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Free entrance and social welfare.
Explaining the causes of excessive entry bias.

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ABSTRACT

The economic theory has proved that free entry is not always advantageous from a social welfare point of view. Fro instance, a number of inefficiencies can arise from free entry in the presence of fixed set-up costs. Then, an excessive number of firms can usually be settled in homogeneous produc markets within an imperfect competition framework. The economic forces underlying the entry biases are somewhat obscure yet.

This paper claims that capacity constraints and diseconomies of scale ought to be driving the discussion of this issue. The characteristics of the cost function, rather than other features, play the major role and should attract the attention of the future research effort. The paper develops an example with which to illustrate the discussion.

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Free entrance and social welfare.
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May 16, 2005

Abstract

The economic theory has proved that free entry is not always advantageous from a social welfare point of view. For instance, some inefficiencies can arise from free entry in the presence of fixed set-up cost. Then, an excessive number of firms can usually be settled in homogeneous product markets within an imperfect competition framework. The economic forces underlying the entry biases are somewhat obscure yet.

This paper claims that capacity constraints and economies of scale ought to be driving the discussion of this issue. The characteristics of the cost function, rather than other features, play the major role and should attract the attention of the future research effort. The paper develops an example with which to illustrate the discussion.

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1 Introduction

In the past, economists typically presumed that free entry was advantageous from a social welfare point of view. More recent research has proved that it may not always be the case. For instance, if a new entrant causes incumbent firms to reduce output (”business-stealing” effect) entry is more desirable to the entrant than it is to society. This view implies that an excessive number of firms can be usually settled in homogeneous product markets within an imperfect competition framework.[1]

In particular, several papers, like Weizsäcker (1980) and Perry (1984), have pointed towards the inefficiencies that can arise from free entry in the presence of fixed set-up cost. In this context, as stated by Mankiw and Whinston (1986), entry restrictions are often socially desirable. Empirical work to test this hypothesis is rather scarce. Berry and Waldfogel (1999) tried to estimate the social welfare loss associated to free entry in radio broadcast in the US. Their study, even if extremely ambitious and rigorously done, presents some major problems. In particular, we argue here that they fail to adopt the right production function, which brings about that they overestimate the welfare loss.[2]

In any case, the main economic forces underlying the entry biases remain to some extent undisclosed. We claim that the attention must be placed on the role played by the costs, which will be undoubtedly helpful to achieve a deeper understanding of the forces provoking the excessive entry bias. Moreover, our suggestion is that in order to improve welfare situations, a higher degree of competition (instead of free entrance regulation) should be encouraged. In any case, further research on this issue must still be carried out.

2 Purpose of the paper

The present study aims to stress the importance of the costs’ structure within the present discussion. This feature was only implicitly treated in Mankiw and Whinston (1986) and regrettably neglected in the paper by Berry and Waldfogel (1999). In our opinion, the former is not sufficiently aware of the major role played by the capacity constraints (the costs linked to increases in the scale of production), while the latter is misleading when assuming a simpler costs’ structure than the one proposed by Mankiw. In fact, we consider that the assumption of radio broadcast having zero marginal cost is mistaken. This is because by increasing the production (the number of effective messages), a positive marginal cost is generated in as much as greater advertising congestion derives in lower audience. Obviously, the conclusions of any empirical study, like the one by Berry and Waldfogel (1999), will strongly depend on the production function as well as on the specific form of the costs which is assumed.

In our analyisis, the starting point is based on the paper by Mankiw and Whinston (1986), whose results are valid but perhaps less powerful than are usually claimed. They derive the excessive entry bias upon the role played by imperfect competition and the ”business-stealing” effect. Instead, here we advocate that capacity constraints and diseconomies of scale in the productive process are the framework in which entry bias takes place.

As long as free entrance exists, with zero-profits for identical firms, the imperfect competition framework (price greater than marginal cost) guarantees that the average costs moves along in the same direction than the number of firms. This feature, which is proved in the Appendix, is enough to produce the results presented by Mankiw. Therefore, the characteristics of the cost function, rather than other features, must attract the attention of future research. In what follows, it is provided an example with which to illustrate the discussion.

3 The Model

Mankiw and Whinston (1986) state that entry restrictions are often socially desirable. However, they also recognise that regulation (to enforce less firms than those resulting from free entry) may not always be advisable. In our model, the number of firms that enters freely the market is denoted by n. The model illustrates in which cases enforcing $n-1$, instead of n firms, is not desirable. Consider the case of a *Cournot* oligopoly formed by n symmetric firms. The cost function of each of them has a conventional specification:

$$c(x) = F + \frac{1}{2}cx^2 \tag{1}$$

[1] Some studies have also shown that the inclusion of product diversity into the analysis may reverse this entry bias, implying less than socially optimal number of firms in equilibrium. The business-stealing effect is described by Cabral (2000).

