Competition and Trust*

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Abstract

We study the interaction of competition and reputation as efficiency enhancing mechanisms. We analyze a dynamic model of monopolistic competition with experience goods and private information, regarding quality. The rate of time preference, acts as a reputation constraint determining the lowest price supporting high quality as a sequential equilibrium. Competition plays no role in reducing prices, when beliefs are arbitrary. However, if beliefs satisfy weak plausibility restrictions, then competition plays a role and there is a unique stationary sequential equilibrium. Competition enhances efficiency, yet the equilibrium is inefficient, even in the limiting case of perfect competition.

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1 Introduction

Under standard assumptions, Bertrand competition, among firms producing an homogeneous product, results in an efficient equilibrium. One of this

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assumptions is that agents can observe the quality of the good being bought. However, if the quality is not observed, then price competition among firms is, in fact, competition on promises. Firms, for example, promise that, at the given price, the good being bought will be of good quality. Experienced goods have this feature. The difference between competing on prices or on promised prices, i.e. prices per unit of unobserved quality, is not trivial. As it is well understood, if achieving good quality is costly, then if these were once-and-for-all transactions, firms would have no incentive to produce good quality and rational consumers would not trust firms' promises.

Trust requires repeated interaction. In such a case, the firm will value the trade-off between the short run profit –of delivering low quality– against the long run cost of a damaged reputation. Reputation is valuable if it can bring future rents, otherwise short-run gains dominate. The more impatient firms are (or the less frequently they are active in the market; i.e., sampled by consumers) the higher must be the future expected profits. This is in sharp contrast with the competitive model, with perfect observability, where firms do not acquire extra rents. It also shows that the trust, or reputation, mechanism inheritly brings some level of inefficiency: trust is costly to sustain!

Once consumers trust firms to produce high quality goods, does competition among firms play any disciplinary role on prices? One may think that competition from other firms will prevent a firm from charging above the minimum price needed to sustain trust. But this intuition –based, again, on Bertrand competition– does not take into account that competition is on promises, that consumers' beliefs can be fairly arbitrary. For example, it they were to associate a lower price with lower quality, a strategy of undercutting prices may not help. Yet, one would like to understand how competition may work in an environment were agents compete on promises.

This is the objective of this paper. We study this issue in the context of a dynamic model of monopolistic competition with experience goods, and it is in this framework that we present our main results. The dynamic Dixit-Stiglitz model is appropriate for our purposes since firms set prices, do not behave strategically with respect to other firms, and a single parameter –the degree of product substitutability– captures the degree of competition. However, it should be noticed, at the outset, that 'competition on promises' is a fairly general phenomenon: assets promise to deliver returns; monies, purchasing power; politicians, good policies, etc.

We show two major results. The previous discussion already suggests the

first result. When quality in not observed ex-ante, trust can be sustained only if there is a minimum mark-up, given by the degree of impatience (or of consumers' sampling[1]). But, with arbitrary beliefs, competition plays no role. In particular, whether goods are more or less close substitutes, that does not change the set of equilibria. This first result is a manifestation, in our competitive environment, of the well studied 'Folk theorems.'

The second, and central, result builds on the fact that some of the of the beliefs sustaining high price equilibria are not only arbitrary, but implausible. In particular, one would expect that agents' beliefs are based on proper inferences. For example, to have beliefs about quality that are consistent with firms' incentives to deliver it. We show that imposing minimal –plausible– restrictions on beliefs drastically changes the set of equilibria. Competition plays again a role and firms effectively compete on prices. Yet, trust must be sustained and the full efficiency of the perfect information case cannot be achieved.

Our work is related to different strands of literature. With respect to the industrial organization literature on experience goods, our work is closely related to Shapiro (1983). He considers a similar model of monopolistic competition in which consumers' expectations regarding quality follow an ad-hoc exogenous process. He does not study the trade-offs between competition and reputation. In contrast, we consider rational expectations about quality and, as we have said, our central theme is the study of these trade-offs.

