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Can Minimum Prices Assure the Quality of Professional Services?

Georg Meran* Reimund Schwarze†

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This papers studies the effects on service quality and consumer surplus of a minimum price which is fixed by a bureaucratic non-monopolistic professional association. It shows that the price set by a Niskanen-type professional association will maximize consumer surplus only if consumers demand the highest possible average quality. If consumers demand services of lesser quality, the association's price will be too high if measured by consumer surplus. Moreover we show that a de-regulated market will always reproduce the favourable result of a uniformly high price in the case of top quality demand while delivering superior results in the case of a mixed demand for high and low quality services.

Key words: Liberal professions, price regulation, quality, professional association, self-regulation, EU competition policy, intrinsic motivation

JEL-classification: L15, J44, K21

1 Introduction

Liberal professions such as lawyers, notaries, accountants, architects, engineers and pharmacists are highly regulated throughout Europe. A recent EU report highlights anti-competitive practices, such as restrictions on entry, fixed or recommanded prices, and limits on advertisement, for "a large number of the EU professions" (Paterson et al. 2003)[1]. The European Commission is undertaking aggressive efforts to limit such practices as part of its Lisbon strategy of becoming the most competitive and dynamic knowledge-based

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[1] The report is available at http://ec.europa.eu/comm/competition/liberal_professions/final_communication_en.pdf; for a comparative analysis in the OECD countries see OECD (2000).

economy in the world by 2010. In its recent Internal Market Strategy for Services, the Commission sets up a programme to screen each member state's regulations on professional services with the stated aim "to abolish any rules that produce anti-competitive effects without being objectively necessary and the least restrictive means to guarantee the proper practice of the profession"[2]. It also considers to take legal action against member state's regulations of professional services at the European Court of Justice in Luxembourg. [3] A key target of the EU-Commission is "the abolition of minimum, maximum or suggested fee scales" for professional services [4].

Professional associations challenge this initiative by pointing to the inherent dangers of lifting price regulations. They argue that fixed prices are necessary to allow professionals "to make a reasonable profit and to exercise their functions in honour and dignity", suggesting that price competition would force professionals to reduce the quality of their services [5]. The Commission openly disregards any such fears. Following the viewpoint of Advocate General Léger of the European Court of Justice, expressed in his Opinion in the famous Arduino case, the Commission "fails to see how a system of mandatory prices would prevent members of the profession from offering inadequate services if, in any event, they lacked qualifications, competence or moral conscience"[6].

This papers tries to shed some light on this essentially economic debate. Departing from the concept of "reasonable profit" as a precondition for professional ethics, we study the effects on service quality and consumer surplus of a minimum price which is fixed by a bureaucratic, i.e. non-monopolistic professional association. Our main results are that the price set by a Niskanen-type professional association will maximize consumer surplus only if consumers demand the highest possible average quality. If consumers demand services of lesser quality, the association's price will be too high if measured by consumer surplus. Moreover we show that a de-regulated market will always reproduce the favourable result of a uniformly high price in the case of top quality demand, while delivering superior results in the case of a mixed demand for high and low quality services. Surprisingly the average quality is even higher in a de-regulated market than in a self-regulated market. Matches of high-quality-high-price and low-quality-low-price services within a segmented market allow a higher average quality than uniform fixed prices can sustain. The general picture that emerges from this discussion is that the abolition of fixed price schemes for professional services will essentially never lead to a decrease in quality that would be undesirable from a standpoint of consumer protection - even if we assume that there is a

[2]The Internal Market Strategy for Services is documented on the DG competition website at: (europa.eu.int/comm/internal_market/en/services/services/com888en.pdf. The quotation is taken from the former Commissioner Montis speech at the Conference on Professional Regulation (europa.eu.int/comm/competition/speeches/text/sp2003_028_en.pdf)

[3]Specifically in the case of Belgian architects' honorary system: europa.eu.int/comm/ internal_market/en/qualifications/99-593.htm.

[4]europa.eu.int/comm/competition/speeches/text/sp2003_028_en.pdf.

[5]For an overview of different viewpoints of this sort: europa.eu.int/comm/competition/ liberalization/conference/summary_of _consultation_responses.pdf.

[6]Case C-35/99 Arduino, Opinion of Advocate General Leger, delivered on 10 July 2001, reflected in the Judgement of the Court on 19 February 2002 as published in the Official Journal of the European Communities C 109/1 on 4.5.2002 (www.curia.eu.int).

chance of deprivation of professional ethics due to price competition.
Our paper is purely institutional. It re-constructs and discusses existing regulations on professionals and their proclaimed rationale in a rigorous economic model. We do not claim to develop an original model of professional behaviour, neither do we claim to fully reflect the fact of intrinsic motivation in the work behaviour of professionals. Instead we empathetically take up the arguments as phrased in the political debate to study if these arguments stand the economic test. In doing so our paper ties to different strands of economic literature.
The most closely related literature addresses the issue of occupational licensing (see e.g. Rottenberg (1980), Faure et al. (1993), Kleiner (2000) for a brief overview). The licensing literature can be broadly split into two groups - the "private interest view" on licensing and its counterpart, the "public interest view". The private interest view follows Stigler's generalized private interest theory of regulation (Stigler 1971). It views entry restrictions as a rent-seeking device of a cartel-like acting regulatory entity, in our case the professional association. Not surprisingly, this theory recommends the abolition of occupational licensing or at least some lifting of access barriers (e.g. Friedman and Friedman 1963, Rometsch and Wolfstetter 1993[7]). The public interest view of licensing departs from an Akerlof-type imperfect information problem (Akerlof 1970, Maurizi 1974). It views occupational licensing as means to select provider quality (e.g. Leland 1979) or as an instrument to reward occupation-specific human capital investment (e.g. Shapiro 1983). The latter theories tend towards a more balanced judgement on licensing, weighing the benefits of enhanced quality performance against the regulatory costs. A general finding of the public interest view is that licensing has an important distributional effect: It benefits consumers who value high quality at the expense of consumers who prefer lower quality services at lower prices (Shapiro 1986). Our paper combines both approaches. We assume an imperfect information setting while at the same time allowing a corporatistic entity - the professional association - to fix entry barriers and service prices in order to stabilize income (per unit) in the immediate interest of the association's members. However, since a stable income (per unit) is having a positive spill-over effect on service quality in our model, the market control of the association has a potentially beneficial role from a public interest point of view.
Another strand of literature pertinent to our discussion analyzes the effect of price regulation on product quality. Departing from the finding that imperfectly competitive markets undersupply product quality (following the seminal work of Spence 1975), it discusses how price floors or more complex fee schedules induce higher choices of quality. An interesting result of this literature is that minimum prices exhibit an U-shaped relationship with average product (or service) quality, i.e. average quality decreases at low price floors (as some firms specialize in low quality-low price products) and it increases at high price floors (as firms symmetrically choose a suboptimal high quality; see Kamien and Vincent 1991). In difference to this literature we study a competitive supply structure that is fully regulated (in quantity and price) by a bureaucratic professional association.

[7] This literature has a great overlap with a critical literature on labor unions (see Kleiner (2000) for an overview).

Finally our results relate to the literature on intrinsic motivation and reciprocity (e.g., Frey 2000, Fehr and Gächter 2000). This literature looks at the economics and psychomechanics of an observed behaviour of "acting without reward". It is driven by a desire to introduce facts from motivational psychology into a more complex economic theory of individiual behaviour. Our approach differs from this literature in that we model intrinsic motivation as a state-dependent attribute of individuals. It rules the behaviour of individuals if, and only if, a sufficient reward ("decent income") is given. If a service is not fairly honoured, or if it does not provide the income for a decent living, suppliers "retaliate" with low quality. In other words, we assume that professional ethics can be deprived.[8]

2 The model setting

The model depicts a market under asymmetric information. Consumers demand services the quality of which cannot be observed at the time the purchases take place. Later, quality can be assessed but is not verifiable[9]. Hence, contracts that comprise quality as an argument are not feasible and consumers resort to estimate the average quality of service that can be inferred from experiences in the past or other sources of information (newspapers, etc.).

Suppliers offer their services at two different levels of quality: low quality ($\underline{q}$) and high quality ($\bar{q}$). The supplier's decisions of how much quality will be offered depends upon the income they earn for every order. If they feel decently payed they will provide high quality services in the spirit of high professional ethics; if on the other hand they receive an income (per unit) below a certain threshold they will respond with low quality services and low work ethics.

Market demand can be derived from the aggregation of consumers' individual demand for services. We assume that each consumer buys only one unit of service. We further assume that consumers differ with respect to their appreciation of service quality. Let $\delta \in [\underline{\delta}, \bar{\delta}]$ be a utility index of consumer type δ reflecting her attitude towards quality. Then, if

$$\delta(EQ(p) + a) - p \geq 0 \tag{1}$$

she will buy a service unit. Here, $EQ(p)$ is the average service quality observable, and p is the price per service unit. a denotes a parameter indicating the valuation of the pure quantitative existence of the product (or service). This implies that there remains a demand for the product even if quality is zero.

