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Modeling innovation and regulation thanks to game theory: Bertrand competition

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Abstract

One uses the model which has been already presented in articles by the author: competition through prices (Bertrand competition), the demands being deduced from the consumers ‘utilities. One can highlight three phenomena: *“Monopolistic competition”*: The products sold are enough differentiated, each firm having its “garden”, its customers it keeps provided its price is not higher than the others’ prices. *The criterium “buy and close down” profitable*: when to buy and close down is profitable, the incentive to merge is stronger. It is a sign of saturated market. *The “non-differentiating innovation”*: One can model it. Each utility (u_1, u_2, u_3) becomes ($u_1 + K$, $u_2 + K$, $u_3 + K$), $K > 0$. One demonstrates, thanks to tractable examples, that non-differentiating innovation can trigger the criterium “buy and close down profitable”. The products are less differentiated than at the start (“monopolistic competition” the “buy and close down” being not profitable). It incites firms to choose disruption.

Keywords: Innovation, Regulation, Game theory

1. Introduction

Innovation has been often modeled by economists using game theory. Names are, for instance, Chamberlain, Hoteling and Salop [1]. In general, the question dealt with is: are there enough products on the market? Or: are there too many products? Or: is there room for more products? Of course, more products are good for the consumers. But when there are too many products (the market is saturated), the firms ‘profits decrease very much. In this article we deal with this topic, using the model already presented in articles by the author: it is Bertrand competition (competition through prices), the demands being deduced from the consumers ‘utilities [2]. This model allows describing three phenomena, “monopolistic competition”, the criterium of “buy and close down” profitable and non-differentiating innovation:

“Monopolistic competition”.

It is competition between firms having “captive customers” or a “garden”. It means that if the price chosen by a firm is low enough, it is sure to attract all the consumers in its garden. At the equilibrium, each firm attracts the consumers in its garden, and only them. If it decreases its prices, it invades the gardens of the two other firms[1]. If it increases its price, its garden is invaded by the two others. In other words: the products which are sold by the firms are well differentiated, but it is not the perfect product differentiation (when each firm is a

[1] To simplify one supposes three firms and symmetry.

monopoly on the particular market of the product it sells). In the model that we use, the consumers ‘utilities are represented in axes O u_1 u_2 u_3, and the possible prices are in the cube $0 \leq p_i \leq 1$, since we suppose a maximal price 1. The “monopolistic competition” corresponds to density of utility in the faces of the cube $p_i = 1$: the garden of the firm E_i is the consumers in the face of the cube $p_i = 1$. Several tractable examples will be given in the paper. This definition of innovation corresponds to the criteria set out by Christensen [3]. For Christensen, there is innovation in a sector when the new products are so attractive to the consumers that all buy (that is to say: any consumer buys a product, choosing one brand of another). In case of “monopolistic competition” defined as in the paper, all the consumers buy. There is a mathematical property: considering Bertrand competition, a sufficient condition for all the consumers buying is that the density of utility is in the faces $p_i = 1$.

A criterium for saturated markets, the “buy and close down” profitable.

In Bertrand competition, all the mergers are profitable. So, the criterium for saturated market cannot be the profitability of a merger. Also, all the firms make a profit. The criterium cannot be loss. We propose this criterium: the “buy and close down” is profitable. If E_i buys E_j and closes it down, the operation is profitable for E_i. The justification is this: when the asset is bought and closed, the direct effect is negative (the loss is the price paid for to buy the asset). Then the strategic effect is strong, since it compensates the loss and besides (when the two effects are taken into account the operation is profitable). In other words: when the number of firms on the market is no more three but two, there is less competition and the profits are higher.

This suggests that with three firms, the profits were low because there were too many different products sold. At the opposite, in case of merger, the direct effect is zero. After, the strategic effect is positive (since the merger is profitable), but it proves nothing. In practice, if the “buy and close down” is profitable, this incites more to merge. Suppose E_i buys E_j, the “buy and close down” being profitable. In case of a quarrel between the managers of E_i and E_j (it is possible, since the two teams manage products which are in competition), E_i can close the bought asset (or underinvest in it during some time) and make a profit. It is a kind of insurance against the risk of failure of the merger. On the other side, the managers of E_j could fear the consequences of the merger, and oppose it. The mergers become more conflictual. In case the asset is already owned it should be closed since it is profitable. That is to say: there are two competitors E_1 and E_2 which are managed by the same owner, and E_3. If to close E_2 is profitable, the owner of E_1 and E_2 should choose it. To close it is easier than to “buy and close down” since there is no negotiation, it is only a decision inside the owner (there is more power on the managers of E_2 than on the managers of a firm one has to buy). Concerning the regulator, he does not like “buy and close down”, which is detrimental to consumers, but he cannot oppose it: the buyer can wait, underinvesting in the bought firm, and close it after some time.

