

Boitier, Vincent

## Article

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## Kontakt/Contact

ZBW – Leibniz-Informationszentrum Wirtschaft/Leibniz Information Centre for Economics

Düsternbrooker Weg 120

24105 Kiel (Germany)

E-Mail: [rights\[at\]zbw.eu](mailto:rights[at]zbw.eu)

<https://www.zbw.eu/>

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## Ownership structure and profit maximization in general equilibrium models with market power

Vincent Boitier\*

Le Mans University, France

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### Abstract

Using Hart (1979, 1985) and Mas-Colell (1984), I defend the idea that the standard ownership structure is somewhat problematic in general equilibrium models of monopolistic competition because profit maximization is not a justified objective of the firm. I then advocate that a solution to overcome this methodological issue is when ownership is disproportionately concentrated among households.

**Keywords:** methodological issues; monopolistic competition; ownership structure

**JEL Classification Codes:** B41, L11, L13

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*"In a competitive framework, this is usually accepted without question as the right objective for a firm. Under imperfect competition matters are more complicated [...] The reason is that the owners of a firm are interested not in monetary profits per se, but rather in what this profit can buy. Given that a monopolistically competitive firm can influence prices, the owners may prefer low monetary profit but favourable prices for consumption goods to high monetary profit and unfavourable prices" Hart in Imperfect competition in general equilibrium: An overview of recent work, 1985, p.106-107*

*"In monopolistically competitive theory (see Hart (1982b) and Mas-Colell (1982) for surveys) profit maximization is, again, at center stage but the foundations are now much less solid [...] As in Hart (1979) the key aspect of our justification of profit maximization is the introduction of a strong asymmetry between ownership and consumption share. The purpose is to make the income effects derived from ownership shares dominant relative to the consumption substitution effects [...] profit maximization is tied to the ownership of the firm [...] What is important is that every consumer's shares be concentrated in a few firms (while his purchases are dispersed among many)" Mas-Colell in The profit motive in the theory of monopolistic competition, 1984, Journal of Economics, p.119-p.121*

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\* Corresponding author. E-mail: vincent.boitier@gmail.com.

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## 1. Introduction

Modern models of monopolistic competition used in trade models (see Krugman (1979) and Melitz (2003)), urban economics (see, for example, Combes et al. (2008)) and macroeconomics (see, among others, Bilbiie et al (2012)) rely on the same ownership structure. Systematically, it is assumed that there is cross-holding in each firm (i.e., households hold shares in all firms), and the shareholding is egalitarian in the sense that households are entitled to an identical share of each firm.

In this article, I defend the idea that such an ownership structure is somewhat problematic in general equilibrium because profit maximization is not a justified objective of the firm. By doing so, I use an argument highlighted by Hart (1979, 1985) and Mas-Colell (1984). I then circumvent this failure by offering a consistent narrative where the purpose of the firm is to maximize profit. The developed setting encapsulates a new particular ingredient: ownership is disproportionately concentrated among households. This means that each firm is owned and managed by a single household called entrepreneur.

This note contributes to the methodological literature that tackles the question of the inclusion of imperfect competition in general equilibrium.

It is well-documented that general equilibrium models experience formidable drawbacks in the presence of increasing returns to scale or non-convexity in the production (see, among others, Mantel (1979), Cornet (1988), Brown (1991) and Villar (1999) for surveys). The main concern stems from the assumption that firms maximize profits. Under constant returns to scale, the production sets of firms are convex, the profit maximization is well-defined, and marginal cost pricing coincides with the maximization of profits. Under increasing returns to scale, the production sets of firms are no longer convex. This implies that the profits maximization becomes not well-posed. Cornet (1988) and Villar (1999) survey some solutions to fix these valuable issue, and notably highlight the role of the so-called "the marginal cost pricing rule".

It is also acknowledged that jumping from a partial equilibrium analysis to a general one leads to serious difficulties when markets are not competitive (see Hart (1985), Gary-Bobo (1988), Bonanno (1990), and Dierker and Dierker (2006) for surveys). Notably, the owners of the firms are consumers in such a way that the objective of the firm no longer is to maximize profit. This is because, as owners can manipulate prices, they face a trade-off between setting low prices to improve the owners' purchasing power and setting high prices to increase their profit (see Hart (1979, 1985) and Mas-Colell (1984)). Recently, Accinelli and Muniz (2021) show such a conflict in a dynamic general equilibrium setting. They show that, under particular conditions, the rational decisions made by the managers of the firms can generate a decrease in the consumers' welfare. The present article seeks to prove that the standard ownership structure in the literature is not well-defined for this reason, and offers a simple solution to fix this issue.

The note is organized as follows. Section 2 shows that, when the ownership structure of the economy is explicitly considered, the standard general equilibrium under monopolistic competition suffers from methodological issues. Section 3 provides the conclusions.