[8] This interpretation literally corresponds to the famous "First comes the grub, then the morals" of Bertold Brecht in his Three-Penny Opera.

[9] This type of goods are called experience goods (originating from a seminal work of Nelson (1970)). Experience goods differ from credence goods in that consumers can, after consumption, in principle determine the quality (an hence the necessity) of a service whereas for credence good such as psychotherapy, education etc. they are unable to ascertain the quality and necessity even after having had treatment. For the latter type of goods see e.g. Emons (1997) and related literature (surveyed in Dullek/Kerschbamer (2006)).

Total demand for services can be derived by introducing a density function $f(\delta) \geq 0, \forall \delta \in [\underline{\delta}, \bar{\delta}]$, rearranging (1) and aggregating over all consumer types exhibiting a $\delta \geq \Omega(p) := p/(EQ(p) + a)$. This yields

$$D(p) = \int_{\Omega(p)}^{\bar{\delta}} f(\delta) d\delta \tag{2}$$

In the following we set without loss of generality $\underline{\delta} = 0$.
Suppliers are characterized by their ability as well as their willingness to provide good quality. Both properties are closely interlinked. For any given price, professionals with poor work abilities (high costs) are relatively more inclined to provide low quality than others with low costs. i.e. favourable work abilities. The willingness to provide quality is secured once a decent income (per unit) is achieved. It is at risk when pay conditions are such that the profit (per unit) is below a threshold level that is reasonable or necessary to make a decent living.
To capture the ability of providers to provide quality we introduce a variable $c \in [\underline{c}, \bar{c}]$, where high values of c indicate low professional abilities and vice versa. In other words, high value suppliers have high costs for good service quality, and low value supplier are able to provide good quality at low costs. c is distributed according to the density function $g(c) \geq 0, \forall c \in [\underline{c}, \bar{c}]$.
Suppliers incur production costs[10]

$$C(q, c) = cq, \quad q \in \{\bar{q}, \underline{q}\}, \, c \in [\underline{c}, \bar{c}]. \tag{3}$$

For simplicity we assume that each supplier produces only one good and $\underline{c} = \underline{q} = 0$. A decent price and a decent income therefore falls into one.
To derive total supply and average service quality we have to focus on the quality decision of suppliers type $c \in [0, \bar{c}]$. c indicates the costs of producing a certain quality level. Again, we assume that c has a uniform density function $g(c) = 1/(\bar{c}) \geq 0, \forall c$.
It is here, where the principle of "reasonable profit"[11] comes to play it's pivotal role in the model. If profits per service unit exceed a threshold value A then a supplier will offer high quality. Formally:

$$p - c\bar{q} \geq A \Rightarrow q^* = \bar{q}, \tag{4}$$

where q^* indicates his quality decision. Otherwise, he will offer low quality, i.e. $q^* = \underline{q} = 0$. This behaviour can be regarded as a result of a conditional intrinsic motivation: Good workmanship sets in whenever minimum conditions of pay and income are fullfilled. Notice that this behaviour is in contrast to the *homo oeconomicus* who will offer low quality regardless whether income is above or below a threshold level. Notice also that this willingness to provide quality services is somewhat out of control of the individual: Professionals are disposed (or were previously educated) to provide quality services whenever

[10] To keep the model as simple as possible we abstract from non-linear costs and fixed costs.

[11] The notion of "reasonable profit" is often interpreted to include an aspect of entitlement, i.e. the right of a qualified supplier to receive the "fair price" for his effort. Our definition captures the economic content of it.

they receive a defined reward - the decent price. Neoclassical moral hazard reduces to a 'psychomechanics' which triggers unethical work behaviour whenever a threshold price is undercut, and it disappears whenever the decent price is payed.
Profits remain positive as long as the price is positive. If profits turn negative then the supplier will decline to offer any services, i.e. he will leave the market.
Thus, from the distribution function of c we can derive the total supply function, i.e. supply of both, good and low quality, which simply is

$$S(p) = \begin{cases} 0 & \text{for}\, p \leq 0 \\ x \int_0^{\bar{c}} g(c)dc = x & \text{for}\, p > 0 \end{cases} \tag{5}$$

where x is the overall level of suppliers.
x is controlled by means of occupational licensing and will be determined later. Notice that occupational licensing does not serve as a direct control for the quality spectrum of suppliers, e.g. by setting minimum requirements of human capital investments (skills). It rather influences the average quality of services indirectly by its effect on "reasonable profit" and intrinsic motivation.
To derive the average quality $E[Q]$ prevailing in the market the following figure is helpful.

Figure 1

Within the interval $[(p-A)/\bar{q}, \bar{c}]$ supplier offer only low quality $\underline{q} = 0$. This differs from interval $[\underline{c}, (p-A)/\bar{q}]$ where the profit per service unit is "reasonable" (see (4)) and, hence, high quality is offered.
Having derived the behaviour of suppliers we are now ready to calculate the average quality of services offered in the market. We simply have to aggregate the two quality levels weighted by their respective probabilities P.

$$EQ(p) = P(\frac{p-A}{\bar{q}} \leq c \leq \bar{c})\underline{q} + P(c \leq \frac{p-A}{\bar{q}})\underline{q} \tag{6}$$

where $P(.)$ are the respective probabilities. Recalling our assumption $\underline{q} = \underline{c} = 0$ and the density function $g(c) = 1/\bar{c}$ (6) reduces to

$$EQ(p) = \bar{q} \int_0^{(p-A)/\bar{q}} g(c)dc = \bar{q}\frac{(p-A)}{\bar{q}\bar{c}} \tag{7}$$

Obviously, $EQ(p)$ is a monotonically increasing, almost everywhere differentiable function of p for all values of p where the income is higher than the threshold level A and average quality has not reached the upper bound $\bar{q}$ (sole good quality). To include all relevant cases one has to distinguish between three intervals:

$$EQ(p) = \begin{cases} 0 & \text{for } 0 < p < A \\ \bar{q}\frac{(p-A)/\bar{q}}{\bar{c}} & \text{for } A \leq p \leq \bar{c}\bar{q} + A \\ \bar{q} & \text{for } p > \bar{c}\bar{q} + A \end{cases} \tag{8}$$

Inserting (8) into the definition of $\Omega(p)$ we have

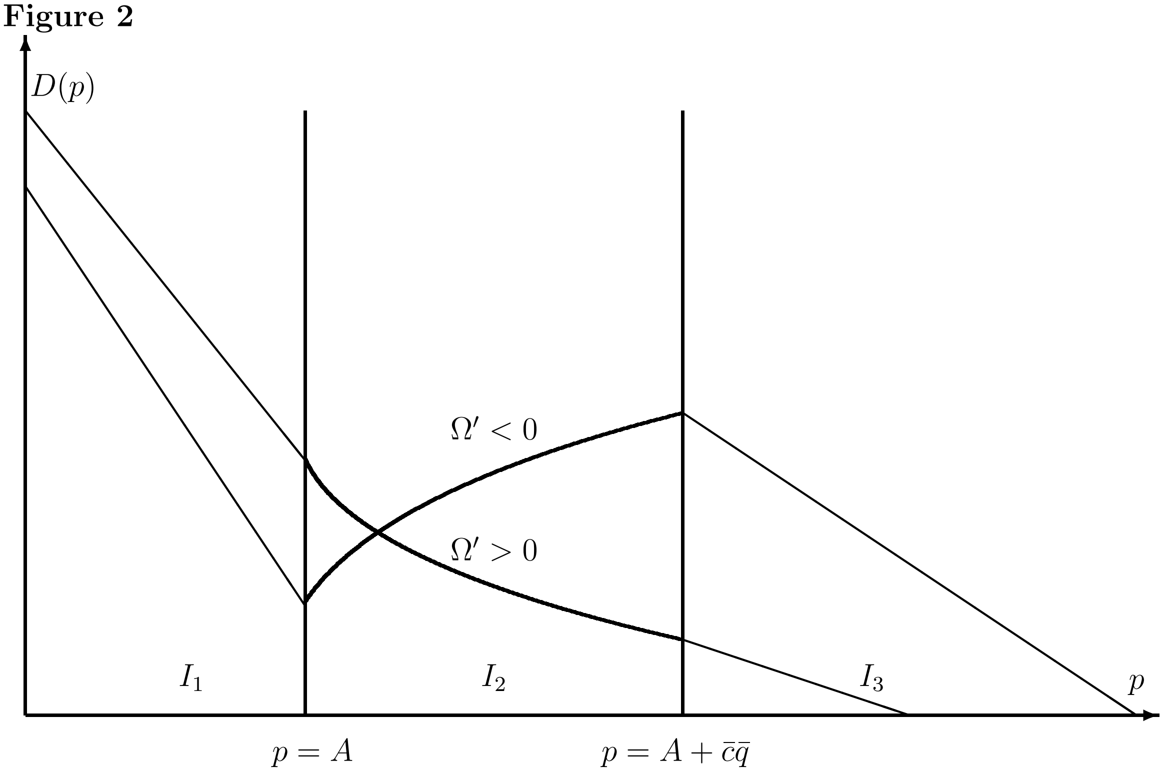
$$\Omega(p) = p/(EQ(p) + a) = \begin{cases} p/a & \text{for } 0 < p < A \\ \frac{p\bar{c}}{(p-A)+\bar{c}a} & \text{for } A \leq p \leq \bar{c}\bar{q} + A \\ \frac{p}{\bar{q}+a} & \text{for } p > \bar{c}\bar{q} + A \end{cases} \tag{9}$$