The criterium of “buy and close down” profitable is a rough one, since it is qualitative (there are two answers, yes or no), but it indicates that the products are more differentiated if there are two products sold than if there are three. In particular, if the Bertrand paradox[2] applies to E_1 and E_2, if E_3 buys E_2 and closes it, the “buy and close down” is profitable. The products are differentiated in a better way after the “buy and close down” [2]. A tractable example is presented in the quoted article [2].

Non-differentiating innovation.

Such an innovation can be defined by a homogeneous increase of all the utilities of the consumers: each (u_1, u_2, u_3) becomes ($u_1 + K$, $u_2 + K$, $u_3 + K$), $K > 0$. These innovations are of three kinds:

- The providers have innovated. All the firms benefit from the innovation carried out by the providers. For instance, in the telecommunications sector, there is an upgrade of the terminals (phones, tablets …). All the operators benefit from it.

[2] The Bertrand paradox is when two products are not differentiated. The utilities are on the bisector. The Nash equilibrium corresponds to prices equal to zero and profits equal to zero.

- The "spillovers". One firms in the sector innovates, and it stimulates innovation carried out by the other competitors. In other words, the competitors quickly imitate the innovation which has concerned, first, the product of some firm in the sector. Notice that we speak of innovation concerning the product or the quality of service, only.
- Regulation. Measures decided by the regulator can trigger a non-differentiating innovation. All the firms of a sector take the same decisions because of the pressure from the regulator, and the utilities of the consumers increase. Examples are (1) creation of a databank on the stolen phones allowing to lock them immediately to prevent the use (2) improvement of the networks (3) to make easier and faster the customer passing from an operator to another one (4) etc.

In this article we state that the non-differentiating innovation can be disadvantageous (for the firms). In some cases, the non-differentiating innovation make the "buy and close down", which was not profitable at the start, profitable. In other words, the non-differentiating innovation makes the products less differentiated. The incentive to merge is stronger. The products are differentiated in a better way, if they are two, than if they are three. Thus, one explains that in some industries (the semiconductors are an example) where there is permanent innovation, there are cyclical states of prosperity and crises. If there are often non-differentiating innovations, it could be one of the causes of the crises. One explains also the obsession of some managers. At the start, they do not search for profit, but only want to accumulate specific experience, get reputation, be part of networks allowing competency and find support and of course financial resources etc. The priority is differentiating innovation. To make profit and remunerate the shareholders come later. Examples are Amazon, Uber and Tesla.

Now we can present the plan of the paper:

- In the chapter "Methods" we describe the model used more accurately and give several tractable examples.
- In the chapter "Results and discussion" we state that the non-differentiating innovation can make the "buy and close down", which was not profitable at the start, when there was monopolistic competition, profitable.
- In the Conclusion, we discuss the consequences of the main idea set out in the paper. It concerns innovation and regulation.

2. Methodology

The Bertrand competition is a competition through prices. Each demand D_i depends on the prices, D_i (p_1, p_2, p_3). To deduce the demands from the utilities of the consumers one considers density of utility in the cube $0 \leq u_i \leq 1$, backed to the axes (O u_1, u_2, u_3). The demand D_i is obtained by integrating the density in the volume V_i: $u_i - p_i \geq 0$, $u_i - p_i \geq u_j - p_j$, (j different from i). The density of utilities can have any form and one can suppose any analytical form. There are interesting mathematical conditions [4]. In particular, $\partial D_i / \partial p_j - \partial D_j / \partial p_i = 0$ because the vector (- D_1, - D_2, - D_3) derives from a potential, S (p_1, p_2, p_3) which is the consumers 'surplus. It is the sum $\sum_i S_i$ where S_i is the surplus of the consumers choosing E_i: the integral on V_i of (u_i - p_i) d (u_1, u_2, u_3) d u_1 d u_2 d u_3. Another interesting condition is: $\partial D_i / \partial p_1 + \partial D_i / \partial p_2 + \partial D_i / \partial p_3 \leq 0$. It is obvious that $\partial D_i / \partial p_i \leq 0$ and $\partial D_I / \partial p_j \geq 0$. One can suppose $\partial^2 D_i / \partial p_i^2 \leq 0$, a sufficient condition to have a unique Nash equilibrium when the p_j (j different from i) are fixed. Also, one can suppose $\partial^2 D_i / \partial pi \, \partial p_j \leq 0$ to have a single stable equilibrium when p_k is fixed, p_i and p_j varying [2].

