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Competition Between For-Profit and Non-Profit Organizations

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By

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Resumo

Apesar da importância do setor sem fins lucrativos na economia, pouca análise tem sido feita sobre se o comportamento deste setor é distinto do setor com fins lucrativos. Para proceder a esta análise, iremos examinar um modelo de concorrência em duopólio para comparar os resultados de equilíbrio que surgem em mercados onde duas organizações com fins lucrativos competem com os resultados de equilíbrio que surgem nos mercados onde uma organização com fins lucrativos compete com uma organização sem fins lucrativos. Os resultados parecem sugerir que a concorrência entre organizações com e sem fins lucrativos pode ser prejudicial para a organização com fins lucrativos, dependendo da natureza da concorrência. No entanto, esta concorrência entre organizações com e sem fins lucrativos irá sempre melhorar o bem-estar dos consumidores e da sociedade como um todo, devido ao aumento da quantidade produzida em equilíbrio assim como da diminuição dos preços em equilíbrio. Finalmente, através da análise dos resultados concluímos que a existência de isenções fiscais concedidas à organização sem fins lucrativos não gera concorrência desleal.

Palavras-chave: Duopólio, Organização Sem Fins Lucrativos, Organização Com Fins Lucrativos, Produtos Homogéneos

Abstract

Despite the importance of non-profit sector in the economy, little analysis has been made as to whether the behaviour of such sector differs from that of for-profit sector. To so do, we examine a duopoly model of competition to compare the equilibrium outcomes that arise in markets in which two for-profit organizations compete with those equilibrium outcomes that arise in the markets in which a for-profit organization competes with a non-profit organization. The results seem to suggest that competition between a for-profit and a non-profit organization may be detrimental to the for-profit organization, depending on the nature of competition. However, it always welfare improving for consumers and the society as a whole, due to the increase on equilibrium output and the decrease on equilibrium prices. Finally, the results also seem to suggest that any eventual tax exemptions given to the non-profit organization do not generate unfair competition.

Keywords: Duopoly Competition, Non-Profit Organization, For-Profit Organization, Homogeneous Products

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Introduction

In the last decades, the non-profit sector has gained economic, social and political importance and attracted a growing attention throughout the world, with competition between for-profit and non-profit organizations increasing not only in sectors where this competition typically already existed, but also in sectors where this competition typically did not initially exist.

Due to the exponential growth of the non-profit sector, recent years have witnessed an increased interest in assessing the competitive effects of non-profit organizations. This thesis contributes to this strand of the literature by analysing competition between for-profit and non-profit organizations and, in particular, if whether this competition is, in fact, unfair to the for-profit sector.

To do so, we consider a homogeneous product duopoly setting in which for- and non-profit organizations are modelled to maximize different objective functions: we assume that the for-profit organization seeks to maximize profit and the non-profit organization seeks to maximize output. We also assume that the non-profit organization may obtain income from both sales and donations, with the latter being the result of expensive fundraising activities, whereas the for-profit organization only obtains income from sales. We further assume that the for-profit is subject to profit taxation. Finally, we assume the two organizations may compete in quantities and prices.

In order to evaluate if competition by the non-profit organization is unfair to the for-profit organization, we perform a three-stage analyses. First, we consider a setting two for-profit organizations and compute the corresponding equilibrium outcomes. Second, we consider a setting with a for-profit organization and a non-profit organization and compute the corresponding equilibrium outcomes. Finally, we compare the equilibrium outcomes between those two settings.

The main conclusions are the following. First, independently of considering that organizations compete in quantities or in prices, the results seem to suggest that in markets in which a non-profit organization competes with a for-profit organization, aggregated output is higher and price is lower when compared with markets in which two for-profit organizations compete. Second, independently of considering that organizations compete in quantities or in prices, the results also suggest that consumers and the society as a whole are better off in markets in which a non-profit organization competes with a for-profit organization when compared with markets in which two for-profit organizations compete. Third, eventual tax exemptions for the non-profit organization have no impact in equilibrium outcomes, which means that tax exemptions do not generate unfair competition. Forth, when organizations compete in quantities, the profit of the for-profit organization can be higher or lower in markets in which a non-profit organization competes with a for-profit organization when compared with markets in which two for-profit organizations compete. Finally, when organizations compete in prices, the non-profit organization as no impact in the profit of the for-profit organization.

The remainder of the thesis is organized as follows. Chapter 1 compares the characteristics of for-profit and non-profit organizations, introduces the sectors in which these organizations coexist, and reviews the existing literature. Chapter 2 describes the theoretical model of competition used, Chapter 3 discusses the equilibrium results, and Chapter 4 concludes.