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2 A model of monopolistic competition with experience goods

Our model is a version of the model of monopolistic competition of Dixit and Stiglitz (1977), with experience goods. Consider an economy with a large number of identical households that gain utility from services and leisure. The utility function of the representative household is

$$\sum_{t=0}^{\infty} \beta^t \left[U(y_t) - \alpha n_t \right], \tag{1}$$

[1] Cabral (2005) also calls it the 'bootstrapping mechanism.' He uses term *trust,* as distinct from *reputation*, to refer to the situation where "agents expect a particular agent to follow a particular course of action, even if she may have incentives to deviate."

where U is increasing and concave and, without loss of generality, $U(0) = 0$, α is a positive constant, n_t is work effort and y_t is an index of services

$$y_t = \left[\int_0^1 (y_{it} q_{it})^{1/\mu} \, di \right]^{\mu},$$

with $\mu \geq 1$. y_{it} is the consumption of good $i \in [0, 1]$. Each of the goods can be provided with variable quality, $q_{it} = 0$ or 1.

Time must be devoted to the production of services, according to the linear technology

$$y_{it} q_{it} = n_{it},$$

Total effort per capita is

$$n_t = \int_0^1 n_{it} di.$$

We assume that there is a single monopolist that produces each good.

Producers have, at any time, the option of producing 'fake' units of the consumption good that are costless to produce. A key assumption for the characterization of the equilibria is whether consumers can distinguish the quality of the goods before they buy them. We proceed to characterize the equilibrium when the services obtained with the consumption of the goods are observed before they are purchased.

2.1 Monopolistic competition with perfect observability

If the quality of the good is public information, there exists a unique equilibrium in this model economy with monopolistic competitive firms. Each firm sets the price equal to a constant mark up over the unitary marginal cost.

In each period t, the representative household chooses the number of units of each good i to purchase, y_{it}, as well as work effort, n_t, in order to maximize utility, (1), subject to

$$\sum_{t=0}^{\infty} Q_t \left[\int_0^1 (p_{it} y_{it} - \Pi_{it}) \, di - n_t \right] \leq 0,$$

where Π_{it} are the per-capita profits of firm i, p_{it} is the price of goods in units of labor time, and Q_t is the price of labor at time t, in units of labor at time zero. The demand functions for goods will be given by

$$U'(y_t) y_t^{\frac{\mu-1}{\mu}} (y_{it} q_{it})^{\frac{1-\mu}{\mu}} q_{it} = \alpha p_{it}, \tag{2}$$

for all i and t. In particular, when $q_{it} = 0$, then $y_{it} = 0$.

We can define the price of the composite good y_t as

$$p_t^q \equiv \left[\int_0^1 \left(\frac{p_{it}}{q_{it}} \right)^{1/1-\mu} di \right]^{1-\mu} = \frac{U'(y_t)}{\alpha}$$

In partiuclar, when for all i, $q_{it} = 1$, then $p_t^q = p_t = \left[\int_0^1 p_{it}^{1/1-\mu} di \right]^{1-\mu}$. The demand function for services of the good i of high quality, $q_{it} = 1$ (2), can be written as

$$y_{it} = y_t \left[\frac{p_{it}}{p_t^q} \right]^{\frac{\mu}{1-\mu}} \tag{3}$$

The monopolist of product i chooses the quality and the price to maximize profits

$$\sum_{t=0}^{\infty} \beta^t \left(p_{it} y_{it} - q_{it} y_{it} \right). \tag{4}$$

Since with $q_{it} = 0$, $y_{it} = 0$, and profits will be zero, then the firms will provide high quality goods, $q_{it} = 1$. They choose the prices to maximize profits (4) subject to the demand functions (3). This is a static problem. As the demand function has constant price elasticity, the optimal price per unit of service of each good will be

$$p_{it} = \mu. \tag{5}$$

The market clearing condition

$$\int_0^1 q_{it} y_{it} di = n_t$$

must hold in equilibrium. The unique equilibrium will be characterized by a price which will be constant over time and across goods

$$\overline{p} = \mu, \tag{6}$$

as equation (5) shows. Therefore, the quantity of services of the goods, $y_t = \overline{y}$, will be constant and will satisfy the following condition

$$U'(\overline{y}) = \alpha\mu \tag{7}$$

The value of the parameter μ determines the substitutability of the goods. The closer is μ to one, the higher is the degree of substitutability. Note that when μ is in fact one, the mark-up goes to zero and the equilibrium is a perfectly competitive one. On the other hand, as μ gets larger, so do the mark-ups. Note that we are not allowing for free entry, so profits will indeed be positive except in the limiting case in which $\mu = 1$.