Now, to represent "monopolistic competition" one can have density of utility in the faces $p_i = 1$. We shall give some tractable examples. First, we name the summits of the cube, as in the figure 1. In these examples the "buy and close down" is unprofitable (examples 1 and 2 are exceptions). The products are well differentiated (with three products sold).

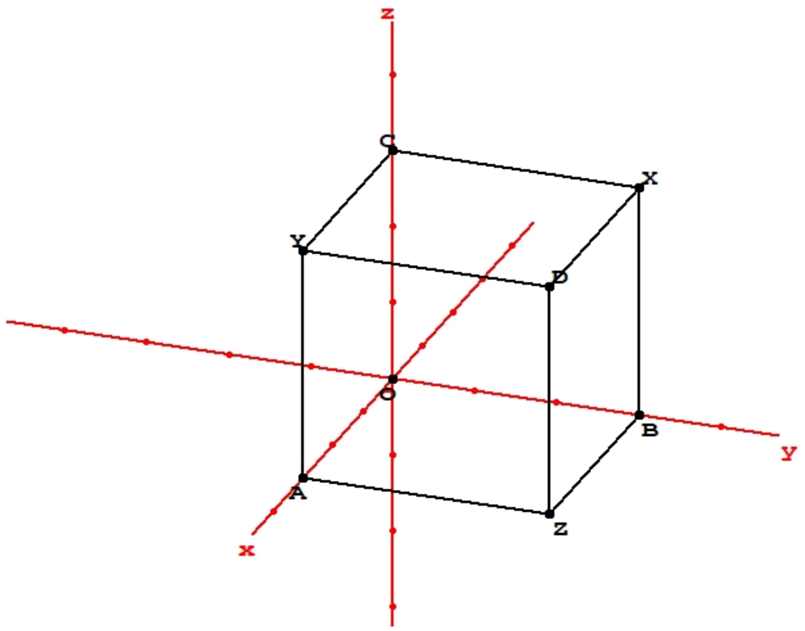

Figure 1. The summits of the cube are named to allow describing the density of utility in the tractable examples

Example 1: The homogeneous density (1 / 3) is on the edges touching D (XD, YD, ZD). The reader can check that the Nash equilibrium is for $p_i = 0$, $P_i = 0$. It is the Bertand paradox for three produts. For two products it is also the Bertrand paradox: $p_1 = p_2 = 0$, $P_1 = P_2 = 0$. The products are not differentiated. The density is on the locus $u_i = u_j = 1$.

Example 2: The density is on the bissectors in the faces of the cube $p_i = 1$ (AD, BD, CD). This example is not interesting for us. For two products there is no Nash equilibrium. The products are not enough differentiated. The density is on the locus: $u_i = u_j$, $u_k = 1$.

Example 3: the homogeneous density ($1 / 3\sqrt{2}$) is on the second bissector in each face (XY, XZ, YZ). The demands are:

$$D_1 = 1 / 3\,[1 - 2\,p_1 + p_2 + p_3]$$
$$D_2 = 1 / 3\,[1 + p_1 - 2\,p_2 + p_3] \qquad (1)$$
$$D_3 = 1 / 3\,[1 = p_1 + p_2 - 2\,p_3]$$

The Nash equilibrium corresponds to $p_0 = 1 / 2$, $P_0 = 1 / 6$. If there are only two products, $p_3 = 1$ and one considers D_1 (p_1, p_2, 1) and D_2 (p_1, p_2, 1), checking that D_3 (p_1, p_2, 1) > 0 (to be "inside the formulas"). The equilibrium price p'_0 is 2 / 3, the profit P'_0 is 8 / 27and the "buy and close down is not profitable": 8 / 27 < 1 / 6 + 1 / 6 = 1 / 3 (the profit after the "buy and close down" is less than the profit before, plus the minimal price paid to buy the asset). Notice that (1) the price p'_0 is always higher than p_0 because prices are strategic complements and (2) one has to check that (p'_0, p'_0) is a Nash equilibrium, because when one considers D_1 (p_1, p'_0, 1) for any p_1, possibly one is "outside the formulas".