Chapter 1:
Literature Review

1. For-profit and non-profit organizations – definition

1.1. Characteristics of for-profit organizations

For-profit organizations are characterized by three main features. First, their ultimate purpose is typically to maximize, in the long run, the wealth of its shareholders. That does not mean that the interests of all the other stakeholders of the firm (such as customers, employees, or suppliers) are to be sacrificed for the interest of the shareholders. After all, the only way that shareholder wealth can be maximized over the long run is by developing customer loyalty and by engaging suppliers and employees in the work of the firm (Jensen, 1998, apud Moore, 2000). Second, they are typically subject to profit taxation (Lien, 2002). Finally, their key source of income is obtained from sales and services to customers (Moore, 2000).

1.2. Characteristics of non-profit organizations

Non-profit organizations are characterized by five main features. First, their ultimate purpose is typically different from for-profit organizations. Among the possible objective functions, we can include the maximization of output (or service), budget, prestige, quality and employee income, or any combination of these (Steinberg, 1986, apud, Liu and Weinberg, 2009). Second, they are not allowed to raise capital through equity financing, which implies they face a budget constraint and can not run negative profits (Lien, 2002). Third, they face a non-distribution constraints (Lien, 2002). In the sense, they are allowed to

accumulate profits under the law, however they are legally barred from distributing these profits to the owners of the organization (Steinberg, 1986). These profits usually are used to make investments for the organization. Fourth, their key source of income is two-folded: as for-profit organizations, they obtain income from obtained from sales and services to customers, but also obtain income from contributions provided by donors from a monetary level and from a time and material level (Moore, 2000). The latter may not necessarily be the largest or the main source of income for non-profits organizations. Nonetheless, contributions provided by donors are the defining source of revenue for non-profit organizations because they are created precisely to capture and channel voluntary contributions. Thus, these organizations will perceive (at least in part) to what the donors want. Moore (2000) concluded that the central value provided by non-profits organizations is the realization of their social intentions and the satisfaction of donor ambitions that contributed to the cause that the organization incorporates. For the non-profit organizations receive donations these organizations must incur in fundraising activities and these fundraising activities have costs. With this Okten and Weibrod (2000, p. 257) conclude that fundraising expenditures have two opposite effects on donations. "They *increase* contributions directly, by reducing information costs for donors, but they may also *reduce* contributions by increasing the price of giving – i.e. by decreasing the average fraction of total revenue devoted to output". Because of that non-profit organizations are only willing to solicit donations up to the point where fundraising expense no longer helps improve their objective function (Liu and Weinberg, 2009). Fifth, almost all non-profit organizations enjoy special treatment under state and federal taxation comparing to their similar for-profit competitors (Hansmann, 1980).

2. Industry background

Non-profit organizations not only compete with other non-profits for revenue and donation. In an extensive variety of industries, they also compete with for-profit organizations (Rose-Ackerman, 1982), typically in industries where additional constraints[1] on that organizations result in better social outcomes than those obtained with only for-profit organizations (Easly and O'Hara, 1983). These industries include health care, education, child daycare, family counselling, R&D, and performing arts (Liu and Weinberg, 2004). However, recently in those industries it had been noted an increase in the competition of for-profit organizations and there has been an increase in the number of non-profit organizations that compete in industries traditionally dominated by for-profit organizations, like the audiovisual, racquet sports, research and testing[2], tour, travel agent, and veterinarian (Liu and Weinberg, 2004).

Further, not only are non-profits involved in some of the most important industries nowadays; they also account for an increasingly large share of economic activities. For example, non-profits produce one-fifth of research and development (Lakdawalla and Philipson, 2006, apud Liu and Weinberg, 2009).

[1] Additional constraints occurs when purchasers of a firm's output cannot find out whether the output is actually produced. Easley and O'Hara (1983, p. 532) explain with an example: "buying food for our own consumption we can observe the products we are purchasing. In donating money to feed Ethiopian famine victims, however, we are not likely to travel to Ethiopia to observe the delivery of the food."

[2] Research and testing industry includes organizations that provide engineering, quality control, and certification services in a variety of industries.

3. The literature

In order to understand competition between for-profits and non-profit organizations, we must understand their pricing behaviour. This section reviews the literature on non-profit pricing. We begin by examining the literature for the case in which a single non-profit organization does not face any type of competition, we then proceed to examine the literature for the case in which a single for-profit organization faces competition from a single non-profit organization, and finally conclude by examining the literature for the case in which a variety of for-profit organizations may face competition from a variety of non-profit organizations. At the end of the chapter, Table 1 summarizes the relation of the different authors.