Thus, there exists a unique equilibrium that is closer to the efficient outcome, the closer is the parameter μ to one. Indeed only when $\mu = 1$, the marginal rate of substitution equals the marginal rate of transformation. The increased substitutability between goods increases competition and increased competition implies an outcome closer to the efficient one. This models thus illustrates in a very clear way the nice properties of competition.[2]

2.2 Monopolistic competition with unobservable quality

We now assume that, as with many durable goods, consumers can observe the quality of the good -or service- only after purchasing it. This feature modifies the model above in very important ways. In particular, note that each firm now faces a "time inconsistency problem". As is clear from the expression for profits, (4) in each period t, once the consumers have paid the price of the good, p_{it}, under the expectation that the good is of high quality, $q_{it} = 1$, it is optimal to provide no services, $q_{it} = 0$, and save the costs of production, as long as this does not affect future expectations.[3] Of course, the firms may refrain from doing so, if this action can affect future demand, since after observing low quality the consumers might choose $y_{it+s} = 0$, $s \geq 1$. In this section, we develop a model of reputation to analyze this problem.

[2] An alternative way to model imperfect competition is to assume that goods are perfect substitutes but production requires fixed entry costs, as in Salop(1979) circular-city-model. The lower the fixed costs, the stronger is competition and the lower the equilibrium mark-ups. Thus, there is a clear connection between lower values of μ in Dixit-Stiglitz and lower fixed costs in Salop. In fact, the same results go through in both models.

[3] This feature has not been unnoticed in the Industrial Organization literature (see Shapiro, 1983).

Let $\lambda_{it}(p_{it}) = \Pr\{q_{it} = 1 \mid p_{it}\}$, i.e., the probability that firm produces good quality, given that the current price is p_{it}. Let h_t^i be the information available to firm i at the moment of making period t decisions. That is, $h_0^i = \{\emptyset\}$ and, for $t > 0$, $h_t^i = \left\{h_{t-1}^i, p_t^q, p_{it-1}, q_{it-1}\right\}$, where p_t^q denotes the price of the composite good in period t. A strategy for firm i, is a $\sigma_i^f = \left\{\sigma_{it}^f\right\}$, where, $\sigma_{it}^f(h_t^i) = (p_{it}, \lambda_{it}(p_{it}))$.

The representative household simply decides how much to work and to purchase of every service, i.e., $(n_t, y_{it}$,for all $i)$, given the available information, which includes the price and quality histories of all firms. Let $h_0 = \{\ p_{i0}$ all $i\}$ and, for $t > 0$, $h_t = \{h_{t-1},\ q_{it-1}, p_{it},$ all $i\}$. An allocation rule is a $\sigma = \{\sigma_t\}$, where, $\sigma_t(h_t) = (n_t, y_{it}$,all $i)$. Let $\upsilon_t^i(h_t)$ denote the belief that, given history h_t, the quality is high for firm i, i.e., $q_{it} = 1$ and let $\upsilon^i = \{\upsilon_t^i(h_t)\}$. Consumers' beliefs are *consistent* with firms' actions if for every (t, h_t^i, h_t), $\upsilon_t^i(h_t) = \lambda_{it}(p_{it})$.

A *Sequential Monopolistic Competitive Equilibrium* (SMCE) consists of $\left(\sigma, \upsilon^i, \sigma_i^f\right)$ such that, for every (t, h_t, h_t^i)

1. $\sigma_{it}^f(h_t^i)$ solves the problem of firm i, for all i
2. $\upsilon_t^i(h_t) = \lambda_{it}(p_{it})$, for all i and
3. $(n_t, y_{it}$, all $i) = \sigma_t(h_t)$ solves the problem of the household, given beliefs $\upsilon_t^i(h_t)$, all i, and satisfies the market clearing condition $\int_0^1 y_{it} q_{it} di = n_t$.

