high type supplier and the low type one, respectively, and, by assumption $K_H > K_L$.

The rationale behind the functional form in [4] is that human capital aides in the production of services. In particular, before the market game starts, each seller first is assigned a level of human capital K_i. After a training period, during which skills develop, the seller will select a service quality q. For the sake of simplicity, I assume that there only two feasible skill levels, with $K_H > K_L$. In other word, according to the level of human capital, it is possible to distinguish high-type firms and low-type ones.

[7] Another interpretation may rely on the fact that, due to high search costs, it is extremely difficult for consumers to achieve (comparative) information on prices.

We assume that the total number of producers (N) is then divided into n low-type firms and m high-type firms, with $n \in \{0, 1, 2, \ldots, n\}$, $m \in \{0, 1, 2, \ldots, m\}$, where n, m are finite integers.

Given the complementarity between training and quality provision, one may foresee that two different equilibrium quality levels will result.

Notice that human capital facilitates the quality production process but at a diminishing rate:

$$\frac{\partial C(.)}{\partial K_i}, < 0, \quad \frac{\partial^2 C(.)}{\partial K_i^{\,2}} > 0 \qquad i = H, L \qquad [5]$$

This amounts to saying that a higher training reduces the cost of producing quality at a given level:

$$C(q, K_H) < C(q, K_L) \qquad [6]$$

Moreover quality and human capital are complements[8]:

$$\frac{\partial C(.)}{\partial q \partial K_i} < 0 \qquad [7]$$

This last assumption is intuitive and fits well with the nature of the market under analysis, as a high-skilled professional can do a better job than low-skilled colleagues.

3. Provision of quality in an unregulated set-up.

In this section we will first deal with a benchmark model, represented by a simple optimisation problem by a local monopolist with full information on goods' quality by consumers.

[8] As Shapiro (1986) points out, this assumption is common also in the signalling literature. What makes a relevant difference is that in the latter context quality is an exogenously given characteristic rather than being subject to choice by producers.

Let $\hat{p}_1^i$ and $\hat{p}_2^i$, $i = H, L$, denote the optimal prices set by the firms respectively during the first and during the second consumption period. Let equilibrium quality levels be denoted by $\hat{q}_H$ and by $\hat{q}_L$ for the high-type firm and the low-type one respectively.

The objective function under the hypothesis of full information is given by:

$$\pi_i = D(q_i, p_1^i)\ p_1^i + D(q_i,\ p_2^i)\ p_2^i - C(q_i, K_i) =$$

$$= \frac{q_i(\bar{y} - p_1^i)p_1^i}{\bar{r}\bar{y}} + \frac{q_i(\bar{y} - p_2^i)p_2^i}{\bar{r}\bar{y}} - \frac{q_i^{\,2}}{K_i} \qquad i = H, L \qquad [8]$$

Solving this optimisation problem, both for high-type firm and for the low-type one, yields the optimal prices in period 1 and period 2 respectively:

$$\hat{p}_1^i = \hat{p}_2^i = \frac{\bar{y}}{2} \quad i = H, L, \qquad [9]$$

By differentiating the objective function for each type w.r.t. q_i and substituting equilibrium prices in the F.O.C.'s, optimal quality levels can be obtained:

$$\hat{q}_H = \frac{\bar{y}K_H}{4\bar{r}} \qquad [10]$$

$$\hat{q}_L = \frac{\bar{y}K_L}{4\bar{r}} \qquad [11]$$

Being the profit function concave in both prices and quality, the interior solution is global too.

Notice that in the full information set-up there is no migration at the end of the first consumption period[9].

Under full information optimal prices set by a local monopolist do not differ depending on the type. This means that they do not convey information on quality levels.

Regarding optimal quality levels, as demand increases with quality level, the monopolist, whatever is his type, faces, on one side, an incentive to supply high quality goods, and on the other side, he is led to undercut quality, being quality production increasingly costly (and more costly the lower is the level of human capital). Hence in equilibrium the monopolist just balances revenues and costs. Furthermore, optimal quality levels are a positive linear function of human capital, thus confirming the intuition that skill levels and quality are complements.