Example 4: The homogeneous density (1 / 6) is on the edges which touch neither O, neither D (AY, AZ, BX, BZ, CX, CY).

The demands are:

$$D_1 = 1 / 3\,[1 - p_1 + p_2 / 2 + p_3 / 2]$$
$$D_2 = 1 / 3\,[1 + p_1 / 2 - p_2 + p_3 / 2] \qquad (2)$$
$$D_3 = 1 / 3\,[1 + p_1 / 2 + p_2 / 2 - p_3]$$

Nash equilibrium is for $p_0 = 1$ and $P_0 = 1 / 3$. The "buy and close down" is not profitable. The price does not change: $p'_0 = 1$ and $P'_0 = 1 / 3$, and $1/ 3 < 1 / 3 + 1 / 3 = 2 /3$.

Example 5: It is obvious that if the homogeneous density is on segments (in the faces of the cube $p_i = 1$) the demands are linear. They have this form:

$$D_1 = 1 / 3 - 2 a p_1 + a p_2 + a p_3 \quad (3)$$

$$D_2 = 1 / 3 + a p_1 - 2 a p_2 + a p_3$$

$$D_3 = 1 / 3 + a p_1 + a p_2 - 2 a p_3$$

The demands are characterized by the value of a. In the example 3, $a = 1 / 3$. In the example 4, $a = 1 / 6$.

In this example, the density is aereal, homogeneous (1 / 3) and is disseminated on all the faces of the cube $p_i = 1$. If the density is homogeneous, aereal and limited by segments the demands should be polynoms of the second degree.

Indeed, if $p_3 \geq p_1 \geq p_2$:

$$D_1 = 1 / 3 [1 + p_1^2 / 2 - p_3^2 / 2 - p_1 p_2 + p_2 p_3 - 2 p_1 + p_2 + p_3]$$

$$D_2 = 1 / 3 [1 - p_1^2 / 2 - p_3^2 / 2 + p_1 p_3 + p_1 - 2 p_2 + p_3] \quad (4)$$

$$D_3 = 1 / 3 [1 + p_3^2 + p_1 p_2 - p_1 p_3 - p_2 p_3 + p_1 + p_2 - 2 p_3]$$

The Nash equilibrium corresponds to $p_0 = 1 / 2$ and $P_0 = 1 / 6$. For two firms one can make $p_3 = 1$ and use $D_1 (p_1, p_2, 1)$ and $D_2 (p_1, p_2, 1)$. One finds $p'_0 = \sqrt{7} - 1 \sim 0, 65$, $P'_0 \sim 0, 28$. One checks that one is inside the formulas, since $D_3 (0, 65, 0, 65, 1) > 0$. The "buy and close down" is not profitable: $0, 28 < 1 / 6 + 1 / 6 = 0, 33$.

3. Results and discussion

Now we use the model which has been presented to study the consequences of a non-differentiating innovation. We shall set out the demonstratioon only in case of linear demands because it is exactly the same in the general case. Resuming the equations (1) one sees that the equilibrium price is $p_0 = 1 / 6 a$, the profit being $P_0 = 1 / 18 a$. Then one considers the equilibrium beween E_1 and E_2, after the "buy and close down", making $p_3 = 1$:

$$D_1 = 1 / 3 + a - 2 a p_1 + a p_2$$

$$D_2 = 1 / 3 + a + a p_1 - 2 a p_2$$

The equilibrium price is $p'_0 = 1 / 3 + 1 / 9a$ and the profit $P'_0 = 2 a (1 / 9a + 1 / 3)^2$. Writing $P'_0 < 2 P_0$, one has the condition for the "buy and close down" not profitable: $a < 13 / 36$.