A *Sequential Monopolistic Competitive Equilibrium* (SMCE) provides a natural framework to study the interactions between competition and trust. On the one hand, as long as μ is strictly larger than one, the economy exhibits monopolistic power, and as μ gets close to one, the competition between firms is increased. On the other hand, in making quality decisions, firms care about their reputation since quality provision has strategic implications.

Notice that the (3) requirement is simply that consumers's allocations satisfy their demands. In particular, letting $\upsilon_t^i = \upsilon_t^i(h_t)$, consumers' demands are given by

$$y_{it} = y_t \left[\frac{U'(y_t)/\alpha}{p_{it}/\upsilon_t^i}\right]^{\frac{\mu}{\mu-1}}$$

In order to stress the pervasive effects of assuming that the quality is only observed after purchasing the good, let us consider an equilibrium where

strategies do not depend on histories. If current actions of the firms do not affect the consumers' expectations about future quality, then, no matter what the price is, it is a dominant strategy for the firms to choose to provide low quality, $q_{it} = 0$, to save on production costs, i.e., $\sigma^f_{it}(h^i_t) = (p_{it}, 0)$. If firm i produces low quality and $\upsilon^i_t(h_t) = 0$ for any h_t (including the price distribution $p(j)_t$), consumer's expectations are fulfilled. Given that all firms will behave in the same way, the corresponding allocation is: $(n_t, y_{it}) = (0, 0)$, for all i and (t, h_t), and the resulting payoffs are zero. Since firms can guarantee this payoff, independently of the beliefs, this is *the worst SMCE*. More formally,

Proposition 1 *There exist a* low quality SMCE *where all firms produce low quality. There is no SMCE with lower payoffs for the firms.*

As an adaptation of standard "folk theorems," we can show that the set of *SMCE* is fairly large. In particular, that a continuum of stationary prices with high quality can be *SMCE*, supported by *trigger strategies*. To see this, consider that agents beliefs' take the form:

$$\begin{aligned} \upsilon^i_0(h_0) &= 1 \text{ if } p_{i0} = \overline{p} \text{ and } \upsilon^i_0(h_0) = 0 \text{ if } p_{i0} \neq \overline{p} \\ \upsilon^i_t(h_t) &= 1, \text{ if } q_{is} = 1,\ p_{is} = \overline{p},\ 0 \leq s < t \text{ and } p_{it} = \overline{p} \\ \upsilon^i_t(h_t) &= 0 \text{ otherwise.} \end{aligned}$$

for an arbitrary $\overline{p}$. Let $y_{\overline{p}}$ be defined by $U'(y_{\overline{p}}) = \alpha\overline{p}$.

If the firm delivers the high quality good, then the profits, each period, will be given by $\Pi_i = (\overline{p} - 1)y_{\overline{p}}$ and, therefore, the present value of profits, after high quality is observed in all previous periods and the current price is $\overline{p}$, are given by $(\overline{p} - 1)y_{\overline{p}}/(1 - \beta)$. However, if the firm deviates -say, in period t- and delivers the low quality good, while setting the price $p_{it} = \overline{p}$, the current profits will be $\overline{p}y_{\overline{p}}$ and the present value of profits, after $q_{it} = 0$ is observed the last period (or any previous period), are zero. Thus, the firm chooses not to deviate and produce high quality if

$$(\overline{p} - 1)y_{\overline{p}} + \beta\frac{(\overline{p} - 1)y_{\overline{p}}}{1 - \beta} \geq \overline{p}y_{\overline{p}} \tag{8}$$

Let $\beta = 1/(1 + \rho)$, then the firm will choose not to deviate whenever

$$\overline{p} \geq 1 + \rho.$$

in other words, when *the mark up is at least* $\rho > 0$. More formally,

Proposition 2 *There exists a continuum of stationary SMCEs where the price is* $\overline{p}$ *and firms always produce high quality, provided* $\overline{p} \geq 1 + \rho$.