Substituting [9] - [10] and [9] - [11] into the objective function for each type, we obtain equilibrium profits:

$$\hat{p}_H = \frac{\bar{y}^2 K_H}{16\bar{r}^2} \qquad [12]$$

$$\hat{p}_L = \frac{\bar{y}^2 K_L}{16\bar{r}^2} \qquad [13]$$

[9] The rationale behind this claim relies on the assumption that migration is driven by dissatisfaction after consumption of a good whose quality could be high, as it typically happens with experience goods. In other words with asymmetric information the matching rule we hypothesise is a random matching rule. On the other hand, with full information on goods' qualities prior to consumption, we imagine that consumers a time t =1 deliberately sort themselves, depending on the pair (y, r) into three groups: those who do not buy at all, those who are satisfied with low-quality services, and those who have a high preference for quality (and/or high willingness to pay) and buy high quality goods. More precisely, we suppose that there exists a set $S = \{(y^i, r^i), (y^j, r^j) / \frac{1}{g} q_i - q_j = \frac{1}{g} r_i - r_j\}$, where $\gamma = (y_j / y_i)$, and $i, j = H, L$. In other words, consumers sort themselves in a way such that a non-migration condition holds.

It should be pointed out that also equilibrium profits are proportional to skill levels and strictly higher for the high-type than for the low-type supplier. This result makes sense insofar as human capital is not modelled as a costly investment choice in the present model and should rather be considered as an innate characteristics.

I will now introduce the hypothesis, more appropriate for a market for professional services, that full information on quality is achieved only after first-period consumption has taken place.

With asymmetric information, demand function at time $t = 1$ becomes $D(p_1^i, q^e)$, $i = H, L$,

where q^e indicates expected quality. As already stated, consumers' rational expectations require that *ex post*

$q^e = q_i^*$, $i = L, H$.

People who get dissatisfied after first period consumption will migrate to other islands. Given the experience good nature of the market of professional services, consumers learn quality while using the good itself: as more information becomes available they may switch to an alternative supplier. We hypothesise that this happens for consumers who were served by low-type type firms[10]. The (extreme) assumption we introduce at this stage of the analysis is grounded on both the theoretical and the empirical literature. In the former[11] we find the prediction that in markets such as the one under analysis, reputation plays a crucial role

[10] We are aware that the hypothesis according to which *all* people who were served during the first consumption period by a low-type firm wish to migrate being dissatisfied is an extreme one. We suspect the conclusions of the present analysis would not change substantially if one assumes more realistically that only a fraction of those people who ran into a low-quality firm at time $t = 1$ is eager to migrate.

[11] See, among others, Rogerson (1983).

leading over time high quality firms to have more consumers. Also in the latter it is shown that, as consumers revise downwards their views on the attractiveness of the current provider, they may wish to switch[12].

Thus the amount $\left(\frac{n}{m+m}\right) D\ (p_1^L,\ q_L)$ is going to be redistributed over the whole population of suppliers at the beginning of time t = 2. This implies that each island receives $\frac{1}{m+n}\left(\frac{n}{m+m}\right) D\ (p_1^L, q^e)$. Notice that migrant consumers are uninformed at time t =2, given that they are not allowed to communicate with inhabitants. Only non-migrant consumers at t=2 will know the true quality. For them demand at time 2 will be given in aggregate by $D\ (p_2^i, q_i)$, $i = H, L$.

It should be pointed out that in this model the probability of migration is endogenous and amounts to the probability of having incurred into a low-type firm, being this it equal to the relative frequency of low type firms in the whole population of suppliers.

I now analyse the solutions of the game in the case of asymmetric information on goods' quality.

The objective function for the low-type firm becomes:

$$p_L = \frac{q^e(\bar{y} - p_1^L)\,p_1^L}{\bar{r}\bar{y}} + \left[\frac{n}{(n+m)^2}\right] \frac{q^e(\bar{y} - p_2^L)\,p_2^L}{\bar{r}\bar{y}} - \frac{{q_L}^2}{K_L} \qquad [14]$$

while the objective function for the high-type firm is:

[12] To give an example, Billinghurst and Whitefield report that 35% of patients who left a practice mentioned dissatisfaction with the personal care, and 36% complained about practice organization.

$$p_H = \frac{q^e(\bar{y} - p_1^H)p_1^H}{\bar{r}\bar{y}} + \frac{q_H(\bar{y} - p_2^H)p_2^H}{\bar{r}\bar{y}} +$$

$$+\left[\frac{n}{(n+m)^2}\right] \frac{q^e(\bar{y} - p_2^H)p_2^H}{\bar{r}\bar{y}} - \frac{q_H{}^2}{K_H} \qquad [15]$$

where q^e is equal to $\left(\frac{n}{n+m}q_L + \frac{m}{n+m}q_H\right)$.