Utilizing (2) and (9) we can define the demand function as:

$$D(p) = \begin{cases} (\bar{\delta} - p/a)/\bar{\delta} & \text{for } 0 < p < A \\ (\bar{\delta} - \frac{p\bar{c}}{(p-A)+\bar{c}a})/\bar{\delta} & \text{for } A \leq p \leq \bar{c}\bar{q} + A \\ (\bar{\delta} - \frac{p}{\bar{q}+a})/\bar{\delta} & \text{for } p > \bar{c}\bar{q} + A \end{cases} \tag{10}$$

One can distinguish two different types of demand functions depending on the slope of $\Omega(p)$(see figure 2).

Figure 2



The three intervals of (9) $I_1 = \{p : 0 < p < A\}$, $I_2 = \{p : A \leq p \leq \bar{c}\bar{q} + A\}$ and $I_3 = \{p : p > \bar{c}\bar{q} + A\}$ are indicated by the three vertical lines in figure 2. The slope of the demand curve in I_1 and I_3 are always negative. The slope in I_2 depends on $\Omega'(p)$. **(...)** From (2) it easy to show that

$$\text{sign}[D'(p)] = -\text{sign}[\Omega'(p)] \tag{11}$$

where

$$\Omega'(p) = \begin{cases} 1/a & \text{for } 0 < p < A \\ \frac{\bar{c}(\bar{c}a-A)}{((p-A)+\bar{c}a)^2} & \text{for } A \leq p \leq \bar{c}\bar{q} + A \\ \frac{1}{\bar{q}+a} & \text{for } p > \bar{c}\bar{q} + A \end{cases} \tag{12}$$

The sign of $\Omega'(p)$ depends on the price elasticity of quality increase $\frac{d(EQ(p)+a)}{dp}\frac{p}{EQ(p)+a}$. [12] If the expected quality in the market rises sharply as a result of higher **prices**, then $\Omega'(p)$ will be negative and the demand for services will have a positive slope. This can occur in the intervall I_2 if $\Omega'(p) < 0$ $(A - a\bar{c} > 0)$. If, on the other hand, the average quality in the market responds inelastically to prices, the demand curve will be downward sloping. The upward sloping demand function in figure 2 differs from the usual textbook version not only in terms of an atypical price reaction but also in that it is not separated from expected supply side effects. Since quality enters the demand function (higher utility) the response of supply to the service price (expected good workmanship) exerts its influence on the level of demand. Specifically, the boundaries of the three intervalls depend inter alia on A, i.e. the decent income. If A increases, I_2shifts rightward in figure 2.
In the following we assume that demand is positive for the first two intervalls I_1 and I_2 and also at the lower bound of I_3.

Assumption 1 *Without loss of generality we assume that*

$$D(A) > 0 \quad \textit{and} \quad D(A + \bar{c}\bar{q}) > 0 \tag{13}$$

These assumptions require that the relevant parameters follow some restrictions.

Lemma 1 *Necessary and sufficient conditions for assumption (1) are*

$$0 > A - a\bar{\delta} < \bar{q}(\bar{\delta} - \bar{c}) \tag{14}$$

Proof: From (10) we have

$$D(A) = \int_{\Omega(A)}^{\bar{\delta}} f(\delta)d\delta = (\bar{\delta} - A/a)/\bar{\delta} > 0 \tag{15}$$

$$D(A + \bar{q}\bar{c}) = (\bar{\delta} - \frac{A + \bar{q}\bar{c}}{\bar{q} + a})/\bar{\delta} > 0 \tag{16}$$

From (15) and (16) the assertation follows immediately.

[12] See Wilson (1980).

To study the effects of service quality and of regulated prices on consumer wellbeing it is important to analyse the functional relationship between consumer surplus CS and price p.
To do so, we define the aggregate surplus:

$$CS(p) = \int_{\Omega(p)}^{\bar{\delta}} (\delta(EQ(p) + a) - p) f(\delta) d\delta \tag{17}$$

Dividing by $EQ + a$ yields:

$$CS(p) = (EQ(p) + a) \int_{\Omega(p)}^{\bar{\delta}} (\delta - \Omega(p)) f(\delta) d\delta \tag{18}$$

If we recall that δ is uniformly distributed we can rewrite

$$CS(p) = (EQ(p) + a) \left(\frac{(\bar{\delta} - \Omega(p))^2}{2\bar{\delta}} \right) = (EQ(p) + a) \frac{\bar{\delta}}{2} [D(p)]^2 \tag{19}$$

A price increase affects consumer surplus through a positive quality effect (first term on the r.h.s) and through a negative direct price effect on demand (second term on the r.h.s). These two effects play a pivotal role in the following.
Inserting (8),(9) and (10) yields

$$CS(p) \begin{cases} a \frac{(\bar{\delta} - p/a)^2}{2\bar{\delta}} & \text{for } 0 < p < A \\ (\frac{(p-A)}{\bar{c}} + a) \frac{(\bar{\delta} - \frac{p\bar{c}}{(p-A)+\bar{c}a})^2}{2\bar{\delta}} & \text{for } A \leq p \leq \bar{c}\bar{q} + A \\ (\bar{q} + a) \frac{(\bar{\delta} - \frac{p}{\bar{q}+a})^2}{2\bar{\delta}} & \text{for } p > \bar{c}\bar{q} + A \end{cases} \tag{20}$$

From (20) we can infer some properties of $CS(p)$. The functional relationships in I_1 and I_3 are straightforward to detect. If $p < A$ or if $p > \bar{c}\bar{q} + A$ consumer surplus is decreasing as the price increases - as usual. At intermediate prices, i.e. in the intervall I_2, $CS(p)$ is a rational function. To analyse this type of function requires to distinguish different cases [13]. We can distinguish between three cases (...):

- *Case 1*: If $\Omega'(p) > 0$, *and* if $\bar{c} - \bar{\delta} > 0$,the functions of demand and consumer surplus both exhibit the usual properties since the positive quality effect (induced by rising prices) does not offset the negative direct price effect. The second parametric restriction $\bar{c} - \bar{\delta} > 0$ reflects the fact that the range of suppliers' quality costs (i.e. $\bar{c}$) is relatively broader than the range of costumers' quality preferences (i.e. $\bar{\delta}$) so that the average costs of quality are higher than the average benefits in this intervall.

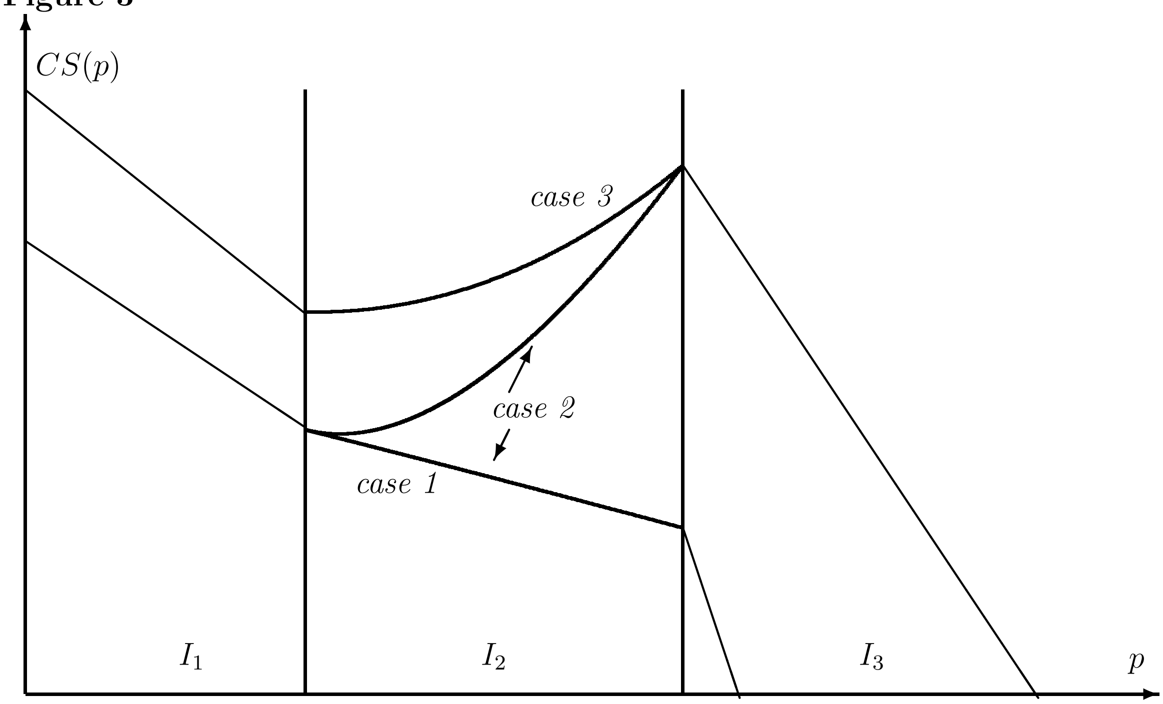
- Case 2: If $\Omega'(p) > 0$, and if $\bar{c} - \bar{\delta} < 0$, demand is decreasing but (contrary to case 1) the effect on consumer surplus is ambigous. Recalling (9) observe that $\lim_{p\to\infty} \Omega(p) = \bar{c}$. Since in this case $\bar{c} < \bar{\delta}$ holds, demand will never be exhausted in I_2. Hence the interplay of the positive quality effect and the negative direct price effect can either lead to an increase or a decrease of consumer surplus.