The intuition of the last proposition is clear. Given that the firm has the option of making a short run profit by selling low quality goods, the equilibrium mark-up must be high enough for the firm not to choose to do it. As the equilibrium profits are accrued over time, the discount rate -as an indicator of the observability lag- matters and, in fact, determines a lower bound for mark ups.

Notice that the degree of substitution among firms, μ, does not play any role in the characterization of the set of *SMCE*. Consumers in this economy are interested in units of quality. Firms would compete in prices per unit of quality if they were able to commit to high quality, in which case μ would be relevant as in the case with perfect observability. Without commitment firms can only compete on promises which must be consistent with agents' expectations. If agents have arbitrary beliefs on future actions, competition may play no role, as is the case here.

3 Regular beliefs

As we have just seen, in constructing the set of SMCE, consumers' beliefs restrict firms actions so that competition plays no role. In those equilibria, price changes will trigger a complete distrust, even though it may be in the firm's best interest to provide high quality, as long as consumers expect the firms to do so. It turns out that by imposing some minimal continuity and monotonicity properties (which, in addition, are consistent with any reasonable learning process), beliefs will not exhibit that property. And it is also the case that competition will play a crucial disciplining role. In what follows, we propose a refinement on the equilibrium definition and show uniqueness of the equilibrium when we only allow for strategies that are stationary on the price. Allowing for non-stationary strategies in the price does not affect the result but enormously complicates the analysis[4].

[4]For a complete analysis of the problem allowing for all possible strategies, see the working paper version Marimon, Nicolini and Teles (199X) which provides a (lenghty!) proof of uniqueness of RMCE in the Monopolistic Competition model.CHECK DATE AND REFERENCE

Some of the beliefs supporting the above set of SMCE are based on agents making *perverse inferences* after observing price changes. For example, in a stationary equilibrium path with price $\overline{p}$ if a firm were to deviate to a higher price $p_{it} = p' > \overline{p}$, this 'deviation' would be associated with the firm producing low quality. Yet, the one period gain from producing low quality rather than high quality is just the quantity demanded; i.e., $p'y' - (p'-1)y' = y'$. Since $y' < y_{\overline{p}}$ the gain is lower with p'. That is, the firm has a lower incentive to deviate when the price is high –since demand is lower– even when agents believe quality to be high. Similarly, in a stationary equilibiurm, agents give a higher probabity to low quality after having observed high quality, $q_{it} = 1$, and and announced price $p_{it+1} \geq p_{it}$, when neither the inference from the observed quality or the price should palusible be that it is less likely that quality will be high. *Plausible beliefs* should have the feature that if the gains from producing low quality are lower, then consumers should not attach a higher probability to that outcome. In the following definition we restrict beliefs along these lines[5].

Definition 3 *A consumer has* weakly monotone beliefs *if, for all* i, t, h_{t+1}, $\upsilon^i_{t+1}(h_{t+1}) \geq \upsilon^i_t(h_t)$, *whenever* $q_{it} = 1$, $p_{it+1} \geq p_{it}$ *and* $p_{-it+1} = p_{-it}$.

We also impose the following restriction (in the limit, as $\varepsilon \searrow 0$):

Definition 4 *A consumer has* $\varepsilon-$ positive beliefs *if there exists an* $\varepsilon > 0$ *such that, for all* i,

- i) $\upsilon^i_0(h_0) \geq \varepsilon$ *whenever* $p_{i0} \geq 1$, *and*
  ii) $\upsilon^i_t(h_t) \geq \varepsilon$ *whenever* $q_{is} = 1$ *for* $s < t$ *and* $p_{it} \geq 1$.