From the maximisation of [14] and [15] with respect to (q_i, p_1^i, p_2^i), the optimal strategy for each type results, being given by:

$$\tilde{p}_1^L = \frac{\bar{y}}{2} \qquad [16]$$

$$\tilde{p}_2^L = \frac{\bar{y}}{2} \qquad [17]$$

$$\tilde{q}_L = \frac{\bar{y}K_L}{8\bar{r}} \frac{n\left((m+n)^2 + n\right)}{(n+m)^3} \qquad [18]$$

for the low-type firm, and by:

$$\tilde{p}_1^H = \frac{\bar{y}}{2} \qquad [19]$$

$$\tilde{p}_2^H = \frac{\bar{y}}{2} \qquad [20]$$

$$\tilde{q}_H = \frac{\bar{y}K_H}{8\bar{r}} \frac{(2m^3 + 4n^2m + 5m^2n + n^3 + mn)}{(n+m)^3} \qquad [21]$$

for the high-type firm.

What clearly appears from the solution of the model under asymmetric information is that first period prices do not differ from prices set in the full information benchmark set-up. Moreover prices do not vary depending on the firm's type.

This means, as anticipated, that it is not feasible for firms to signal quality through prices. From the observation that equilibrium prices do not vary over time periods, it is straightforward to reckon how the present model differs from the so-called quality premium model[13]

As far as optimal quality levels are concerned, it is straightforward to see that $\tilde{q}_H > 0$ and $\tilde{q}_L > 0$, $\forall m$, $\forall n$.

A comparative statics exercise yields the sensible results that $\tilde{q}_H$ is positively affected by an increase in the number of high-type firms m, $\forall n \geq 1$, while it is a decreasing function of n. In the case of $n = 0$, optimal quality supplied by the high type under asymmetric information is independent of m and equals to the optimal quality provided by the same type under full information.

On the other hand, the dependence of $\tilde{q}^L$ on m and n is quite intuitive as well, since

$$\frac{\partial \tilde{q}^L}{\partial n} > 0 \text{ provided } m \geq 1, \text{ and } \frac{\partial \tilde{q}^L}{\partial m} \leq 0.$$

The effects of asymmetric information on the optimal strategy selected by the two types of suppliers are illustrated in the following Proposition.

[13] On this model, see, among others, Klein and Leffler (1981), Shapiro (1983), Biglaiser and Friedman (1994).

Proposition 1: Under asymmetric information:

(i) The low-type firm chooses an optimal quality level strictly lower than the one chosen under full information, provided $1<n<N$.

(ii) The high-type firm chooses an optimal quality that is strictly lower than under full information, provided $n \geq 1$.

Proof:

Let us first consider the optimal quality chosen by a low-type firm. It is easily ascertained that $\tilde{q}_L = g\ \hat{q}_L$, where $\hat{q}_L$ is optimal quality under full information as stated in [11] and $g = \frac{1}{2}\frac{n(m^2+2mn+n^2+n)}{(n+m)^3} < 1$ for $0 < m < N$.

For $m = 0$, instead, $g = \frac{(n+1)}{2n} < 1$ *iff* $n > 1$. On the other hand, for $m = 0$ *and* $n = 1$, $\tilde{q}_L = \hat{q}_L$.

Similarly, the high-type firm optimally sets a quality level such that that $\tilde{q}_H = q\ \hat{q}_H$, where $\hat{q}^H$ is optimal quality under full information as stated in [10] and

$q = \frac{1}{2}\frac{(4n^2m+5m^2n+2m^3+n^3+mn)}{(n+m)^3} < 1$ *iff* $n > 0$. For $n = 0$, $\tilde{q}_H = \hat{q}_H$.

□

What Proposition 1 stresses is the relevance of migration in this set-up. In particular, the occurrence of migration ($n > 0$) is the reason leading firms to underprovided quality with respect to the

full information set-up. Were all consumers perfectly informed at time $t = 2$, firms would have an incentive to supply Pareto-optimal quality levels.

Another condition highlighted by the Proposition is that the above results require a genuinely mixed population of sellers. The extreme case of only one low-type supplier (m=0 and n =1) shows that if the probability of incurring into a low-type producer (and then the probability of migration) is equal to one, asymmetric information has no effect. On the other hand, again under specific parametric conditions, that is with no migration *and* only high type producers, rational agents will anticipate that there will be no segment of uniformed consumers at time $t = 2$, and quality provided by high type suppliers will be at the full information level.

To summarise**,** given that quality is below the full information level and profits are increasing functions of quality, aggregate welfare may be reduced under asymmetric information if compared with the full-information set-up. This claim is certainly true for consumers' welfare, being prices at the same level and quality strictly lower under asymmetric information.