3.1. Non-profit organizations

3.1.1. Monopoly and non-profit pricing

Weinberg (1984) was one of the first authors to analyse the question of pricing in non-profit organizations (Weinberg, 1984, apud Liu and Weinberg, 2009). He modelled the non-profit organization as obtaining income from both sales and donations[3] facing a nondeficit constraint, and pursuing an objective function clearly different from a for-profit organization. In particular, he assumes that the objective function of the non-profit is to maximize sales (quantity sold), which are modelled – similarly to for-profits – to depend on both price and marketing expenditures[4].

[3] Donations are the outcome of both fundraising expenses and sales.

[4] Because of the nondistribution constraint and that both price and marketing expenditure influence the demand, the non-profit organizations have the ability of improve product quality.

The key conclusions of this non-profit pricing model are derived by comparing the equilibrium outcomes of a non-profit monopolist, modelled as described above, with those of a for-profit monopolist. They are the following. First, the non-profit optimal price is lower than the for-profit price and this price difference increases as donations become more reactive to fundraising expenses and sales. As a consequence of this price difference, the optimal non-profit output is larger than the for-profit output. Second, fixed costs are important for the non-profit pricing decision. Given that fixed costs have direct effect on the efficiency and innovativeness of non-profits, the author concluded that the non-profit is more reserved in the ability to use newer technology. Third, the non-profit could spend more efforts on marketing expenditures rather than a similar for-profit however, most of non-profit organizations does not rely on that marketing expenditures. Finally, as the non-profit seeks to maximize the quantity sold, the quality of the non-profit's output could be higher than the quality of a similar for-profit.

The model of James (1983) extends the model of Weinberg (1984)'s by allowing the non-profit monopolist to produce multiple (two) products. To do so, she modelled the non-profit organization as obtaining income from both sales and donations (with the latter being exogenous) and facing a nondeficit constraint. Further, she assumes that the manager of the non-profit derives utility from producing both products and assumes that the objective function of the non-profit is to maximize the manager's utility.

The key conclusions of this non-profit pricing model are the following. First, if the manager's marginal utility for a given product is equal to zero, then the quantity in equilibrium would be equal to the profit maximizing quantity and, in this case, for-profit and non-profit organizations will choose the same quantity. Second, if the manager's marginal utility for a given product is higher than zero, then the quantity in equilibrium is bigger to the profit maximizing quantity and, in this case, the non-profit organization will produce more than the

for-profit because its manager derives positive utility from it. Third, if the manager's marginal utility for a given product is lower than zero, then the quantity in equilibrium is less than the profit maximizing quantity and, in this case, the non-profit organization will produce less than the profit maximizer. Finally, non-profit organizations can cross-subsidize products from which the manager derives positive utility (e.g., products with a social interest) with the profits from those products over which the manager is indifferent (e.g., commercial products).

To sum up, non-profit organization could incur in a loss in one of the products, which would be cross-subsidized by a gain in the other. So, the non-profit organization's involvement in non-mission-related (revenue-generating) activities can not be considered an indicator of pursuit of commercial interests.

Ansari, Siddarth, and Weinberg. (1996) extend James (1983)'s model by allowing the non-profit monopolist to engage in price discrimination strategies. In particular, they compare three alternative price strategies: pure components (sell the different products individually), pure bundling (sell the different products as a package) and mixed bundling (sell the different products either individually or as a package). To do so, they modelled the non-profit organization as obtaining income from both sales (but not donations) and facing a nondeficit constraint. Further, they consider the particular setting of a non-profit classical musical/dance association organizing a series of concerts[5]. They assume that the objective function of the non-profit is to maximize total usage (frequency) or number of users (reach).

The key conclusions of this non-profit pricing model are the following. First, a usage-maximizing non-profit firm charges a lower price and holds more events than a profit-maximizing organization. Second, the non-profit organization takes fixed costs into account when setting prices, since prices are set to (just) cover all

[5] Here, the authors associate the series of concerts as the products sold (Ansari *et al.*, 1996).

costs, including the fixed ones. This characteristic is distinctive from for-profit organizations, for which the fixed costs only determines the decision of whether the organization should enter or not in the market, but not the price charged. Third, when compared with a profit-maximizing firm, there is a reversal in the order of preferred price strategies, with the pure bundling strategy dominating the pure components strategy, even though mixed bundling is the most preferred strategy for both types of organizations.