But one is inside the formulas if $D_3 (p'_0, p'_0, 1) > 0$. Therefore: $a < 5 / 12$.

To sum up:

If $1 / 6 < a < 13 / 36$ one is inside the formulas and the "buy and close down" is not profitable.

If $13 / 36 < a < 5 / 12$, one is inside the formulas and the "buy and close down" is profitable.

If $a < 5 / 12$, one is outside the formulas. One demonstrates that the "buy and close down" is profitable.

In the garden of E_3, the maximal price π such as there is no density in the sqare $0 \leq u_i < \pi$ is: $1 - 1 / 6a$. When a increases, $\pi \rightarrow 1$. When a increases the products of $E_1$and E2 are differentiated in a better way, in the garden of E3. Therefore the profits of E_1 and E_2 should increase.The "buy and close down" is profitable if a has a high value. Notice that the examples 3 and 4 correspond to $a = 1 / 6$ and $a = 1 / 3$. The “buy and close down” is not profitable ($1 / 6 \leq a \leq 13 / 36$).

In case of non-differentiating innovation, the demand D_i (p_1, p_2, p_3) becomes D'_i ($p_1 – K$, $p_2 – K$, $p_3 – K$). The equilibrium with three firms is not changed. Therefore, the firms have made an expense S, and their profits remain the same. But the consumers ‘surplus increases (of K).

Now we suppose that at the start one is inside the formulas ($a < 5 / 12$) and the “buy and close down” is not profitable for $K = 0$:

$$D'_1 = 1 / 3 + a (1+K) – 2 a p_1 + a p_2$$

$$D'_2 = 1 / 3 + a (1+K) + a p_1 – 2 a p_2$$

$$p'_0 = 1 / 9a + 1+K / 3.$$

Where, the price p'_0 increases when K increases. The profit $P'_0 = 2 a [1 / 9a + 1+K / 3]^2$ increases when K increases.

And $p''_0 = p'_0 – K$ decreases. That is to say, in the square of length of side 1 which slides along the bisector, the equilibrium point tends toward (0, 0). At some point, one is outside the formulas (when $p'_0 – K = \pi$). At this point, the profit is $1 / 4a$ and the profit is $1 / 8a$. The “buy and close down” is profitable: $1 / 8a > 1 / 18a + 1 / 18a = 1 / 9a$. For some value of K ($K = 5 / 12a – 1$) the “buy and close down” which was not profitable at the start ($K = 0$) becomes profitable. That is to say: one has demonstrated that in some cases ($1 / 6 < a < 13 / 36$) the non-differentiating innovation triggers the “buy and close down” profitable (if the value of K is high enough, the innovation makes the utilities of the consumers increase of a sufficient amount). The products are differentiated in a better way if they are two. There is a stronger incentive to merge.

In the general case (when the density in the faces p_i is of any form) the demonstration is the same. One considers the sign of the marginal revenue $[p'_0\, \partial D_1 / \partial p_1 (p''_0, p''_0, 1) + D_1 (p''_0, p''_0, 1)]\, d p$, with $d p > 0$. When K increases, p'_0 increases and p''_0 decreases and at some point, one is outside the formulas (we suppose that at the start, when $K = 0$, the “buy and close down” is not profitable and one is inside the formulas).

If we define:

$$k = - \partial D_1 / \partial p_1 (p_0, p_0, p_0)$$

$$k' = - \partial D_1 / \partial p_1 (\pi, \pi, 1) \text{ with } D_3 (\pi, \pi, 1) = 0,$$

The equilibrium price with three firms is $p_0 = 1 / 3k$, and the profit is $1 / 9k$. The equilibrium remains the same when K increases. The equilibrium price with two firms when one is outside the formulas is $p'_0 = 1 / 2k'$ and the profit is $1 / 4k'$. The profit increases when K increases, then when one is outside the formulas, remains constant. The non-differentiating innovation triggers the “buy and close down” profitable (if the increase of the consumers ‘utilities K is sufficient) if: $1 / 4k' > 2 / 9k$, or: $k' < 9 / 8\, k$. One demonstrates $k' \geq k$. The examples 3 and 4 correspond to $k = k'$ because the demands are linear. Thus, it is confirmed that the “buy and close down” becomes profitable (when K increases). In the example 5, also, $k = k'$, therefore it is confirmed that the “buy and close down” becomes profitable. One can calculate a majorant for P'_0 / P_0 and obtain a sufficient condition for the “buy and close down” not profitable ($P'_0 / P_0 < 2$):

$(1 + 3k /2) (1/ 2 + 3k / 2) < 3$. So, for $1 / 3 < k <2 / 3$, the “buy and close down” is not profitable.