Regarding equilibrium profits under asymmetric information, a more careful evaluation is needed.

Let us denote with $\tilde{p}_H$ and with $\tilde{p}_L$ equilibrium profits accruing respectively to high-type and to low-type monopolists.

I will assume henceforth a linear relationship between the number of low-type suppliers (n) and the number of high-type ones (m), that is:

$$m = k\,n \qquad [22]$$

where k is a strictly positive and finite arbitrary constant such that $k = (m/n)$ with $(m+n) = N$.

A short elucidation on the hypothesis in [22] may be helpful. It is easily seen that, since $k = \frac{N}{n} - 1$, for a fixed total number of suppliers, an increasing k implies a decreasing n (and conversely an increasing m). Hence in employing the relationship in [22] the migration rate is still made dependent on the population relative shares.

The following Proposition illustrates the way asymmetric information affects equilibrium profits if compared with the full-information benchmark model.

Proposition 2: Under asymmetric information on goods' quality

(i) equilibrium profits accruing to the high-type firm are strictly lower than under full information ($\tilde{p}_H < \hat{p}_H$) provided n is not too low;

(ii) equilibrium profits accruing to the low-type firm are strictly lower than under full information ($\tilde{p}_L < \hat{p}_L$) for any $0<n<N$.

Proof:

By substituting values in [19]- [20]- [21] into the objective function in [15] we obtain:

$$\tilde{p}^H = F\ \hat{p}^H \qquad [23]$$

where $F =$

$$\frac{1}{4}\frac{(4n^2m+5m^2n+2m^3+n^3+nm)(3n^3+8n^2m+7nm^2+2m^3+2n^2+mn)}{(n+m)^6}$$

By substituting $m = k\,n$ into the expression for F, we obtain that $F < 1$ *iff*

$$n^4 [k^4 (n^2 - 4n) + k^3 (4n^2 - 16n) + k^2 (6n^2 - 22n - 1) +$$

$$+ k (4n^2 - 12n - 2) + (n^2 - 2n)] > 0 \qquad [24]$$

A sufficient condition for the inequality in [24] to hold is that

$n > 4$.

Notice that by resorting to numerical methods in order to ascertain whether or not $F < 1$, it is possible to verify that $n > 4$ is just a sufficient condition. As a matter of fact, for n = 3 there is a cut-off value k° ($k^\circ \cong 0.3$) such that $F < 1$ for any $k < k^\circ$. Thus, for n small, m has to be smaller that n. Moreover, when

$n = 0$, $\tilde{p}^H = \hat{p}^H$.

Turning now to equilibrium profits for the low-type firm, plugging [16]- [17]- [18] into the objective function in [14] yields:

$$\tilde{p}_L = Y\,\hat{p}_L \qquad [25]$$

where $Y = \frac{1}{4}\frac{(n+2m)\left((n+m)^2 + n\right)}{(n+m)^6}$

Substituting $m = k\,n$ into Y, we obtain that, in order to have $Y < 1$, it has to be:

$$4\,n^6 (1+k)^6 - \left[\left(n^2 (1+k)^2 + n\right)^2 (n + 2kn)\right] > 0 \qquad [26]$$

This last expression can be rewritten as

$$\left[4\,n^6 (1+k)^6\right] - n\,(1+2k)\left[\left(n^2 (1+k)^2 + n\right)^2\right] >$$

$$\left[4\,n^6\,(1+k)^6\right] - n\,(1+k)^2\left[\left(n^2\,(1+k)^2+n\right)^2\right] > 0,\ \forall n \neq 0$$

Therefore we may conclude that $Y < 1,\ \forall n \neq 0,\ \forall k$.

Notice finally that, for m=0, n=1, $\tilde{p}^L = \hat{p}^L$.

□

To summarize, the analysis on the effects of asymmetric information on equilibrium qualities set by professional services suppliers, on consumers' welfare and finally on equilibrium profits has highlighted that:

(i) The inefficiencies stemming from the informational problem arise when migration occurs at a strictly positive rate. Moreover, the consequences of the informational problem are even more severe in the presence of a composition of the population of sellers where low-type firms are more numerous than high-type ones. (m<n, if n=3).

(ii) Provided there is some migration among consumers, local monopolists are led to underprovide quality with respect to the full-information set-up. This statement holds true for the low-type firm, while the high quality one undersupplies quality, provided n is high enough. This makes sense since the only incentive to provide high quality comes from the portion of informed consumers who are served in both consumptions periods by the same firm. Faced with a positive probability of migration, the firm is tempted to exploit the informational asymmetry. In turn, a positive probability of migration is linked to the existence within the population of suppliers of at least one 'quack'.