Notice that ε-*positive beliefs* incorporate elements of trust and induction. Consumers' beliefs must assign at least ε probability of delivering high quality, as long as firms have not delivered low quality in the past. Although we are not aware that such restriction on beliefs has previously been used, it can also be seen as containing two restrictions that have been used elsewhere. The first is a non-degeneracy condition on initial beliefs. The second

[5] Analyzing reputation games, Kreps and Wilson (1982) considered a similar restriction on beliefs.

is a very weak form of the *induction hypothesis*[6] requiring that $\upsilon_t^i(h_t) \geq \varepsilon$ as long as in all previous periods high quality has been produced.

If equilibrium beliefs in a SMCE satisfy these requirements, we call that SMCE an $\varepsilon-$ *Regular SMCE,* which are formally defined as follows

Definition 5 *An* $\varepsilon-$ Regular SMCE *is a SMCE where agents' beliefs are* ε*-positive and weakly monotone.*

We will only look at the set of equilibria that can be obtaine as the limit of a sequence of $\varepsilon-$ *Regular SMCE.* We now provide a definition of those equilibria.

Definition 6 *A* Regular Monopolistic Competition Equilibrium *(RMCE) is a SMCE with beliefs* $\{\upsilon_t^i\}$*, such that there is a sequence of* ε_n*-Regular SMCE, with beliefs* $\{\upsilon_t^i\}_n$ *satisfying* $\{\upsilon_t^i\}_n \to \{\upsilon_t^i\}$ *as* $\varepsilon_n \searrow 0$.

The main result of this section is that there is a unique stationary RMCE and it is characterized by a price equal to the $\max\{\mu, 1+\rho\}$. To see how our regularity conditions so drastically change the set of stationary SMCE,consider a stationary SMCE with price $\overline{p} > 1+\rho$, $\overline{p} \neq \mu$, and $\upsilon_t^i(h_t) = \lambda_{it}(\overline{p}) = 1$, $\overline{p} = U'(y_{\overline{p}})/\alpha$. Assume now that, in period t, firm i deviates to a strategy with high quality $q_{is} = 1$ and prices $p_{is} = p_i$, for all $s \geq t$, for some $p_i \neq \overline{p}$, and $p_i \geq 1$.

The firm i will deliver high quality in period t if the following incentive condition, equivalent to (8) is satisfied

$$\begin{aligned} & \sum_{s=0}^{\infty} \beta^s (p_i - 1) y_{\overline{p}} \left(\frac{\overline{p}}{p_i}\right)^{\frac{\mu}{\mu-1}} \left(\upsilon_{t+s}^i\left(h_{t+s}\right)\right)^{\frac{\mu}{\mu-1}} \\ \geq \quad & p_i y_{\overline{p}} \left(\frac{\overline{p}}{p_i}\right)^{\frac{\mu}{\mu-1}} \left(\upsilon_t^i(h_t)\right)^{\frac{\mu}{\mu-1}} \end{aligned}$$

where h_{t+s} is the history up to period $t+s$ corresponding to this deviation by firm i, when all the other firms maintain their prices at $\overline{p}$ and produce good quality . Note that after producing low quality once, the firm will produce

[6] A learning, or forecasting, rule satisfies *the induction hypothesis* if after always observing a variable to be a constant it predicts such a constant; which is a feature of any reasonable learning rule. Forms of the induction hypothesis have been used, for example, by Cho and Matsui (1995) and Sargent (1999).

low quality for ever, so future profits after that node are zero. The expression can be simplified to

$$\beta(p_i - 1)\sum_{s=0}^{\infty}\beta^s\left(\upsilon_{t+s}^i\left(h_{t+s}\right)\right)^{\frac{\mu}{\mu-1}} \geq \left(\upsilon_t^i(h_t)\right)^{\frac{\mu}{\mu-1}} \tag{9}$$

With ε_n- *positive beliefs* $\upsilon_t^i(h_t) \geq \varepsilon_n$, and by *weak monotonicity,* since prices of firm i, and all other firms, are constant: $\upsilon_{t+s}^i\left(h_{t+s}\right)/\upsilon_t^i(h_t) \geq 1$. Therefore, if

$$\frac{\beta}{1-\beta}(p_i - 1) \geq 1,$$

or, equivalently,

$$p_i \geq 1 + \rho, \tag{10}$$

condition (9) is satisfied.