[13] A more detailed analysis can be found in the appendix.

- Case 3: If $\Omega'(p) < 0$, and if $\bar{c} - \bar{\delta} < 0$, the direct price effect and the quality effect act in the same direction due to the 'atypical' shape of the demand function. As a result, consumer surplus increases unambigously with $p \in I_2$ reaching a peak at $p = A + \bar{c}\bar{q}$.

Finally notice, that the case $\Omega'(p) < 0$ and $\bar{c} - \bar{\delta} > 0$ cannot occur due to assumption 1 and Lemma 1.
The following figure depict the three cases:

Figure 3



In case 1 consumer surplus is unambigiously decreasing, and in case 3 it is unambigiously increasing. In case 2, however, consumer surplus can either increase or decrease, depending on the relative importance of the positive quality effect vis-a-vis the negative direct price effect. $\Omega'(p) < 0$ is a sufficient condition to ascertain a relative peak of consumer surplus in $p = A + \bar{c}\bar{q}$ while $\Omega'(p) > 0$ is necessary but not sufficient for a peak in $p = 0$.
From the different cases drawn in the picture the following lemma can be derived:

Lemma 2 *Consumer surplus is maximized either for $p = 0$ or for $p = A+\bar{c}\bar{q}$. It coincides with an expected quality $EQ(0) = 0$ or $EQ(A+\bar{c}\bar{q}) = \bar{q}$. The incidence of both cases depend on the various parameters $\Omega'(p)$, $\bar{c}$ and $\bar{\delta}$ and their relative magnitude as systemized under the three cases.*
Proof: The proof follows immediately from the analysis of the $CS(p)$-function under the different cases and subcases. See appendix 6.1

3 The Self-Regulated Market

The market for professional services are in many European countries controlled by professional associations, often in subtle ways such as restrictions on multi-disciplinary cooperation or mandatory memberships. This form of self-regulation has been subject to many criticism. Critics point to the potential abuse of power to exploit consumers in a monopolistic fashion (Friedman and Friedman (1963), Stigler (1971)). A modern day's institutional answer to this critique is a procedural separation of the formal power to legally fix the price and entry rules (done by a state entity) from the informal power to establish the economic rationale behind such settings (done by the associations). Another institution to solve this potential conflict of interest is to tie the (formal or informal) regulatory power of the associations to public interests. Typically, professional associations bind themselves by internal constitution to serve and safeguard market-wide high quality services by, amongst other things [14], securing a "decent earning" for as many members as possible. In this section we assume this optimistic view of self-regulation to evaluate the quality and consumer protection effects it produces (neglecting the more fundamental Stigler-type objections against it).

The self-regulated market in our model is characterized by a professional association (PA) the membership of which is mandatory. PA regulates the access (this is the level x) and the price to maintain a reasonable profit (and hence quality) for as many members as possible. The objective function of this Niskanen-style of PA reads:

$$Z^{pa} = x \int_0^{(p-A)/\bar{q}} g(c)dc \tag{21}$$

Market equilibrium requires

$$S(p) = x = D(p) = \int_{\Omega(p)}^{\bar{\delta}} f(\delta)d\delta \tag{22}$$

The PA choses an equilibrium level of x to ascertain the level of p it wishes to attain for its members. Notice, that $x \in [0,1]$. If p is such that $\Omega(p) = \bar{\delta}$ then x= 0, and if $p = 0$ then $x = 1$ (see (22) and figure 2). Inserting this into the definition of Z^{pa} and recalling (9) we arrive at:

$$Z^{pa}(p) = \begin{cases} 0 & \text{for } 0 < p < A \\ \frac{p-A}{\bar{c}\bar{q}\bar{\delta}}(\bar{\delta} - \frac{p\bar{c}}{(p-A)+\bar{c}a}) & \text{for } A \leq p \leq \bar{c}\bar{q} + A \\ (\bar{\delta} - \frac{p}{\bar{q}+a}) & \text{for } p > \bar{c}\bar{q} + A \end{cases} \tag{23}$$

Similar to $CS(p)$, $Z^{pa}(p)$ exhibits some characteristics that depend on $EQ(p)$ and $\Omega(p)$.

[14]Other ways of safe-guarding high quality services are codes of conduct, complaint procedures, prohibitions against certain business relationships and professional indemnity insurance (see OECD (2000) for an overview of professional practices).

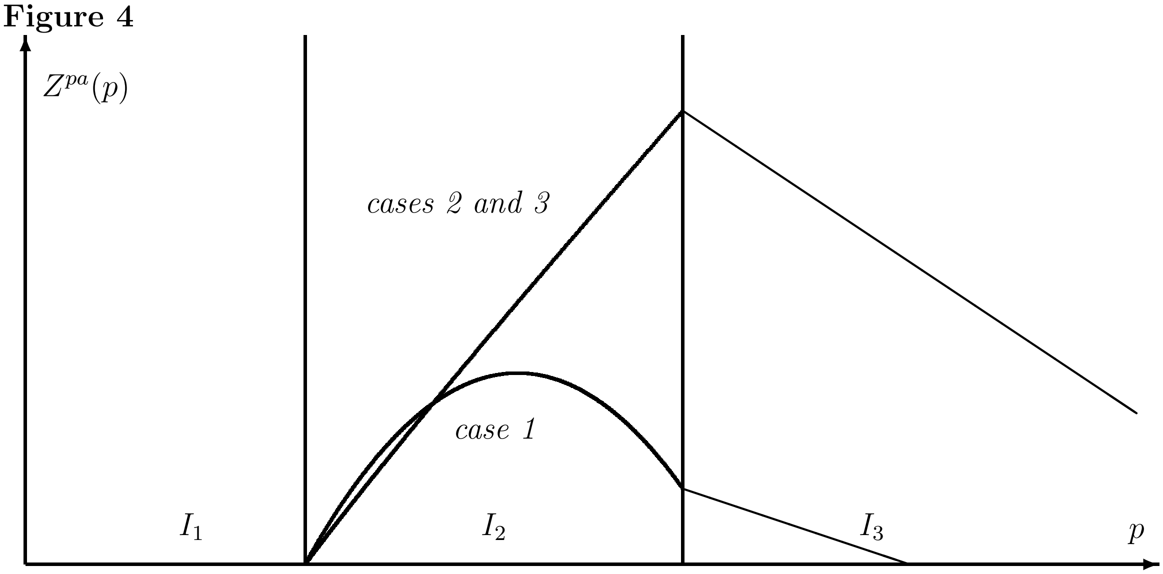
Lemma 3

1. *The number of members earning a sufficiently high income is zero for* $p \in I_1$.
2. $Z^{pa}(p)$ *is decreasing* $\forall p \in I_3$
3. *If case 1 applies, then* $Z^{pa}(p)$ *attains a maximum in* I_2*. The maximum is either in the interior or at* $p = A + \bar{c}\bar{q}$.
4. *If case 2 or case 3 applies,* $Z^{pa}(p)$ *attains a maximum at* $p = A + \bar{c}\bar{q}$.

Proof: See appendix 6. 2

The following figure displays Z^{pa} for the various cases. The association has no concern for suppliers in I_1 since members would be serving the market at an unreasonably low profit. Z^{pa} in I_2 reflects the market response to quality services. The association experiences a continous increase in decently working members if case 3 applies ('atypical' demand reaction). In case 2 the volume of decent income also rises. If the negative direct price effect on demand overcompensates the positive quality effect (case 1), an interior maximum can occur in I_2. In I_3 suppliers earn a unreasonably high profit which by definition does not contribute to the professional association's objective function. Its membership decreases because of the market response to higher prices (lesser demand).