(iii) Since prices are at the same level and qualities are lower than with full information, consumers are worse off under asymmetric information.

(iv) Under quite general conditions even firms are made worse off under asymmetric information and may improve on it. Once again a sufficiently high probability of migration hurts firms on the whole.

From the above considerations we may conclude that in this set-up there is scope for some regulatory policy intervention aiming at mitigating the informational problem and increasing aggregate welfare.

The highly stylised structure of the model under analysis captures a few interesting elements. The first one is that mobility of consumers is crucial in determining firms' behaviour, being mobility itself spurred by the nature and characteristics of suppliers. The second one is the assumption that the learning process is imperfect and such that each firm faces in any time period at least a fraction of consumers who do not know its quality. This feature highlights the relevance of reputation. In this set-up individual reputation is not the only aspect that matters, and collective reputation may play a role.

4. A self-regulatory mechanism

So far we have reached the conclusion that in this set-up there is a strong incentive to regulate the market . Under quite general conditions, producers would be better off if they could commit to higher quality with respect to the asymmetric information environment. Similarly consumers would benefit from the action of a regulatory authority imposing some kind of regulation on quality levels such as a minimum quality standard (MSQ).

Since quality levels and training levels are private information for producers, a self-regulatory agreement between them to commit to high quality might in principle perform better than statutory regulation.
In examining whether or not self-regulation will be a feasible or optimal form of regulation two different roles for it can be

distinguished: on one side, the determination of some regulatory rules, and, on the other side, the proper application of such rules. In general, the determination of the regulatory rules takes place in time period zero. These rules are formulated by some welfare-maximising body in the case of statutory regulation and by the industry in case of self-regulation. It is quite easy to identify the differences between external or statutory regulation and self-regulation: in the latter, regulation will be effective if a SRO is given sufficient incentives to properly work. Therefore, introducing a SRO may be extremely fruitful in that it allows to investigate the issue of controlling behaviour besides assessing the effects of a given regulatory rule.

In this section we suppose that *all* producers join a club and self-commit to some self-imposed minimum quality standard (MQS).

Let us denote this minimum quality standard as q_C >0. Consumers are now able to observe membership to the self-regulating organisation (SRO) and have beliefs about club's goods. Even if they migrate, they trust the SRO and expect $q^e = q_C$.

If a member deviates and is not immediately detected and excluded from the club, he is supposed to behave like the monopolist in the asymmetric information case. At the end of the first consumption period, his action is discovered and consumers expect henceforth $q^e = \tilde{q}_i$, $i = L, H$, that is the level of quality chosen by each type under asymmetric information[14].

[14] The reason for this assumption is that, if club agreement is effectively enforced and non-compliance is credibly deterred, a deviant firm is immediately detected and excluded and thus posed in the position of a local monopolist.

Furthermore, if at t=1 it is discovered that quality may be below the standard, then $q^e < q_C$, and the club on the whole is no longer credible.

As a consequence of migration there is an incentive to punish deviant agents since at t=2 the eventual non-compliant's consumers are going to spread over the whole population of suppliers expecting $q^e < q_C$.

If an agreement on a MQS is reached, all producers adhere to the club (and are correctly perceived to offer quality q_C), the club objective function is a joint profit function given by:

$$\pi_C = n\left[\frac{q^e(\bar{y}-p_1)p_1}{r\bar{y}} + \frac{q_C(\bar{y}-p_2)p_2}{r\bar{y}} - \frac{q_C^2}{K_L}\right] +$$

$$+ m\left[\frac{q^e(\bar{y}-p_1)p_1}{r\bar{y}} + \frac{q_C(\bar{y}-p_2)p_2}{r\bar{y}} - \frac{q_C^2}{K_H}\right] \qquad [27]$$

where $q^e = q_C$ if the club's agreement is credible.

The occurrence of migration does not affects the optimisation problem with a SRO. Two hypotheses are reasonable: either migration does not take place at all since people do not expect anything better than quality level q_C if all producers adhere to the club, or the existence of migrant consumers for exogenous reasons does not invalidate the results stated here below.

