Competition and Trust*

Ramon Marimon
Universitat Pompeu Fabra, CREI, CREA, NBER and CEPR

Juan Pablo Nicolini
Universidad Di Tella

Pedro Teles
Banco de Portugal, Universidade Catolica Portuguesa and CEPR

*We want to thank Robert Lucas and Massimo Motta for their comments as well as participants in seminars and conferences where previous versions of this work were presented, under the title "Competition and Reputation."

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Revision: April, 2006

Ramon Marimon, Universitat Pompeu Fabra, Ramon Trias Fargas 25-27, Barcelona, Spain; email: ramon.marimon@upf.edu

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.

JEL classification: D41; D43; D82; D84; E31; E42

Key words: Experience goods; Competition; Reputation; Equilibrium beliefs

1. Introduction

Under standard assumptions, Bertrand competition among firms producing an homogeneous product results in an efficient equilibrium. One of these 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. Experience 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 requires a 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 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: e-commerce promises to deliver goods; assets, 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 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 beliefs sustaining high price equilibria are not only arbitrary, but implausible. In particular, one would expect that agents' beliefs are based on proper inferences; that beliefs about quality should be consistent with firms' incentives to deliver it. For instance, a price movement, resulting on a lower incentive to deviate to low quality, should not weaken consumers' trust. We show that imposing minimal regularity 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 the industrial organization literature on experience goods, as in Shapiro (1983). Shapiro 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. Our regularity restrictions on beliefs are similar to the plausibility restrictions introduced by Kreps and Wilson (1982) in the context of signaling games and, therefore, our work also relates to the extended literature that has followed that seminal work.

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

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

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.

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 provides high quality and 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

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

where Π_{it} are the per-capita profits of firm i, p_{it} is the price of each good i 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 particular, 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, (2), for services of the good i of high quality, $q_{it} = 1$, 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 unique equilibrium will be characterized by a price which will be constant over time and across goods

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

The quantity of services of the goods, $y_t = \overline{y}$, will also be constant and will satisfy

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

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. In the limit, as μ approaches 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 $\mu = 1$.

As is well known, in this economy, 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 price is equal to marginal cost. 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.

Monopolistic competition with unobservable quality

We now assume that 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.[2] 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.

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 $t > 0$, $h_t^i = \{h_{t-1}^i, p_t^q,\ p_{it-1}, q_{it-1}\}$, where p_t^q denotes the price of the composite good in period t. A strategy for firm i is $\sigma_i^f = \left\{\sigma_{it}^f\right\}$, where $\sigma_{it}^f(h_t^i) = (p_{it}, \lambda_{it}(p_{it}))$.

The representative household behaves competitively, simply deciding 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. $(n_t, y_{it}, \text{ all } i) = \sigma_t(h_t)$ 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., $\sigma_{it}^f(h_t^i) = (p_{it}, 0)$. If firm i produces low quality and $\upsilon_t^i(h_t) = 0$ 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:

$$\begin{aligned} \upsilon_0^i(h_0) &= 1 \text{ if } p_{i0} = \overline{p} \text{ and } \upsilon_0^i(h_0) = 0 \text{ if } p_{i0} \neq \overline{p} \\ \upsilon_t^i(h_t) &= 1, \text{ if } q_{is} = 1, \ p_{is} = \overline{p}, \ 0 \leq s < t \text{ and } p_{it} = \overline{p} \\ \upsilon_t^i(h_t) &= 0 \text{ otherwise.} \end{aligned}$$

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 in ways that prevent competition from playing any role. In those equilibria, price changes may 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 regularity restrictions, beliefs will not exhibit such implausible property. Furthermore, competition will play a crucial disciplining role. In what follows, we propose an equilibrium refinement which results in a unique stationary equilibrium[3].

To see that some of the beliefs supporting the above set of SMCE are based on agents making *perverse inferences* , consider 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 less incentive to deviate when the price is higher; since demand is lower, even when agents believe quality to be high. Similarly, in the above class of stationary equilibria, agents give a higher probability to low quality after having observed high quality, $q_{it} = 1$, and an announced price $p_{it+1} \geq p_{it}$. However, taking the prices of other firms to be constant, neither the inference from the observed quality or the price should plausibly be that it is more likely that quality will be low. *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 low quality. In the following definition we restrict beliefs along these lines[4].

DEFINITION 1: *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 2: *A consumer has* $\varepsilon-$ positive beliefs *if there exists an* $\varepsilon > 0$ *such that, for all* i,

i) $v_0^i(h_0) \geq \varepsilon$ *whenever* $p_{i0} \geq 1$, *and*

ii) $v_t^i(h_t) \geq \varepsilon$ *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 is a very weak form of the *induction hypothesis*[5] requiring that $v_t^i(h_t) \geq \varepsilon$ 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 3: *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 obtained as the limit of a sequence of $\varepsilon-$ *Regular SMCE.* We now provide a definition of those equilibria.

DEFINITION 4: *A* Regular Monopolistic Competition Equilibrium *(RMCE) is a SMCE with beliefs* $\{v_t^i\}$, *such that there is a sequence of* ε_n-*Regular SMCE, with beliefs* $\{v_t^i\}_n$ *satisfying* $\{v_t^i\}_n \to \{v_t^i\}$ *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 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 3: *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 sequential stationary equilibria with high quality, the one that is the most efficient. Since trust must be sustained in equilibrium, there is still a loss in efficiency. More precisely, 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 study the interaction of competition and trust in an environment where firms compete on promised prices per unit of unobservable quality. We show how arbitrary beliefs, while building trust, may shield firms from the effects of competition. More importantly, we show that this is only the case if beliefs are not plausible. By placing minimal regularity restrictions on beliefs, competition recovers its disciplinary force, without destroying the mechanism of trust, which requires a minimum degree of inefficiency.

These results do not rely on the specific features of the dynamic monopolistic competition model analyzed here. The general and relevant features driving our results are the following: *i)* firms compete on promises, non-fully observable or uncommitted actions; *ii)* firms are atomistic, i.e., do not compete strategically among themselves and treat aggregate outcomes as given; *iii)* consumers have beliefs on firms' unobservable actions, while observing a non fully revealing signal, which in our set up is the price. Under these conditions, our *regular beliefs* restrictions are very weak and general. They require, first, that consumers can make *plausible inferences* on how the observed signal (price) and the unobserved action (quality) interact, i.e., they understand the basic incentive problems that firms face. Second, that regular beliefs are limiting beliefs from nondegenerate

distributions, i.e, from beliefs with a minimum of trust.

It follows that the results presented here apply to many socioeconomic environments that share these general features. For example, in a companion paper we analyze an application to competition of privately supplied monies, which is competition in promises on the intertemporal returns of different monies. We show that Hayek's conjecture, that efficient monetary equilibria can be achieved through currency competition, is not verified. This is the case, even if competition still enhances efficiency, as it does in the model presented in this paper, when *regular beliefs* restrictions are introduced.

The analysis in this paper can also be extended to models with 'hidden' types. For example, it is not too difficult to see that our results on the ineffectiveness of competition with arbitrary beliefs could also be extended to environments with firms that have different, and unobservable, cost structures. Non plausible inferences about prices may preclude consumers from properly discriminating across firms, while such proper discrimination takes place with *regular beliefs*. In this context competition also plays a disciplinary role when there is trust and reputation.

It should not escape the reader the empirical applications of the theory presented here. From the experimental testing of the beliefs restrictions, to the corresponding empirical study of trust and reputation in different competitive socioeconomic environments.

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