Figure 4



The main question to be addressed in this section is whether a professional association contributes to consumer protection or conflicts with it. Define the consumer surplus maximizing price as p^*, i.e. $p^* = \text{argmax}_p[CS(p)]$, and the association's utility maximizing price as p^{pa}, i.e., $p^{pa} = \text{argmax}_p[Z^{pa}(p)]$.

Proposition 1 *Assume, that the consumer surplus maximizing price occurs at* $p^* = A + \bar{c}\bar{q}$ *in the cases 2 and 3. Then*

$$p^{pa} = p^* \tag{24}$$

i.e. the professional association maximizes consumer surplus.
Assume, that the consumer surplus maximizing price is $p^* = 0$ *in the case 1. Then*

$$p^{pa} > p^* = 0 \tag{25}$$

Hence, the professional association sets a price that is too high in terms of consumer protection.
Proof: The proof follows immediately by comparing the $CS(p)-$ and $Z^{pa}(p)$-function for all possible cases, i.e. case 1-3.

The purpose of the association to maximize the number of members with a sufficiently high income would be in accordance with the goal of consumer protection if consumers' surplus is maximized at a uniform high quality (i.e. $\bar{q}$). This is so because the maximization of quality requires to increase the price to assure that all members earn an income at least as high as A. Both groups of market participants, producers and consumers, are interested in a corner solution where the price induces maximum average quality. We call this the 'harmony case' since both groups share the same interest.
In the 'divering interest case' p^* implies low average quality. The tendency of the association to put weight on sufficiently high producer's income leads to a price level exceeding the price that maximizes consumer surplus.
Notice however, that these results depends largely on the assumption that only a uniform price is admissable. If the market allows different prices for different qualities, the welfare implications of proposition 1 will change as we will show in the following.

4 The De-regulated Market

So far, we have analyzed the case of a professional association that acts as a complete market maker, setting one mandatory price for all members and regulating access through its mandatory membership. The latter is similar to and may therefore be called occupational licensing "on the part of the association". In the following we want turn to the case of a de-regulated market the main characteristics of which are free market prices and the absence of mandatory membership. The access to the market, however, shall remain restricted by some form of occupational licensing "on the part of the state". Restriction on market entry will apply in both regimes because certain entry qualifications are needed to deliver professional services which are usually acquired at some institutions of higher education. The throughput-decision of these outside institutions are in reality only loosely related to the market demand for professionals (e.g. controlled by a central governing board for higher education). We may therefore take their supply as given. The assumption of a given number of qualified professionals (with different production costs) for both the self-regulated and the de-regulated market serves in our model to discuss the partial equilibrium effect of different pricing regimes *ceteris paribus*.Later on, we will relax this assumption to demonstrate that our key results also hold for the case of increasing supply due to de-regulation (but are not driven by this effect).

In a market with no restrictions on price formation, price discrimination according to service quality may occur which in the literature is called a reputation equilibrium[15]. In our model, a reputation equilibrium is a separating equilibrium with two prices, one price for high quality and one for low quality. High quality is offered by those professionals with a decent income (relatively low costs) while low quality is offered by the remaining suppliers (with relatively high costs). Costumers can rely on the price as a quality signal since good service quality is ascertained once a decent profit is made (at a high price), and it always disappears if the price goes below theprovider-specific threshold value needed for a decent living.

To define a separating equilibrium we firstly look at what kind of consumers choose a low or a high quality of services. Utilizing (1) we have utility for customers buying high quality

$$U^h = \delta(\bar{q} + a) - p^h \geq 0 \tag{26}$$

and low quality

$$U^l = \delta a - p^l \geq 0 \tag{27}$$

where p^h (p^l) is the price for the high (low) quality segment of the market. A necessary condition for a separating equilibrium is that

$$\frac{p^h}{\bar{q} + a} > \frac{p^l}{a} \tag{28}$$

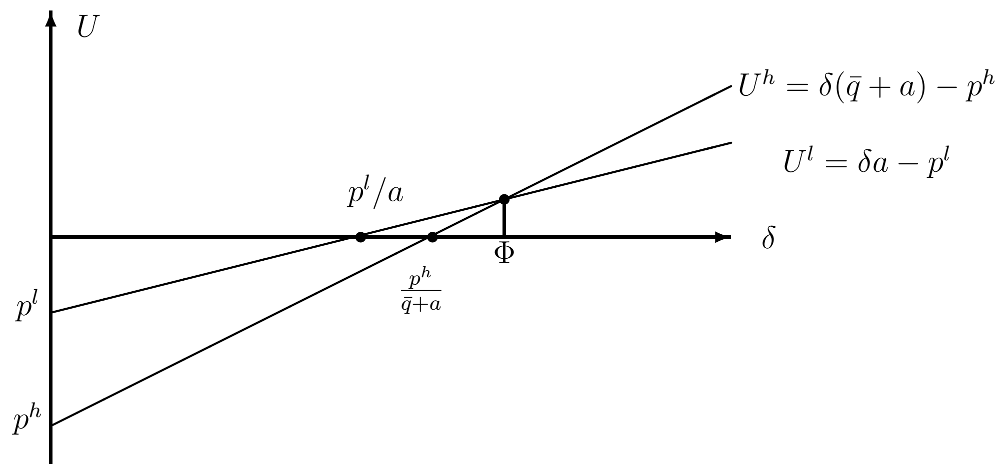
which implies that

$$p^h > p^l \tag{29}$$

as is shown in the following figure.

[15]See Shapiro (1986).

Figure 5



All consumers with $\delta \in [p^l/a, \Phi]$ buy low quality and consumers with $\delta \in (\Phi, \delta]$ choose high quality $\bar{q}$, where

$$\Phi = (p^h - p^l)/\bar{q} \tag{30}$$

can be calculated from $U^h = U^l$.
Similar, suppliers are grouped according to their costs. If

$$p^h - c\bar{q} \geq A \tag{31}$$

suppliers choose to voluntarily join the high-quality segment and offer high quality. Otherwise they offer low quality for $p^l > 0$.
In a separating market equilibrium demand and supply are equalized for both qualities, i.e.

$$S^h(p^h, p^l) = x \int_0^{(p^h - A)/\bar{q}} g(c)dc = D^h(p^h, p^l) = \int_\Phi^{\bar{\delta}} f(\delta)d\delta \tag{32}$$

and

$$S^l(p^h, p^l) = x \int_{(p^h - A)/\bar{q}}^{\bar{c}} g(c)dc = D^l(p^h, p^l) = \int_{p^l/a}^{\Phi} f(\delta)d\delta \tag{33}$$

These two equations determine the equilibrium prices p^h and p^l. The existence of a separating equilibrium depends upon the magnitude of supply controlled by the parameter $x \in [0, 1]$. The following lemma summarizes important characteristics of the separating equilibrium (SE).

Lemma 4 *For all $x \in SE = (\underline{x}^{SE}, \bar{x}^{SE}) \subset [0, 1]$ and $\underline{x}^{SE} < \bar{x}^{SE}$ there exists a separating equilibrium (reputation equilibrium), where $\underline{x}^{SE}$ solves (22) for the regulated price $p^{reg} =$*

$A+\bar{c}\bar{q}$ and $\bar{x}^{SE}$ solves (32) and (33) such that $p^h(x) = A$. If $\bar{x}^{SE} > 1$ then $SE = (\underline{x}^{SE}, 1]$. This case occurs if $A - \bar{\delta}q < 0$ (sufficiency). The SE is characterized by

$$p^l(x) < p^{reg}(x) < p^h(x) \, x \in SE \tag{34}$$

If $x = \underline{x}^{SE}$ then only one market for high quality exists. Increasing x opens a market for low quality continously growing in x. At the same time the market for high quality decreases in x. If $x = \bar{x}^{SE}$ only one market for low quality exists.
Proof: See appendix 6.3.

The results of the lemma is quite obvious. If the supply is short then the service price guarantees a decent income for all suppliers regardless of their costs of providing high quality. Hence, only one market for high quality exists. Increasing x lowers the price and leads to a separation of those with high quality costs from those with low quality costs who still receive at least the threshold value A. If $x = \bar{x}^{SE}$ the price for high quality does not sustain A and, as a result, the market for high quality vanishes.
To compare the self-regulated market with a reputation equilibrium we have to recall that the key difference is price formation (not market size). While the former market is characterized by a uniform price set by a professional association covering all suppliers the latter allows for two prices. Hence, camparing both cases in terms of consumer protection, i.e. consumer surplus, should start from the same market size x for both institutional settings. Put differently: What would happen in terms of consumer protection if, ceteris paribus, prices were de-regulated and the mandatory membership was abolished? The following proposition resumes the main results.

Proposition 2 *For any given market size x for which a separating equilibrium exists*

$$CS^{dereg}(x) > CS^{reg}(x) \quad \forall x \in SE \tag{35}$$

where CS^{dereg} (CS^{reg}) denotes consumer surplus in a deregulated (regulated) market. Moreover, deregulation enhances average quality, i.e.

$$EQ^{dereg}(x) > EQ^{reg}(x), \quad \forall x \in SE \tag{36}$$

Proof: See appendix 6. 4.