From the maximisation of the objective function in [27] with respect to (p_1, p_2, q_C), it comes out that:

$$\bar{p}_1^C = \bar{p}_2^C = \frac{\bar{y}}{2} \qquad [28]$$

$$\overline{q}_C = \frac{1}{4}\frac{\overline{y}K_H K_L}{\overline{r}}\frac{(n+m)}{(nK_H + mK_L)} \qquad [29]$$

From simple inspection of [28] and [29] it is evident that prices would be set by the SRO at the same level as under full information. Notice then that only if $n = 0$ it would be $\overline{q}_C = \hat{q}_H$ where $\hat{q}_H$ is the optimal quality set under full information. Conversely, if $m = 0$, $\overline{q}_C = \hat{q}_L$.

Only under these last conditions efficiency would in principle be restored with a SRO.

We remind, though, that these parametric conditions as to the composition of the populations of suppliers are explicitly ruled out (see Section 3).

Being our focus on a population within which both types of firms are unevenly represented, we are allowed to conclude that $q_C > \hat{q}_L$ and $q_C < \hat{q}_H$.

We also investigate the ranking between quality levels offered under asymmetric information and the common quality set by the club.

Assuming that $K_H = L\,K_L$, with $L > 1$, we obtained that

$$\left(q_c - \tilde{q}^L\right) =$$

$$\frac{1}{8}\frac{\overline{y}K_L\left(2Lk^4 n + (8Ln - n)k^3 + (11Ln - 2n)k^2 + (6Ln - n - 1)k + L(n-1)\right)}{n\overline{r}(L+k)(1+k)^3}$$

$$> 0, \ \forall n > 0$$

Moreover,

$$(q_C - \tilde{q}^H) =$$

$$-\frac{1}{8}\frac{\bar{y}LK_L\left((2Ln-3n)k^3+(5Ln-8n+1)k^2+(4Ln-7n+L)k+n(L-2)\right)}{n\bar{r}(L+k)(1+k)^3}$$

$$> 0,$$

for $1<L<L^*$ where L^* is a cut-off value found through numerical methods, decreasing with k, *ceteris paribus*, (L^*=1.85, if k=0.1, L^*=1.62 if k=1.1, L^*=1.5, if k =5). Notice also that for $1<L<L^*$, an increasing k influences the difference $(q_C - \tilde{q}^H)$, as it tends to zero for a very high k.

In order to enforce the club's agreement, there must be an incentive (for both types) to punish deviant members, that is members that undersupplied quality with respect to the minimum quality standard during the first consumption period. Obviously if there were no incentive to punish a deviant member, club's collective reputation would be 'milked' and the standard would not be credible any longer for all members.

First of all it is necessary to assess whether it is the low-type or rather the high-type firm to face a higher incentive not to deviate.

Considering that

$$\left.\frac{\partial p_L}{\partial q}\right|_{q=q_c} = -\frac{1}{2}\frac{\bar{y}m(K_H-K_L)}{\bar{r}(nK_H+mK_L)} < 0$$

$$\left.\frac{\partial p_H}{\partial q}\right|_{q=q_c} = \frac{1}{2}\frac{\bar{y}n(K_H-K_L)}{\bar{r}(nK_H+mK_L)} > 0$$

we may infer that the low-type firm may have an incentive to deviate from the agreed upon standard, while the high-type firm is not led to defect.

This is confirmed when one calculates the incentive to stick to the club's agreement for both types, being it given by:

$$\left[\frac{q^e(\bar{y}-p_1)p_1}{\overline{ry}}+\frac{q_C(\bar{y}-p_2)p_2}{\overline{ry}}-\frac{q_C^2}{K_L}\right]-$$
$$\left[\frac{q^e(\bar{y}-p_1)p_1}{\overline{ry}}+\frac{n}{(n+m)^2}\frac{\tilde{q}^L(\bar{y}-\tilde{p}_2^L)\tilde{p}_2^L}{\overline{ry}}-\frac{\tilde{q}^L}{K_L}\right] \qquad [30]$$

for the low-type firm, with $q^e = q_C$, and by:

$$\left[\frac{q^e(\bar{y}-p_1)p_1}{\overline{ry}}+\frac{q_C(\bar{y}-p_2)p_2}{\overline{ry}}-\frac{q_C^2}{K_H}\right]-$$
$$\left[\frac{q^e(\bar{y}-p_1)p_1}{\overline{ry}}+\frac{n}{(n+m)^2}\frac{\tilde{q}^H(\bar{y}-\tilde{p}_2^H)\tilde{p}_2^H}{\overline{ry}}-\frac{\tilde{q}^H}{K_H}\right] \qquad [31]$$

for the high type firm. The rationale behind these expressions is that once any producer deviates underproviding quality, consumers migrate being dissatisfied and start to expect $\tilde{q}_i$, $i = L, H$.