## 2. Ownership structure and profit maximization in models of monopolistic competition

Hereafter, I carefully describe the ownership structure of a standard general equilibrium model with monopolistic competition. The considered setting is very general, and encapsulates most of the models of the literature. I then argue that profit maximization is not a justified objective of the firm. Last, I offer a solution to circumvent this methodological failure.

### 2.1. Environment

Let there be an economy populated by a mass  $h$  of identical households. Households play the starring role as they comprise consumers, workers, and entrepreneurs.

As consumers, households derive utility  $\mathcal{U}$  from consuming a continuum of varieties of a differentiated good produced in a single industry.  $\mathcal{U}$  is assumed to follow standard properties (see Parenti et al. (2017)). Among various cases,  $\mathcal{U}$  can be CES such that:

$$\mathcal{U} \equiv \left( \int_0^n x_k^\rho dk \right)^{\frac{1}{\rho}} \quad (1)$$

with  $0 < \rho < 1$ . Consumers aim to maximize the utility function  $\mathcal{U}$  in the face of a budget constraint:

$$\int_0^n p_k x_k dk = \mathcal{I} \quad (2)$$

$p = (p_0, \dots, p_k, \dots, p_n)$  is the market price profile,  $p_k$  is the price of variety  $k$ ,  $x_k$  is the consumption of variety  $k$ ,  $n$  is the number of varieties and  $\mathcal{I}$  is the revenue of households.<sup>1</sup>

As workers, households inelastically supply  $g$  units of labor in a competitive market for wage rate normalized to one  $w = 1$ . As the labor market is perfectly competitive (i.e., workers are perfectly mobile across firms), there is no unemployment in equilibrium, and the following constraint is satisfied:

$$gh = \int_0^n \ell_k dk \quad (3)$$

where  $\ell_k$  is the mass of workers employed in firm  $k$ . The previous equation is the standard labor market clearing condition which stipulates that the supply of labor must be equal to the demand for labor.

The model is elaborated on the standard neoclassical theory of the firm. Homogeneous firms have no behavioral attributes. That firms are usually treated as decision-makers (“firms choose how much to produce,” “firms set a price above the marginal cost,” etc.) is a personification or metonymy (see Jensen and Meckling (1976) for a deeper analysis). Firms are reduced to a technology delivering a set of feasible production plans. This technology is summarized by a cost structure that uses labor as the sole input, exhibits increasing returns to scale, and permits the production of a single variety of the differentiated good. Namely, producing  $q$  units of good needs  $\mathcal{C}(q)$  units of labor.  $\mathcal{C}$  is of the form:

$$\mathcal{C}(q) = cq + f \quad (4)$$

where  $c > 0$  is the marginal cost and  $f > 0$  is the fixed cost. A direct consequence of (3) is that  $\ell_k = \mathcal{C}(q_k)$  where  $q_k$  is the output of firm  $k$ .

As entrepreneurs, households juggle two balls at the same time: they are both owners and managers of all firms of the economy. There is no separation between ownership and control, which eliminates the agency problem. The ownership structure of the society shows two salient features. On the one hand, there is cross-holding in each firm: households hold shares in all firms. On the other hand, the shareholding is egalitarian: households are entitled to an identical share  $\frac{1}{h}$  of each firm. Consequently, they receive a fraction  $\frac{1}{h}$  of the profit generated by each firm, are rewarded with a right in each firm (proportional to their share), and influence the strategy of the firms that consists in determining the objective (purpose) of the firm.<sup>2</sup> The revenue of households is therefore given by:

$$\mathcal{I} = g + \frac{1}{h} \int_0^n \pi_k dk \quad (5)$$

where  $\pi_k$  the profit of firm  $k$  is defined as revenues minus total costs:

$$\pi_k = p_k q_k - cq_k - f \quad (6)$$

The decision-making process for the choice of a strategy does not need to be specified. In a world where firms are governed by different shareholders, we could surely envision that the shareholding confers a voting right, and that the adoption of a strategy is done by majority voting. But owing to homogeneity, there is no conflict of interest between owners. The

<sup>1</sup>  $p$  can be rewritten as  $p = \{p_k\}$ .

<sup>2</sup> In some versions, the repatriation of profits is governed by a mutual fund (see, among others, Bilbiie et al (2012)). This fund aims to pool the profits from all the operative firms. Each household owns identical shares of the fund. The value of the profits is then uniformly distributed across households through dividends.

individual objectives are well aligned in such a way that the actions of the group reflect the actions of the individual members of that group irrespective the decision process.