These results, especially the latter one (36), are contrary to the allegiation put forward by professional associations in political negotiations. Quality differention within a service market not only increases aggregate consumer surplus but also leads to more quality on average. Intrinsic motivation will not erode under an unregulated market because high quality finds its demand in an separating equilibrium. The interaction of demand and supply is sufficient to guarantee an increasing quality of services.
The following diagramme illustrates the proposition in a generalized way (for different market sizes)[16]

[16]The picture is drawn under the assumption, that the relevant range of x that sustains a separating equlibrium is $SE = (\underline{x}^{SE}, 1]$.

Figure 6

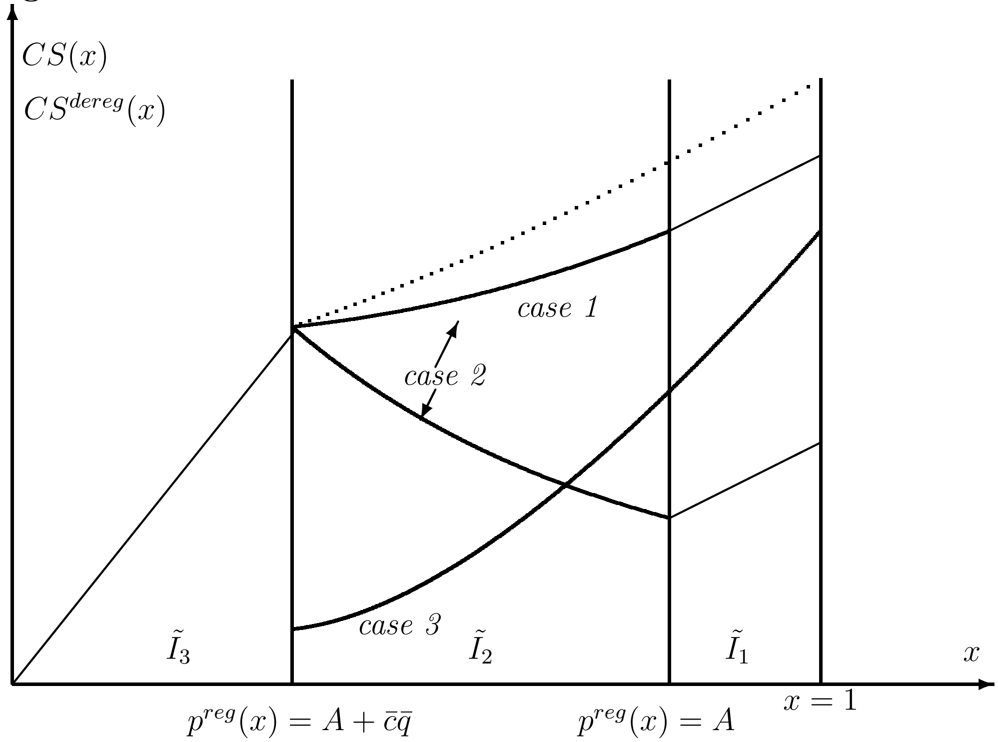


Figure 6 depicts aggregate consumer surplus as a function of market size x for both scenarios, self-regulation (solid lines) and deregulation (dotted line). Consumer surplus for the case of self-regulation has already been defined in (20). Notice however, that in figure 6 it is expressed as function of the market size x . This can be achieved by utilizing the demand function (10) and market equilibrium condition (22). Simply solve the demand function piecewise for the price as a function x . This leads to

$$p^{reg}(x) = \begin{cases} \bar{\delta}(a+\bar{q})(1-x) & \text{for} x \in \tilde{I}_3 \\ \frac{(A-a\bar{c})\bar{\delta}(x-1)}{\bar{c}+\bar{\delta}(x-1)} & \text{for } x \in \tilde{I}_2 \\ a\bar{\delta}(1-x) & \text{for } x \in \tilde{I}_1 \end{cases} \tag{37}$$

where $\tilde{I}_3 = \{x|p^{reg}(x) > A+\bar{c}\bar{q}\}$, $\tilde{I}_2 = \{x|A \leq p^{reg}(x) \leq A+\bar{c}\bar{q}\}$ and $\tilde{I}_1 = \{x|p^{reg}(x) < A\}$. (37) can be be inserted into (20) which leads to the graphs depicted in the figure[17].
The picture shows that the impact of deregulation on consumer surplus is positive for any given market size. Take the upper bound of $\tilde{I}_3$ where the price in the regulated market

[17]Notice however, that case 3 is somewhat more complicated due to the non-monotonicityy of the demand function. As a result, a discontinuity emerges. To be more precise, the non-monotonicity of $D(p)$ in case 3 requires a rule, which price on the demand curve should be chosen for given $x = D(p)$. For the intervall $(\underline{x}, \bar{x})$ where $p^{reg}(\underline{x}) = A + \bar{c}\bar{q}$ and $p^{reg}(\bar{x}) = A$ the prices $p_1^{reg} < p_2^{reg} < p_3^{reg}$ solve the market equilibrium condition (22).To derive the function $CS(x)$ we insert the price $p_i^{reg}(x)$ that maximizes consumer surplus, i.e. $CS(x) = \max_i[CS(p_i^{reg}(x))], i = 1, 2, 3$. From (19) one can infer that p_3^{reg} maximizes the consumer surplus since average quality is highest and quantity constant.

equals $A + cq$ and induces the highest quality. This value is identical to $\underline{x}^{SE}$ the lower bound of the intervall SE which supports the existence of a separating equilibrium. If x increases the prices of the reputation equilibrium decrease and lead to more consumer surplus. In the regulated market an increase of x can either lead to an increase in consumer surplus (under case 1 and also one specification of case 2) or to an decrease (case 3 and the other specification of case 2). Even in case 1 where consumer surplus increases the separating equlibrium dominates the regulation case. This can easily be inferred from

$$CS^{reg}(x) - CS^{dereg}(x) = [EQ^{reg}(x) - EQ^{dereg}(x)] \int_{p^l/a}^{\bar{\delta}} (\delta - p^l/a) f(\delta) d\delta \tag{38}$$

where the r.h.s. follows from the proof of proposition (see appendix 6.4). If one recalls (19) and bears in mind that $p^l(x)/a = \Omega(p^{reg}(x))$ it is easily understood that the surplus difference is solely induced by the quality increase of deregulation. The market size x exerts no effect on this dominance.

The overall result is clear cut. Consumer surplus will be globally maximized if $x = 1$ and prices are deregulated to allow for a reputation equilibrium. This applies irrespective of what the optimal price (and hence the optimal market size) would be in the cases of self-regulation. Hence, to argue that regulation is necessary to protect consumers against deteriorating average quality ignores the fact that high quality always finds its costumer in a deregulated market. Of course, intrinsic motivation plays a role in that it alleviates the establishment of a separating equilibrium. Assuming a different concept of work behaviour does not lead to an other assessment of the superiority of the market. On the contrary, intrinsic motivation makes things easier for the functioning of the market.

5 Summary

What would happen if the EU Commission would abolish all minimum prices for professional services in Europe? According to opponents from the league of professional associations, we would see prices come down but also a decline of service quality and work dignity. If, for the sake of the argument, we follow this critique and assume that the quality of professional services is conditional upon the intrinsic motivation of service providers, and if we moreover assume that the intrinsic motivation of service providers rests upon a "reasonable profit", we would want to know whether the decline of service quality would indeed accrue and whether it runs in or against the interest of consumers.

In this paper we have shown that a minimum price which is fixed by a Niskanen-type professional association will generally not serve the consumers if there is a demand for a variety of low and high quality services. If the price is fixed so that quality is somewhere below the top, t is too high compared to the price that maximizes consumer surplus. The tendency of the professional association to put weight on sufficient producers' income leads to average quality in the market that exceeds the average quality that consumers desire (given a uniform price).

Moreover, we have demonstrated that a de-regulation of a pre-existing fixed price scheme will never lead to a decrease in average service quality. A reputation equilibrium allows

to separate between a low-quality-low-price and a high-quality-high-price segment in the merket. Given the same size and the purchasing power in the market, lower prices for low quality services allow higher-prices for high quality services and an increasing group of decently working service men. The price split simply helps to stabilise expectations. Those who want low quality services will get exactely this type of services while those who desire top quality also get what they want. Even if all consumers want top quality in full harmony with the professional association, the deregulated market will deliver exactely this corner solution. In fact intrinsic motivation does nor run against the working of a free market but empowers the market to separate efficiently.
The EU's initiative for de-regulation of professional tariffs therefore seems in the best interest of consumers - even if we acknowledge the argument of opponents that there is a chance of deprivation of professional ethics due to price competition. We even see a surprising increase of average service quality, if the demand for quality is such that some top quality segment that would not be served under a uniform pricing scheme will be served in market without price regulation.
This paper's analysis can be extended in many explorative ways, e.g. by considering overall welfare effects (including producer surplus). None of this possible extensions would, according to our expectation, change our result in favor of the EU's initiative to de-regulate professional tariffs.