As to the expression in [30], it was not feasible to give it a sign, but through numerical methods. By employing the relationships $m = k\ n$ and imposing that $K_H = L\ K_L$, with $L > 1$, it was possible to show that the low type firm is more tempted to deviate the higher is k and the higher is the gap L between training levels.

A similar analysis was worked out for the expression in [31]. It was found that the high-type always gain from adhering to the club, with an increasing gain as k increases.

Therefore, we may infer that the low-type firm is more likely to defect from the agreed upon standard.

On the basis of the analysis developed so far, we are now going to assess under which conditions the club agreement can be enforced. The gain from monitoring other members stems from

the fact that migrant consumers coming from a non-compliant member are going to be redistributed over the whole population at time t =2 and will expect $q^e = \tilde{q}_i$.

Different hypotheses can be introduced to model a credibility constrain, depending on the beliefs a compliant firm forms as to the number of migrant consumers at time t =2.

If migrant consumers (are believed to) come from low-type firms, being them most likely to deviate. Hence the minimum value for the credibility constraint is as follows:

$$\frac{n}{(m+n)^2}\left[\left(D(\bar{q}_C, \bar{p}_2^C)\bar{p}_2^C\right) - \left(D(\tilde{q}_i, \tilde{p}_2^i)\ \tilde{p}_2^i\right)\right] \qquad [32]$$

If the inequality in [32] is satisfied, then the club agreement can be implemented. Being the demand function increasing in quality, the gain from monitoring is represented by an increasing second period demand $D(\bar{q}_C, \bar{p}_2^C)\bar{p}_2^C$. This increased demand has to be compared with the demand that would come from those consumers betrayed by a deviant firm and hence distrusting the club agreement and expecting $\tilde{q}_i$, $i = H, L$.

Our main results on the viability of a self-regulatory organisation in this set-up are summarised in the following Proposition.

Proposition 3: A self-regulating association is always viable for low-type firms, provided $0 < n < N$. For high-type firms a SRO is enforceable if $0 < n < N$, *and* if the difference between training levels is small enough.

Proof:

For a low-type firm the minimum value for the incentive to punish is given by:

$$\frac{1}{32}\frac{\bar{y}^2 K_L}{\bar{r}^2}\frac{(K_H n^4 + 6K_H n^3 m + 11K_H n^2 m^2 + 8K_H n m^3 + 2K_H m^4)}{(n+m)^3 (nK_H + mK_L)} +$$
$$-\frac{1}{32}\frac{\bar{y}^2 K_L}{\bar{r}^2}\frac{(K_L n m^3 + 2K_L n^2 m^2 + K_L m n^3 + K_H n^3 + K_L m n^2)}{(n+m)^3 (nK_H + mK_L)}$$

[33]

Substituting $m = k\,n$ and $K_H = L\,K_L$, into [33] and defining the function $sgn\,(x) = \frac{x}{|x|}$ we obtain that the sign of the expression in [33] is determined by

$sgn\,(n^3 K_L\,[2k^4 Ln + k^3\,(8nL\text{-}n) + k^2\,(11nL\text{-}2n) + k\,(6nL\text{-}n\text{-}1) +$

$+L\,(n\text{-}1) + 2k^2)]) = \pm 1$

Provided $n > 0$, $sgn\,(x) = +1 \;\; \forall k, \forall L$.

Moreover, for m=0 the expression in [36] is again positive but for n = 1. Therefore enforceability from a low type firm requires

$0 < n < N$.

Notice also that the incentive to punish is increasing with k, and that it is increasing with n at a decreasing rate.

Let us turn now to the incentive to comply with the club's agreement for the high-type firm.

Using the same procedure as before, we find that the minimum incentive to punish is now:

$$\frac{1}{32}\frac{\bar{y}^2 K_H n}{\bar{r}^2}\frac{(2K_L n^3 + 7K_L n^2 m + 8K_L nm^2 + 3K_L m^3}{(n+m)^3(nK_H + mK_L)} +$$

$$-\frac{1}{32}\frac{\bar{y}^2 K_H n}{\bar{r}^2}\frac{(4K_H n^2 m + 5K_H nm^2 + 2K_H m^3 + K_H nm + K_L m^2)}{(n+m)^3(nK_H + mK_L)}$$

[34]

Provided $n > 0$, the sign of [34] is determined by,

$sgn\,(k^3(2n - 2nL + n - 1) + k^2 n(8 - 5L) + k(5n - 4nL + n - L) +$

$+ n(2 - L)) = \pm 1$

A sufficient condition for $sgn(x) = +1$ is given by $L < 5/4$.