If $p_i > 1 + \rho$, the condition is satisfied with strict inequality. If $p_i = 1 + \rho$, then the firm can be indifferent between supplying high or low quality. However bad quality would not be an equilibrium outcome, because the firms would deviate to a slightly higher price. In other words, firm i will maintain high quality as long as the price satisfies the mark up condition (10). Then, consistency of beliefs requires: $\upsilon_t^i(h_t) = 1$, for all t.

Since all firms behave the same way, if $\mu \geq 1 + \rho$, then the equilibrium price will be μ, the *monopolistic competition* price with perfect observability. If $\mu < 1 + \rho$ the equilibrium price will be $1 + \rho$, which is the lower bound resulting from the *trust mechanism.* Hence

$$p_i = \max\{\mu, 1 + \rho\} \tag{11}$$

Therefore, since for any ε_n-Regular SMCE (11) is satisfied, it must also be satisfied in a RMCE. Furthermore, the previous argument also shows that the worst SMCE is not a RMCE since, given that beliefs are not degenerate in period zero, firms always prefer to start offering high quality. Nevertheless, in the zero probability event that low quality is observed, the worst SMCE path is part of the RMCE since after low quality has been observed our regularity conditions do not place any restriction on beliefs. We can now state the main proposition that relates competition and reputation.

Proposition 7 *There is a unique stationary* Regular Monopolistic Competition Equilibrium *(RMCE) outcome, which is characterized by the production of high quality services being sold at a per unit price of* $p = \max\{\mu, 1 + \rho\}$.

Notice that, by making very weak assumptions on beliefs, we have obtained very strong results. Competition does play a role allowing to select in the set of sustainable stationary equilibria with good quality the one that is the most efficient. Precisily because that equilibrium must still be a sustainable equilibrium there is still a loss in efficiency.

As the degree of substitutability is increased and $\mu \searrow 1$, the price will be bounded below by the rate of time preference, $\rho > 0$, which is the remaining restriction on efficiency.

4 Conclusions

In this paper we analyze how competition affects equilibrium outcomes when firms compete in the supply of experience goods, i.e. goods of varying quality that can only be observed after the good is purchased.

There is an aspect of trust in this competition in promises, since in order for consumers to demand a positive quantity of the good they have to trust it to be of high quality. Without repeated interaction this is not reasonable since it is always in the interest of the seller to provide low quality. Instead, if interaction is repeated, and future profits are high, the firm may still be interested in supplying good quality, inducing the consumers to trust the quality of the good it provides.

The need for positive profits in any equilibrium with high quality means that equilibria will not be efficient. In particular, as we show, prices will be marked up, and the minimum mark up will be the rate of time preference, which is a function of sampling frequency.

The degree of substitutability that would determine the mark up in the monopolistic competitive equilibrium with perfect observability plays no role in affecting the set of stationary equilibria. Beliefs are arbitrary and that prevents competition from playing any role when competition is in promises.

We impose minimal plausibility restrictions on beliefs to show that we can recover, to some extent, the efficiency enhancing role of competition. We impose a non-degeneracy restriction, that if quality has always been high the probability of high quality should be $\varepsilon -$ positive, as well as the restriction that consumers should not attribute a higher probability of the good being of low quality if the incentives for the firms to do so are not higher. These plausibility restrictions are all that is needed for the large set of inefficient

stationary equilibria with high quality, to colapse to a single equilibrium, the most efficient in that set.

With plausible beliefs, competition plays again a crucial role in enhancing efficiency. Nevertheless, it is within the nature of the reputational mechanism that competitive pressures cannot achieve full efficiency.

We have analyzed a model with experience goods. However our results apply to other structures, of economic or social and political interaction, where competition is in promises. In a related paper we analyze an application to competition of privately supplied monies, which is competition in promises of a high intertemporal return to money. We show that Hayek's conjecture, that efficient monetary equilibria can be achieved through currency competition, is not verified if currency suppliers make sequential decisions. This, even if competition still enhances efficiency, as it does in the model in this paper when beliefs are plausible.

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