6 Appendix

6.1 Some analysis on the consumer surplus function

In the intervall I_2 the consumer surplus function is a rational function (see (20)). The nominator is a quadratic form, the denominator contains a linear affine function. Obviously, the domain of $CS(p)$ exhibits a hole at $A - a\bar{c}$ which is either negative (cases 1 and 2) or positive (case 3). From (20) we obtain the following expression for the specification in I_2:

$$CS(p) = \frac{(\bar{\delta}(A - a\bar{c}) + (\bar{c} - \bar{\delta})p)^2}{2\bar{c}\bar{\delta}(-A + a\bar{c} + p)} \tag{39}$$

Differentiating with respect to p yields

$$CS'(p) = \frac{-(\bar{c} - \bar{\delta})(\bar{\delta}(A - a\bar{c}) + (\bar{c} - \bar{\delta})p)}{\bar{c}\bar{\delta}(A - a\bar{c} - p)} - \frac{(\bar{\delta}(A - a\bar{c}) + (\bar{c} - \bar{\delta})p)^2}{2\bar{c}\bar{\delta}(-A + a\bar{c} + p)^2} \tag{40}$$

Setting (40) equal to zero yields two solutions:

$$p_1 = \frac{-\bar{\delta}(A - a\bar{c})}{\bar{c} - \bar{\delta}} \quad p_2 = \frac{(2\bar{c} - \bar{\delta})(A - a\bar{c})}{\bar{c} - \bar{\delta}} \tag{41}$$

It is easy to show that one solution is always to the left and one is to the right of the hole $H = A - a\bar{c}$. Notice, that the hole is not contained in I_2 since $A > H$ is the lower bound of that intervall. For all $p > H$ the respective solution of (41) always characterizes a minimum of the function. This can be inferred from the second derivative which is

$$CS''(p) = \frac{\bar{c}(a\bar{c} - A)^2}{\bar{\delta}(-A + a\bar{c} + p)^3} > 0, \quad \forall p > H \tag{42}$$

$CS(p)$ is convex if $p \in I_2$.
It remains to be proven that $CS(p)$ follow the lines depicted in figure 3. For case 1, always $CS'(p) < 0, p \in I_2$. This follows from (42) and $p_1 > A + \bar{c}\bar{q}$, i.e. the minimum of $CS(p)$ occurs in I_3. Inserting p_1 from (41) and recalling assumption 1 and lemma 1 yields:

$$\frac{-\bar{\delta}(A - a\bar{c})}{\bar{c} - \bar{\delta}} > A + \bar{c}\bar{q} \Leftrightarrow \bar{q}(\bar{\delta} - \bar{c}) > A - a\bar{\delta} \tag{43}$$

For case 3 we can show that $CS'(p) > 0, \forall p \in I_2$. Notice first that for this case $p_1 > p_2$. Since $CS(p)$ is convex it is sufficient to show that $p_1 < A$. Utilizing (41) it is easy to show that

$$p_1 < A \Leftrightarrow \bar{c}(A - a\bar{\delta}) < 0 \tag{44}$$

The r.h.s. follows from assumption 1 and lemma 1.
Finally, if case 2 applies the $CS(p)$-function decreases in $\forall p \in I_2$ if the root $p_2 \geq A + \bar{c}\bar{q}$. Again, utilizing (41) it can be shown that

$$p_2 \geq A + \bar{c}\bar{q} \Leftrightarrow (A - a\bar{c}) - (a + \bar{q})(\bar{c} - \bar{\delta}) \leq 0 \tag{45}$$

If $A < p_2 \leq A + \bar{c}\bar{q}$ then $CS(p)$ has a (local) minimum in I_2. If $p_2 < A$, then $CS(p)$ is increasing throughout I_2.
Notice that under case 3 two maxima of $CS(p)$ exist. The same property can also occur under case 2. The following table shows that for different values of the relevant parameters the maximum consumer surplus either occurs at $p = 0$ or at $p = A + \bar{c}\bar{q}$.

	$CS(A + \bar{c}\bar{q}) > CS(0)$		$CS(A + \bar{c}\bar{q}) < CS(0)$	
	$\bar{c} - \bar{\delta} > 0$	$\bar{c} - \bar{\delta} < 0$	$\bar{c} - \bar{\delta} > 0$	$\bar{c} - \bar{\delta} < 0$
$A - a\bar{c} < 0$	xxx xxx	A = 10, a= 8, c = 4 $\bar{\delta}$ = 21, q =2.5	A = 20, a= 2, c = 17 $\bar{\delta}$ = 15, q =2.5	A = 15, a= 8, c = 4 $\bar{\delta}$ = 15, q =2.5
$A - a\bar{c} > 0$	xxx xxx	A = 15, a= 1, c = 5 $\bar{\delta}$ = 50, q =2.5	xxx xxx	A = 25, a= 2, c = 5 $\bar{\delta}$ = 50, q =1

(Entries xxx designate case 1 where $CS(0)$ is always a maximum and the case $\{A - a\bar{c} > 0, \bar{c} - \bar{\delta} > 0\}$ which does not exist by assumption 1).

6.2 Proof of Lemma 3

The first and second assertation follows immediately by (23). To proof (3) one has to differentiate $Z^{pa}(p)$ with respect to p. Utilizing the definitions of $\Omega(p)$ and Z^{pa} (eqs. (9)and (23)) we have

$$Z^{pa}(p) = \frac{p - A}{\bar{c}\bar{q}} \left(\frac{\bar{\delta} - \Omega(p)}{\bar{\delta}} \right) \tag{46}$$

Differentiating with respect to p yields

$$Z'_{pa}(p) = \frac{1}{\bar{c}\bar{q}}\left(\frac{\bar{\delta}-\Omega(p)}{\bar{\delta}}\right) - \left(\frac{p-A}{\bar{c}\bar{\delta}\bar{q}}\right)\Omega'(p) \tag{47}$$

If $p = A$, then (47) is positive. Hence, there exist a $p^{pa} \in I_2$ that maximizes $Z^{pa}(p)$. To show that p^{pa} is either a interior solution or $p^{pa} = A + \bar{c}\bar{q}$, notice, that $Z^{pa}(p)$ is concave. This follows from differentiating (23) twice. This yields:

$$Z''_{pa}(p) = -\frac{2a\bar{c}(A-a\bar{c})}{\bar{\delta}(A-a\bar{c}-p)^3\bar{q}} < 0 \tag{48}$$

For case 3 (i.e. $\Omega'(p) < 0$) the final assertation follows by inspection of (47).
For case 2 $Z'_{pa}(p)$ has to be calculated with the help of (23). Diiferentiating (23) for I_2 and rearranging yields

$$Z'_{pa}(p) = \frac{-(\bar{c}-\bar{\delta})(A-p)}{\bar{c}\bar{\delta}(A-a\bar{c}-p)\bar{q}} - \frac{a\bar{c}[A-a\bar{c}+(\bar{c}-\bar{\delta})p]}{\bar{c}\bar{\delta}(A-a\bar{c}-p)^2\bar{q}} > 0,\ \forall p \in I_2. \tag{49}$$

6.3 Proof of Lemma 4

Recall that c and d are uniformely distributed and insert the definition (30) into the the equilibrium conditions (32) and (33). This yields

$$x\frac{(p^h-A)}{\bar{q}\bar{q}} = 1 - \frac{p^h-p^l}{\bar{\delta}\bar{q}} \tag{50}$$

$$x(1-\frac{p^h-A}{\bar{c}\bar{q}}) = \left[\frac{p^h-p^l}{\bar{q}} - \frac{p^l}{a}\right]/\bar{\delta} \tag{51}$$

Solving for p^h and p^l yields

$$p^h(x) = \frac{\bar{c}\bar{\delta}(a+\bar{q}) + \bar{\delta}(A-a\bar{c})x}{\bar{c}+\bar{\delta}x} \tag{52}$$

$$p^l(x) = a\bar{\delta}(1-x) \tag{53}$$

Both prices decrease in x which can be shown by differentiating (52) and (53):

$$p^{h\prime}(x) = \frac{\bar{c}\bar{\delta}(-(a+\bar{q})\bar{\delta}+(A-a\bar{c}))}{(\bar{c}+\bar{\delta}x)^2} < 0 \quad p^{l\prime}(x) = -a\bar{\delta} < 0 \tag{54}$$

The sign of $p^{h\prime}(x)$ follows from assumption 1 and lemma 1.
A separating equilibrium exist if $p^l(x)/a < p^h(x)/(\bar{q}+a)$ (see figure 5). To determine the two bounderies of the intervall SE we first set $p^l(x)/a = p^h(x)/(\bar{q}+a)$ and solve for x. Since the equation is quadratic there a two solutions.