Finally also the incentive for the high-type firm increases in n at a decreasing rate, while it decreases in k.

□

The intuition behind Proposition 3 is that low-type firms' gain from joining the club is so high that they always have the incentive to punish deviant members, provided there is a positive probability of migration.

On the other hand, high-quality firms would be eager to enforce a self-regulatory agreement in environments where they do not fear too much to milk their reputation due to an excessive gap in skill levels within in the population of sellers. This is a quite sensible conclusion, since the perspective of contributing to a collective reputation rather than building up its own individual reputation is a feasible solution if the population of club's members to is perceived as quite homogenous.

5. Conclusions

The purpose of this paper has been to investigate the behaviour of heterogeneous sellers in a market for an experience good, where consumers are fully aware of quality only after consumption has taken place and where it is not feasible for producers to credibly signal quality levels through prices.

Employing a the two-period model, we reached the conclusion that, as expected, in this set-up the presence of asymmetric information brings about some inefficiency . Besides the result of underprovision of quality, the model highlights that in equilibrium consumers' welfare is reduced and, under quite general conditions, profits are reduced too with respect to the full information set-up. The rationale behind this results is that, being qualities lower and prices at the same level than under asymmetric information, consumers are made worse-off.

Also producers are hurt when qualities are not perfectly observable. This is due to a reputation effect for them: as a matter of fact, because of migration, only *some* consumers are perfectly informed after the first consumption period. It should be clear that only the portion of informed consumers represents an incentive for firms to provide high quality. Therefore, the more consumers can correctly evaluate the quality of the producer at the second consumption period, the larger are the incentives for each firm to supply high quality.

As a consequence, we could infer that there is scope for attenuating the distortions caused by asymmetric information by means of some regulatory policy intervention. In other words, both consumers and producers could be led to improve upon the equilibrium with asymmetric information.

We introduced the hypothesis that all producers decide to join a self-regulatory organisation. This regulatory intervention may in principle perform better than statutory or external regulation, since, being skill levels and quality levels private information of

firms, it might be difficult for a third party to condition a regulatory scheme on these variables.

Being the number of firms predetermined when the SRO is introduced, in this paper we have not focused on the monopoly aspects of the association. Rather, we aimed at investigating under which conditions a SRO may be effective in improving average quality levels with respect to the asymmetric information set-up, and in deterring opportunist behaviour.

Among our findings, we found that a SRO is feasible as regulatory mechanism provided there is a positive rate of mobility among consumers.

We proved that low-quality firms always find advantageous to invest in a collective reputation and consequently to monitor and exclude from the club eventual deviant members.

This claim needs some specifications when one examines the incentives for high-quality firms.

These firms are more likely to ensure compliance with the club agreement the more homogenous the population of sellers is. The reason behind this result is that the incentive to punish for high quality firms increases when the members' features and interests tend to coincide.

The above sketched analysis could be extended in several interesting directions.

We are well aware that the hypothesis that firms are local monopolists could be relaxed to allow for competition among sellers.

Another interesting extension could introduce a (costly) monitoring technology. Moreover the possibility of multiple and competing SRO and their effectiveness in disciplining the market could be fruitfully be investigated.

In particular, the definition of the incentives for the SRO to punish deviant members is not yet satisfactory. In this paper, it has been assumed that a SRO will punish a deviant member for the fear of losing its reputation with the consumers. However, another kind of causal link could be taken into account. When the SRO punishes a member, it gives a (negative) signal regarding also the average quality of the club on the whole. Thus, the association might have an incentive to hide deviations of its members since a public knowledge of such deviations might harm even its honest members[15].

In our view, a satisfactory representation of a SRO's incentives to punish should balance both effects: on one side, the fear that the diffusion of information can damage the reputation of the SRO, and, on the other side the risk that all SRO's members suffer from a reputational externality when the fraudulent behaviour of one member is made public.

Finally, some aspects of competition policy and self-regulation are complements. Indeed, a greater mobility of consumers makes collective reputation more important, since it may act as a disciplinary device on the SRO, forcing it to monitor its members. This has both theoretical and policy implications. To our knowledge the role of search costs as well as of switching costs has not been formally treated in the literature. We foresee that, being these costs particularly important in the market for professional services, their inclusion in a model could bring about relevant changes. Besides, removing all barriers to mobility of customers may represent a sensitive goal as it facilitates an effective regulatory policy for the professions.

[15] This point is due to Scarpa (1997; 2001).

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