## 2.2. Methodological issue

### 2.2.1. Is profit maximization a justified objective of the firm?

As outlined previously, a firm has no behavioral attributes. The purpose of a firm is set by its owners. Because owners are also consumers, it is normal to suppose utility-maximizing owners (see, among others, Hart (1985), Bonanno (1990), and Dierker and Dierker (2006)). The objective of a firm is therefore to maximize the indirect utility of owners, and the "primitive maximization program" is given by:<sup>3</sup>

$$\max_p \mathcal{V}(p; \mathcal{I}) \quad (7)$$

with  $\mathcal{I}$  given by (5) and  $\mathcal{V}$  being the indirect utility of households.<sup>4</sup>

For example, if  $\mathcal{U}$  is CES, then the maximization program becomes the following:

$$\max_{\{p_k\}} \frac{\mathcal{I}}{\left(\int_0^n p_k^{1-\sigma} dk\right)^{\frac{1}{1-\sigma}}} \quad (8)$$

with  $\rho = \frac{\sigma-1}{\sigma}$ .

Due to collective cross-holding in each firm, owners choose  $p$  as a price profile for all available varieties at once. This makes the decisions regarding consumption and production intertwined. As in Hart (1979, 1985) and Mas-Colell (1984), a change in the price  $p_k$  has two distinct effects on owners' indirect utility. On the one hand, as the owners can determine purchase power, there is a consumption effect measured as follows:

$$\frac{\partial \mathcal{V}(p; \mathcal{I})}{\partial p} \times \frac{\partial p}{\partial p_k} \quad (9)$$

On the other hand, as the owners can influence profits, there is a standard income effect captured by the following:

$$\frac{\partial \mathcal{V}(p; \mathcal{I})}{\partial \mathcal{I}} \times \frac{\partial \mathcal{I}}{\partial p_k} \quad (10)$$

Depending on the relative importance of each effect, owners may set high (low) prices to increase profits (consumption). As a consequence, the first order conditions of (7) are summarized such that:

$$\frac{\partial p}{\partial p_k} \frac{\partial \mathcal{V}(p; \mathcal{I})}{\partial p} + \frac{\partial \mathcal{I}}{\partial p_k} \frac{\partial \mathcal{V}(p; \mathcal{I})}{\partial \mathcal{I}} = 0, \quad \forall k \quad (11)$$

Therefore, profit maximization is rarely compatible with shareholders' interests:

$$\max_p \mathcal{V}(p; \mathcal{I}) \neq \max_{p_k} \pi_k \quad \forall k \quad (12)$$

and profit maximization does not constitute the goal of the firm.

### 2.2.2. Solution

To overcome this issue, it is sufficient to put forward a new "negligibility hypothesis." Consider that ownership is disproportionally concentrated among households. Namely, impose private ownership so that some households individually run a single firm and do not participate in the labor market. The revenue of these entrepreneurs is simply  $\mathcal{I} = \pi$ , and the maximization program becomes as follows:

$$\max_{p_k} \mathcal{V}(p; \pi_k) \quad (13)$$

The argument in the maximization problem is  $p_k$  and not  $p$  or  $\{p_k\}$ , and, due to the negligibility hypothesis,  $p$  is considered as given.

For example, if  $\mathcal{U}$  is CES, then the maximization program becomes the following:

<sup>3</sup> That the objective of the firm is to maximize the indirect utility of owners is an established result. See, for example, Dierker and Grodal (1996, 1999).

<sup>4</sup>  $\mathcal{V}$  has standard properties. It is an increasing (decreasing) function of  $\mathcal{I}$  ( $p$ ).

$$\max_{p_k} \frac{\pi_k}{\left(\int_0^n p_k^{1-\sigma} dk\right)^{\frac{1}{1-\sigma}}} \quad (14)$$

with  $\left(\int_0^n p_k^{1-\sigma} dk\right)^{\frac{1}{1-\sigma}}$  being treated as a constant.

Owners no longer choose  $p$ . As there is private ownership, each entrepreneur sets  $p_k$  a price for his variety only. As the number of firms is infinite and ownership is infinitely concentrated, the owners' consumption of their own varieties is negligible. Hence, entrepreneurs consider  $p$  as a parameter such that:

$$\frac{\partial p}{\partial p_k} \frac{\partial \mathcal{V}(p; \mathcal{I})}{\partial p} = 0 \quad (15)$$

The consumption effect is eliminated, and the choice regarding consumption and production is no longer interconnected. In that case, the first order conditions of (13) are given by the following:

$$\frac{\partial \pi_k}{\partial p_k} \frac{\partial \mathcal{V}(p; \pi_k)}{\partial \pi_k} = 0, \forall k \quad (16)$$

As  $\frac{\mathcal{V}(p; \pi_k)}{\partial \pi_k}$  is strictly positive, (16) collapses to:

$$\frac{\partial \pi_k}{\partial p_k} = 0, \forall k \quad (17)$$

This ensures that each owner instructs his firm to maximize profits:

$$\max_{p_k} \mathcal{V}(p; \pi_k) = \max_{p_k} \pi_k, \forall k \quad (18)$$

This fixes the issue highlighted in Section 2.2.1.

### 3. Conclusion

Using Hart (1979, 1985) and Mas-Colell (1984), I defend the view that the standard assumption about the ownership structure is inconsistent in general equilibrium models of monopolistic competition. I then offer a simple solution to fix this issue.

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