[2] Consider the following two comments. Primarily, it is questionable that radio broadcast constitutes one homogeneous product market, since advertising contracts are diverse in each radio. More importantly, they assume that the marginal cost of production is 0, which we believe that is not precisely the case. It is not the case due to the existence of timing constraints: 24 hours a day. To maximise profits, each radio has to achieve a balance between entertainment and advertising. Only having this technological feature into account the optimum level of production will be obtained. The radio’s business consist of selling to other firms messages for listeners, rather than simply offering a certain spell of time. But the quality of this service depends on the number of messages that effectively reach the audience, which obviously is not independent from the level of advertising congestion. (In the extreme situation in which the radio devotes 24 hours a day to advertising, no entertainment is offered and a very few radio consumers would remain. In the opposite case in which zero advertisement is hired, no revenues come into the radio).

In addition, we assume that the market demand is a linear function:

$$X = S(a - p) \tag{2}$$

The quantity produced by each single firm is denoted by x, while X accounts for the rest of the production in the market. Our attention is placed on the question about social welfare: in which cases it is preferable to allow free entrance in the market?; in which cases the social welfare recommends to enforce a number of firms lower than n?

The next theoretical developments delimit the conditions of the cost structure for which it is better to intervene the market. More specifically, the analysis will be focussed on the values of c and F, parameters with which to capture the production capacity and diseconomies of scale. Observe that the cost function considered by Mankiw, would be obtained here by simply enforcing $c = 0$.

3.1 Solving the model

Given the relationship $X = (n-1)x$, the *Cournot* model consists of chosing the value of x that maximises the following expression:

$$\left(a - \frac{x+X}{S}\right)x - \left(F + \frac{c}{2}x^2\right)$$

The solution to this, leads to the following value of x:

$$x = \frac{Sa}{cS+n+1} \tag{3}$$

In addition, for the particular case of functions (1) and (2), the price is:

$$p = cx + \frac{x}{S} \tag{4}$$

Therefore, the profit for each single firm in this market is defined by:

$$\pi = \frac{a}{cS+n+1}(cS+1)\frac{Sa}{cS+n+1} - F - \frac{c}{2}\left(\frac{Sa}{cS+n+1}\right)^2$$

It means that the maximum value of F for which n firms can enter the market is that for which the profits of each of them are zero. In other words, by imposing $\pi = 0$, we are able to determine the value:

$$F = \frac{1}{2}a^2 S\frac{2+cS}{(cS+n+1)^2} \tag{5}$$

3.2 Social welfare evaluation

Social welfare is denoted by $W^{(n)}$. The value of these welfare functions is calculated as the difference between production and costs. We do not argue here if consumer and producer surplus must be similarly evaluated: social welfare is going to be computed as the simple summation of these two components. The welfare associated to n firms is then given by:

$$\frac{1}{2}S\left(a^2 - \left(\frac{(1+Sc)a}{cS+n+1}\right)^2\right) - n\left(F + \frac{c}{2}\left(\frac{Sa}{cS+n+1}\right)^2\right)$$

To compare the welfare status of having n and $n-1$ firms in the market, we take the value of the fixed set-up cost (F) for which the n firms present zero profits, and define the difference. We evaluate the welfare with n firms minus the welfare when $n-1$ firms enter the market, as the difference between $W^{(n)} - W^{(n-1)}$. In order to do so, we introduce the value of F, shown in expression (5), into the corresponding expressions. After simplifying, we get:

$$W^{(n)} - W^{(n-1)} = \frac{1}{2}Sa^2\frac{1+2n+3cS+S^2c^2-2n^2-ncS}{(cS+n+1)^2(cS+n)^2} \tag{6}$$

Whenever (6) > 0, free entrance (n firms settled in the market) will be preferred to regulation ($n-1$ firms). Now, assume that $S = 1$ and $a = 1$, which does not imply lack of generality. In order for expression (6) to be greater than zero (and free entrance preferred in terms of social welfare), the following condition must hold:

$$n < \frac{1}{2} - \frac{1}{4}c + \frac{1}{4}\sqrt{12 + 20c + 9c^2} \tag{7}$$

However, we have advocated that the cost structure ought to be driving the discussion of this issue. Hence, our attention has to be foccussed on the analysis of c and F. From (5) we can express n in terms of c and F:

$$n = \sqrt{\frac{c+2}{2F}} - (c+1)$$

Then, we substitute this value of n into expression (7) and we get:

$$F < \frac{(c+2)\left(9c^2 + 28c + 24 - \sqrt{9c^4 + 56c^3 + 128c^2 + 128c + 48}\right)}{4\left(4c^2 + 12c + 9\right)} \tag{8}$$

In summary, it is not always the case that regulation will produce better results than free entrance. Instead, condition (8) indicates that in some circumstances (for specific values of c and F) it is better not to regulate, since the free market outcome would provide a greater welfare for society.