Steinberg and Weisbrod (2005) extend James (1983)'s cross-subsidization argument. They do so, by focusing not on a cross-subsidization across products, but on a cross-subsidization across consumers, derived from the ability of the non-profit organization to engage in price discrimination strategies. They modelled this organization as obtaining income from both sales and donations (with the latter being exogenous) and facing a nondeficit constraint, but caring about the amount and distribution of consumer surplus. So, the objective function of the non-profit organization is assumed to be the maximization of a convex function of the spectrum of consumer surpluses obtained from provision of a specified single-product to a particular target population.

The key conclusions of this non-profit pricing model are the following. First, the power that the non-profit organization has to price discriminate reduces the need to trade revenue-generation against serving favoured costumer classes. Second, in equilibrium, the marginal value of price adjustments is equated across consumers and at optimal (interior) prices, in order for the customers who have larger welfare weights achieve more consumer surplus, non-profit organization charges a lower price relative to their reservation price. Third, all consumers who are willing to pay at least marginal cost will be supplied. However, if the reservation price of the consumer is lower than marginal cost, the consumer would only consume the good if the same is sufficiently subsidized. So, if the non-profit firm wants to subsidize a consumer, it will do so in a way that the

consumer will receive a larger surplus. Forth, the non-profit organization prices a good at price zero, because some consumers have the reservation prices near zero. This happens because the non-profit organization wants to maximize the consumer surplus. Finally, the most important consumers are the ones with the lowest reservation prices under this objective function, nonetheless, they are the most expensive consumers as they require the largest subsidies. With this they show that price discrimination often arises in equilibrium.

In the end, price discrimination plays multiple roles. First, it defines how much revenue the non-profit firm obtains. Second, it controls which clients will consume its products/services. And last, it shows the distribution of client surpluses among those clients.

3.1.2. Duopoly and non-profit pricing

The literature of monopoly pricing models discussed in the previous sub-section illustrate the principal distinctive features of non-profit pricing. In this sub-section, we turn to competitive situations, more specifically to a duopoly setting that involve the competition between a for-profit and a non-profit organizations. An important reason to account for competition in non-profit pricing is because reality shows us that most non-profits do operate in a competitive environment.

Lien (2002) was one of the first authors to analyse the question of pricing in a duopoly in which a non-profit organization competes with a for-profit organization. He considered a homogeneous product market, modelled the for-profit as obtaining income from sales and being subject to taxation (whenever it obtains a positive profit, i.e., taxation is asymmetric), modelled the non-profit organization as obtaining income from sales (but not donations) and being exempted from taxation, and assumed that the two compete in quantities. He assumed the marginal cost of both organizations to be potentially different and

considered that the for-profit organization maximizes its own profit, while considered two alternative objective functions for the non-profit organization: (i) the maximization of a weighted sum of its own profit and the consumer surplus and, (ii) maximization of a weighted sum of the total surplus.

The key conclusions of this duopoly pricing model considering the first objective function for the non-profit organization are the following. First, tax rate increases imply a decrease in the production of the for-profit organization and an increase (decrease) in the production of the non-profit organization if the weight assigned to the consumer surplus (in the non-profit objective function) is lower (higher) than the weight assigned to its own profit. The overall effect is a reduction in total production and an increase in price. Second, when the non-profit organization assigns more weight to the consumer surplus (in its objective function), its production level will increase while the production level of the for-profit organization will decrease. The overall effect will be an increase in total production and a reduction in price.

The key conclusions considering the second objective function for the non-profit organization are similar to ones discussed above. First, when the tax rate increases, the for-profit organization will reduce its production level whereas the non-profit organization will increase its production. However, the increase in the production level of the non-profit organization would be smaller than the decrease in the production level of the for-profit organization. So, overall, the total production level will decrease and, as a result, the price will increase. Second, when the non-profit organization assigns a higher weight on total surplus, it will expand the production level whereas the for-profit will reduce its production level. Overall, total production will increase and price will reduce.

Although Lien (2002) modelled competition between a non-profit and a for-profit organization, his focus was essentially on comparative statics regarding two particular variables: tax rate and non-profit altruism (measured by the

weight assigned to consumer/total surplus). As such, the question of the impact of non-profit competition on the for-profit organization was disregarded.