As $k = 2a$ in case of linear demands, one obtains that if $1 / 6 \leq a \leq 1 / 3$ the “buy and close down” is not profitable. The examples 3 and 4 correspond to $a = 1 / 3$ and $a = 1 / 6$. If $1 / 3 \leq k \leq 2 / 3$, in the general case, the “buy and close down”, at the start, is not profitable. And it becomes profitable (when K increases) if $k' < 9 / 8\, k$. In the example 5, $k = 2 / 3$ and $k' = k$.

4. Conclusion

To conclude we shall make several remarks:

On "monopolistic competition". One can model "monopolistic competition", this state of competition in which each firm has its "garden". It is a group of consumers with a utility u_i (of the product sold by Ei) of maximal value: $u_i = 1$. At the equilibrium, each firm attracts the consumers in its garden, and only them (because of symmetry). If the "buy and close down" is not profitable, the products are enough differentiated. We have presented several tractable examples.

On the "buy and close down" profitable. If the "buy and close down" is profitable, it is a criterium for saturated market. The products are differentiated in a better way if there are two firms, than if there are three. There is a strong incentive to merge.[3] A merger can fail, for instance because two teams managing rival products do not agree one another (it is sometimes called "dyssynergias"). In this case the buyer can underinvest or close the asset, and all the operation is profitable. The "buy and close down" profitable brings a kind of insurance. The managers of the purchased firm can oppose the merger, but the shareholders decide. Or the buyer can placate them thanks to "rewards" such as an important role in the merged firm. Also, they can bank on the opposition of the regulator but often the regulator accepts the arguments of the buyer and authorizes the merger. One could say that the buyer and the competitor remaining on the market (after the merger) have differentiated their products, efficiently. There are barriers to entry. They are not artificial: the products of the incumbents are well differentiated, and the products of the entrant is not enough differentiated. It is the argument "When there are a few leaders in a sector, it is because these firms are able to sell attractive products to the consumers".

One can present a tractable example. Suppose that the density of utility is homogeneous ($1 / \sqrt{2}$), in the plane $p_3 = 1 / 2$, along the second bisector. The firm E_3 provides a little utility to the consumers (utility equal to 1 / 2). At the opposite, either the firm E_1, either the firm E_2, provides the consumers with a utility which is more than 1 / 2. Unsurprisingly, the "buy and close down" is profitable. It is because the products are differentiated in a better way if there are two firms, E_1 and E_2, than if there are three firms. The firm E_3 is obliged to choose a low price ($p_3 < 1 / 2$) and as the prices are strategic complements, E_1 and E_2 have also to choose low prices: $p_1 = p_2 = 1/ 3$. With two firms the prices are higher: $p'_1 = p'_2 = 1 / 2$.

However, it raises an objection. The model presented is quite static. One supposes that each firm has realized its potential. If the entrant is a firm developing its product, it is another story. To merge or to "buy and close down" could be useful to remove a rival product. It harms innovation and should be prevented by the regulator. In this case he "protects disruption". We shall deal with this topic again, later in the paper, at the end of the conclusion.

On the non-differentiating innovation. We have defined it by (u_1, u_2, u_3) becoming ($u_1 + K$, $u_2 + K$, $u_3 + K$), $K > 0$. We have presented examples in which at the start, the products are well differentiated (the "buy and close down" is not profitable), and if the non-differentiating innovation is enough important (K large enough) it triggers the "buy and close down" profitable. It is a sign of saturated market. Notice that the non-differentiating innovation can be defined in other ways. For instance, it is defined as having the characteristics of a public good. The author has presented an example. If a first firm provides a new product which removes the old product sold by a second firm, a third firm selling a product which is not new but is better than the old product, remains on the market. This third firm benefits from the removal of the old product, thanks to the first firm [4]. A non-differentiating innovation can occur because of spillovers or a regulator's decision.