This is not exactly a novel result. Mankiw and Whinston (1986) stated that: "when firms must incur fixed set-up costs, the regulation of entry is *often* desirable". The use of "often" indicates that intervention may not be always preferred in terms of welfare. Nevertheless, the contribution of this study is twofold: first, it delimits the values for c and F that makes it desirable to allow free entrance, and second, it stresses the important role played by the structure of the cost function.

3.3 Graphical analysis

Figure 1 permits to interpret the previous discusion. The line in bold represents the function for which either expression (6) takes value 0, or the values for which F equals the right hand side of inequality (8). This function gathers those pairs of values, within space (c, F), for which the welfare associated to n firms is equal to that obtained when $n-1$ firms enter the market. The graph also shows the shape of a family of equations representing the points for which zero-profits exist for the cases in which $2, 3, 4$ and 5 firms are settled in the market.

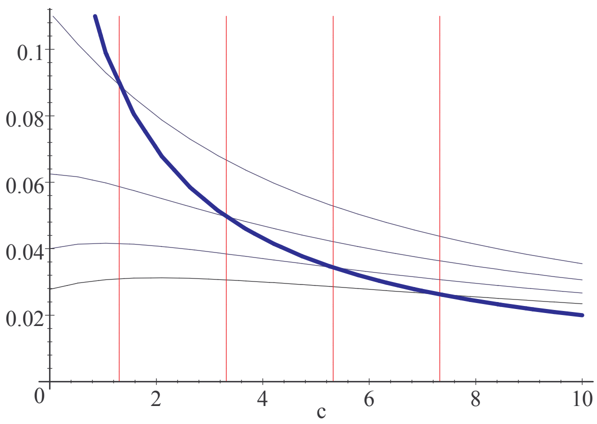

Figure 1:

The analysis of *Figure 1* illustrates that the structure of the costs (and the value of c and F) does definitively matter in the discussion about the convenience of regulating the number of firms. The higher the costs of increasing production (c), the greater the margin for other firm to enter the market, since there is a larger number of values for F that makes free entrance better than regulation. In other words, for a given value of F, the greater the diseconomies of scale (or, the steeper the shape of the average cost function), the lower the probability that regulation is something desirable. Note that the last issue could not be perceived in the paper by Mankiw and Whinston (1986), given that c was equal to 0 in their model.

4 Conclusion

Common view of free entry as something desirable for social efficiency has long ago been questioned by economists. Models considering the welfare-maximising number of firms together with a non-competitive behaviour after entry, point to a tendency for excessive entry in homogeneous product markets. It is the case when imperfect competition and "business-stealing" effect coexists.

In this paper, a deeper understanding of the issue have been reached from the analysis of the costs structure. In addition, we venture that a better analysis of the structure of the cost function is required to extract conclusive opinions about free entry and welfare, since the whole discussion depends on the quasi-limits of capacity. Previous papers on this issue did not devote sufficient attention to the place that the diseconomies of scale deserve, which makes their results less powerful than it is usually claimed. In particular, the empirical exercise provided by Berry and Waldfogel (1999) might have been strongly conditioned by the inclusion of a wrong production function.

In summary, the paper supports the view that, as far as firms find it costly to increase their output level, the regulation of the number of firms is less likely to be justified with respect to the alternative of free entrance.

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6 Appendix

Imperfect competition (a market price bigger than the marginal cost) is equivalent to impose a positive first derivative of the average cost with respect to the number of firms, as fas as the profits are zero (or, at least, if they tend towards 0). The proof for that is straighforward.

Consider an industry with n identical firms. Each one of them has a cost function $C(x) = F + c(x)$. Total cost in the industry is $C(X) = nF + nc(X/n)$, where X is the total output in the industry. Average cost is $AC(X) = \frac{nF}{X} + \frac{n}{X}c\left(\frac{X}{n}\right)$. Deriving the average cost with respect to n, we obtain:

$$\frac{\partial AC}{\partial n} = \frac{F}{X} + \frac{1}{X}c\left(\frac{X}{n}\right) - \frac{1}{n}c'\left(\frac{X}{n}\right)$$

If $\pi = 0$, then $F = p\frac{X}{n} - c\left(\frac{X}{n}\right)$. Substituting this value of F in the previous expression yields:

$$\frac{\partial AC}{\partial n} = \frac{1}{n}\left(p - c'\left(\frac{X}{n}\right)\right)$$

Average cost always increases with the number of firms n, when the firms have zero profits, if the firms do not behave competitively. Besides that, the less competitive the industry is, the more deseconomies with respect to the number of firms we get in the industry. In conclusion, given that profits are equal to zero, the following result holds:

$$p > CMg <==> \frac{\partial AC}{\partial n} > 0$$