$$x_1 = 0, \quad x_2 = \frac{-A+a\bar{\delta}-(\bar{c}-\bar{\delta})\bar{q}}{\bar{\delta}(a+\bar{q})} > 0 \tag{55}$$

The latter inequality follows again from assumption 1 and lemma 1. Notice also, that p^l is a linear function whereas p^h is convex which can be inferred from the second derivative

$$p^{h\prime\prime}(x) = -\frac{2\bar{c}\bar{\delta}^2(-(a+\bar{q})\bar{\delta} + (A - a\bar{c}))}{(\bar{c} + \bar{\delta}x)^3} > 0 \tag{56}$$

Due to the convexity (linearity) of p^h (p^l) it follows that that x_2 divides the admissable intervall $[0,1]$ into a subintervall where $p^l(x)/a \geq p^h(x)/(\bar{q}+a)$ and SE, where $p^l(x)/a < p^h(x)/(\bar{q}+a)$. Hence, $\underline{x}^{SE} = x_2$. It can be shown that at x^{SE} equals that market size that leads to the lowest regulated price securing high quality $\bar{q}$, i.e. $p^{reg}(\underline{x}^{SE}) = A + \bar{c}\bar{q}$. This can be inferred from the market equilibrium condition (22) and the demand function (10).
Finally, in a separating equilibrium supply and demand must be positive, i.e.

$$p^h(x) < A \quad \text{and} \quad \Phi(x) < \delta \tag{57}$$

The restriction on SE can be determined by turning both inequalities into equalities. Inserting (52) and (53) and solving for x yields

$$\bar{x}^{SE} = \frac{\bar{\delta}a + \bar{q}\bar{\delta} - A}{a\bar{\delta}} > 0 \tag{58}$$

for both restrictions. Utilizing assumption and lemma 1 it is a easy task to show that $\underline{x}^{SE} < \bar{x}^{SE}$.
To demonstrate that prices in the two regimes differ we first show hat $p^l(x) < p^{reg}(x), x \in SE$. Adding (32) and (33) and recalling (22) yields

$$S^h + S^l = x = \int_{p^l/a}^{\bar{\delta}} f(\delta)d\delta = \int_{\Omega(p^{reg})}^{\bar{\delta}} f(\delta)d\delta \tag{59}$$

Since total supply x is the same in both regimes total demand must also be the same to assure market equilibrium. Hence, from (59) it follows

$$p^l/a = \Omega(p^{reg}) = \frac{p^{reg}}{EQ(p^{reg}) + a} \tag{60}$$

and, since $EQ(p^{reg}) > 0$ by proposition 1,

$$p^l < p^{reg} \tag{61}$$

A reputation equilibrium which separates high and low qualities requires by (33)

$$p^l/a < \Phi = \frac{p^h - p^l}{\bar{q}} \tag{62}$$

Utilizing (60) we end up with

$$p^h > \left(\frac{\pi\bar{q} + a}{EQ(p^{reg}) + a}\right) p^{reg} \tag{63}$$

which implies $p^h > p^{reg}$ since $\frac{\bar{q}+a}{EQ(p^{reg})+a} > 1$.

To prove the final part of the lemma insert $\underline{x}^{SE}$ in (59). From (55) and $\underline{x}^{SE} = x_2$ it follows that $\Phi(\underline{x}^{SE}) = p^l(\underline{x}^{SE})/a$ and, hence, by (33) no market for low quality exists. Inserting $p^{reg}(\underline{x}^{SE})$ into (9) and recalling that $EQ(p^{reg}(\underline{x}^{SE}) = \bar{q}$ leads to $p^{reg}(\underline{x}^{SE}) = p^h(\underline{x}^{SE})$. If x increases both prices decrease by (54). By (59) the market for low quality grows. The market for high quality decreases if $\Phi'(x) > 0$. The later can be shown by recalling that $p^h(x)$ is a convex function and, hence,

$$\frac{d(p^h(x)/(\bar{q}+a))}{dx} > \frac{d(p^l(x)/a}{dx}, \quad x \in SE. \tag{64}$$

Rearranging (64) leads to

$$\left(\frac{a}{\bar{q}+a}\right)\frac{dp^h(x)}{dx} > \frac{dp^l(x)}{dx} \Rightarrow \frac{dp^h(x)}{dx} > \frac{dp^l(x)}{dx} \tag{65}$$

As a result, $\Phi'(x) > 0, x \in SE$.

6.4 Proof of Proposition 2

To prove $CS^{dereg}(x) > CS^{reg}(x)$ it is first shown that that average quality in a de-regulated market exceeds that of a price-regulated market. First one has to determine the average quality of the former market.

$$EQ^{dereg} = 0\int_{(p^h-A)/\bar{q}}^{\bar{c}} g(c)dc + \bar{q}\int_0^{(p^h-A)/\bar{q}} g(c)dc \tag{66}$$

Since $p^h > p^{reg}$ it follows from (66) and (7) that $EQ^{dereg} > EQ^{reg}(x)$. By (38) the the first part of the proposition follows. Hence, it remains to prove that (38) holds true.
The consumer surplus for a reputation equlibrium is defined as

$$CS^{dereg}(x) = \int_{p^l/a}^{\Phi}[\delta a - p^l]f(\delta)d\delta + \int_{\Phi}^{\bar{\delta}}[\delta(\bar{q}+a) - p^h]f(\delta)d\delta \tag{67}$$

Adding and subtracting $\int_{\Phi}^{\bar{\delta}}[\delta a - p^l]f(\delta)d\delta$ and recalling the definition of $\Phi = (p^h - p^l)/q^h$ yields after some rearrangements:

$$CS^{dereg}(x) = \int_{p^l/a}^{\bar{\delta}} a(\delta - p^l/a)f(\delta)d\delta + \int_{\Phi}^{\bar{\delta}} \bar{q}(\delta - \Phi)f(\delta)d\delta \tag{68}$$

Notice that $p^h(x)$, $p^l(x)$ and $\Phi(x)$ are functions of x. To determine the impact of the institutional change we subtract (68) from (18) which yields:

$$CS^{reg}(x) - CS^{dereg}(x) = EQ^{reg}(x)\int_{p^l/a}^{\bar{\delta}}(\delta - p^l/a)f(\delta)d\delta - \int_{\Phi}^{\bar{\delta}}\bar{q}(\delta-\Phi)f(\delta)d\delta \tag{69}$$

where the relevant prices are functions of x (see (32), (33) and (37)). Notice also that $CS^{dereg}(x) = CS(p^{reg}(x))$ where $p^{reg}(x)$ is defined in (37). Adding and subtrating $EQ^{dereg}(x)\int_{p^l/a}^{\bar{\delta}}(\delta - p^l/a)f(\delta)d\delta$ leads to

$$\begin{aligned} CS^{reg}(x) - CS^{dereg}(x) = \quad & [EQ^{reg}(x) - EQ^{dereg}(x)]\int_{p^l/a}^{\bar{\delta}}(\delta - p^l/a)f(\delta)d\delta \\ & - \left\{\int_{\Phi}^{\bar{\delta}}\bar{q}(\delta-\Phi)f(\delta)d\delta - EQ^{dereg}(x)\int_{p^l/a}^{\bar{\delta}}(\delta - p^l/a)f(\delta)d\delta\right\} \end{aligned} \tag{70}$$

It can be shown that the second term within the accolades is nil. The proof continues in two steps.
First, we integrate the expression

$$\int_m^{\bar{\delta}} (\delta - m) f(\delta) d\delta \quad m = \{p^l/a, \Phi\} \tag{71}$$

by parts which yields

$$\int_m^{\bar{\delta}} (\delta - m) f(\delta) d\delta = (\delta - m) - \frac{(\bar{\delta} - m)}{\bar{\delta}} = (\bar{\delta} - m) - D(m), \quad m = \{p^l/a, \Phi\} \tag{72}$$

where $D(m)$ follows from the definition (2) and the assumption of the uniform distribution of δ. From (66) and the market equilibrium condition (22) it follows that

$$EQ^{dereg}(x) = \bar{q} \frac{D(\Phi)}{D(p^l/a)} \tag{73}$$

Secondly, if one inserts (72) and (73) into (70) the expression within the accolades vanishes.QED.

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Georg Meran and Reimund Schwarze

Can minimum prices assure the quality of professional services?

Abstract

This paper studies the effects on service quality and consumer surplus of a minimum price which is fixed by a bureaucratic non-monopolistic professional association. It shows that the price set by a Niskanen-type professional association will maximize consumer surplus only if consumers demand the highest possible average quality. If consumers demand services of lesser quality, the association's price will be too high if measured by consumer surplus. Moreover we show that a de-regulated market will always reproduce the favourable result of a uniformly high price in the case of top quality demand while delivering superior results in the case of a mixed demand for high and low quality services.

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