On non-differentiating innovation because of spillovers. It occurs when an innovation by some firm, in first, is easily imitated by the other competitors. For instance, the innovation is not protected by a patent. Or an innovation by the providers benefits to all the competitors. Another case is Research Joint Ventures (RJVs): All

[3] Even, if the "buy and close down" is more profitable than the "buy and manage", the "buy and close down" could be chosen.

the competitors participate in a center specialized in R and D. If the hypothesis set out in this paper is valid, the competitors hope a reduction of costs which will offset the disadvantages of non-differentiating innovation. And how is organized the common center has to be adequate: the goal is to remove a kind of free rider behavior (a firm appropriates the result of R and D without having financing them), so one has to avoid a free rider behavior among the firms participating in the center [5]. This leads to the idea that there are two styles of management. The competitors can cooperate (for instance in a common center devoted to R and D) and hope that the economies of costs will offset the disadvantages of non-differentiating innovation (an innovation concerning the product). Or they search for specific, non-imitable innovation. Also, they want to convince the investors that in the long run they will sell a very well differentiated product, which will allow large profits. We have already quoted some of these firms. They bank on "disruption". This also evokes the domain of software: here also, there are two styles of management. Some firms specialized in software prefer the development of software in Open Source: there are economies of costs but the innovations are not differentiating, since they are in free access for the competitors. At the opposite, some firms prefer a development of software in a proprietary mode: it is more expensive, but the innovation is specific, non-imitable, and benefits to the product of the firm, only (hence a larger market share).

On non-differentiating innovation due to the regulator. We have quoted decisions taken by the regulator which trigger more utility for the consumers, like an innovation. Of course, it is a non-differentiating innovation if the decision concerns all the competitors. In the model presented, when there is a non-differentiating innovation, the profits remain the same. But the firms have to make expenses. Suppose the expense is S. The gain in consumers 'surplus is K. If K > S, not only the consumers' surplus, but also the total surplus, increases and the regulator should take the measure. If S > K, the total surplus decreases. The regulator can take the measure, if he thinks that the consumers' surplus is his priority. In some cases (as we have stated) the "buy and close down" becomes profitable.For the regulator, it is not good: of course, he can prevent the merger, but sometimes the regulator accepts mergers. All this shows that the regulator is a strategist who cannot simply apply rules. There are dilemmas. A decision implies advantages and disadvantages (from his point of view).

The debate on innovation and regulation continues. For instance, the French economist Michel Philippon has recently published a book the title of which is: "The great reversal: how America has given up on free markets". In the conference with the same title, he states that there are two kinds of concentration, the good one and the bad one. The good one is when leaders have large market shares because they have invested and innovated, without crazy expenses in lobbying [6]. Another specialist of this topic, the American economist Carl Schapiro, argues that the regulator has to protect "disruption" [7]. Suppose a firm, the buyer, wants to buy another firm. One can suppose two cases [7]:

The buyer sells an existing product, the other has a "product in the pipeline". The regulator can suspect the buyer to buy a competitor to suppress a rival product. This stifles competition. The regulator should prohibit the merger. The argument is the following: a firm is not incited to develop a new product when it gets a sure and large rent thanks to the existing product it sells. It is the argument of the proponents of "disruption". They claim that the regulator should take measures to protect disruption.

The two firms have "products in the pipeline". The regulator will ask the buyer for proof that he will develop the two rival products, perhaps making economies on R and D, if it is conducted on the two products, simultaneously. Or he will ask for the proof that another arrangement, preserving the competition between the two products, is not possible. This other arrangement would be cooperation (in a RJV). Here the opposition between the regulator and the buyer appears: with cooperation the buyer may expect economies in R and D, but it is non-differentiating innovation. It would be a trade-off. The buyer can make economies on R and D, but he will benefit from a non-differentiating innovation, only. The regulator preserves competition.

The regulator is a strategist who cannot apply rules. He makes subtle choices. There are dilemmas. In particular: in case of non-differentiating innovation, the incentive to merge can be strengthened. But it is beneficial for the consumers.

An economic sector can be considered as a "pluriversum", according to the French sociologist Michel Maffesoli [8]. For Maffesoli, the society is a "pluriversum", very much complex and in evolution. One cannot reduce it to a too simple scheme, even if sometimes the Power does it. The same idea applies to the regulator and the economic sector which is regulated.

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