Liu and Weinberg (2004) address exactly that question, by examining the degree to which a for-profit's competitive disadvantage, if any, can be attributed to the favourable policy and regulatory treatments received by the similar competing non-profit organization. They considered a differentiated product market (allowing the degree of differentiation and, therefore of competition between the two, to change), modelled the for-profit as obtaining income from sales and being subject to taxation, modelled the non-profit organization as obtaining income from sales and donations (with the latter being the outcome of sales), facing a nondeficit constraint, and being exempted from taxation, and assumed that the two compete in prices. He assumed the marginal cost of both organizations to be the same and considered that the for-profit organization maximizes its own profit, while considered that the non-profit organization maximizes quantity sold.

The key conclusions of this duopoly pricing model are the following. First, the reaction function of the for-profit and the non-profit organizations are different. In a pricing game, the reaction function of the for-profit organization is upward sloping, implying that prices are – from the perspective of the for-profit – strategic complements, while reaction function of the non-profit is downward sloping, implying that prices are – from the perspective of the non-profit – strategic substitutes. Second, in equilibrium, non-profit organizations charge a lower price than for-profit organizations. Third, this difference, decreases as costs increase and/or competition intensifies. Fourth, when compared to a for-profit rival, due to nonprofit's budget constraint, non-profit organizations are more sensitive to changes in cost factors and less sensitive to changes of competitive intensity. Finally, concerning the issue of unfair competition between non-profit and for-profit organizations, a for-profit is much worse competing with a non-

profit rival than with a for-profit rival, even when the non-profit does not receive any policy advantages. What it matters is the nature of the non-profit objective function, and not the policy or regulatory advantages that the non-profit organizations could receive. So, the for-profit organization is put into an unfavourable market position because its profit-maximizing behaviour is intrinsically vulnerable to the competition from a service-maximizing non-profit. As a consequence, the regulatory advantages received by the non-profit are neither decisive nor necessary to induce losses for the for-profit and to enable the non-profit to charge a lower price.

As such, Liu and Weinberg (2004) conclude that does not exist unfair competition between non-profit and for-profit organizations. What happens in a duopoly demand is that the difference in the objective functions is responsible for most of the disadvantage that exists for a for-profit when competing with a non-profit.

Steinberg and Weisbrod (2005) examine a similar question as Liu and Weinberg (2004), but focusing on the impact of for-profit competition on the non-profit organization. To do so, they considered a homogeneous product market, modelled the for-profit as obtaining income from sales, and modelled the non-profit organization as obtaining income from both sales and donations (with the latter being exogenous) and facing a nondeficit constraint, and assumed that the two compete in prices. They disregarded the issue of taxation, assumed the marginal costs of the two organizations to be potentially different, and considered that the for-profit organization maximizes its own profit, while considered that the non-profit organization maximizes a convex function of the spectrum of consumer surpluses obtained from provision of a specified single-product to a particular target population.

The key conclusions of this duopoly pricing model change the results obtained by Steinberg and Weisbrod (2005) for the monopoly setting. And depend on the

assumptions made for donations and marginal costs, if the non-profit obtains no donations and has the same marginal cost as the for-profit, it loses the ability to price discriminate (as a monopoly had) and the equilibrium outcome will be the same as in a perfect competition. So, the non-profit organization should behave like its profit–maximizing competitor. If, however, the non-profit does obtain donations, it will afford limited subsidies to those consumers whose willingness-to-pay is less than marginal cost, but it would not be able to complement those subsidies with revenues from other consumers. Finally, if the marginal cost of the for-profit is greater than the marginal cost of the non-profit, the non-profit could offer high-end consumers a price just below the for-profit marginal cost; yielding those consumers with a bit more surplus than the for-profit would provide, and thereby obtaining additional revenues to finance subsidies to low-end consumers.

3.1.3. Oligopoly and non-profit pricing

In the previous sub-section, we address the literature on competition between for-profit and non-profit organizations in a duopoly setting. In this sub-section, we turn to oligopoly settings that involve at least one non-profit organization.

Rose-Ackerman (1982) try to evaluate if it exists unfair competition between a for-profit and non-profit organizations using a legal analysis. She modelled the non-profit organization as obtaining income from both sales and donations (with the latter being exogenous) and having tax exemption. In particular, the author assumes that the objective function of the non-profit is to maximize the expected profits[6] and assumed that the organizations compete in quantities

The key conclusions of this oligopoly pricing model are the following. First, the legitimacy of injury to for-profit depends on the definition of fairness use and

[6] The objective function is the expected profits because Rose-Ackerman (1982) was analysing if the organizations should or should not enter in the market. To do so, the organization, even a non-profit organization, will only enter in one market if receives a profit.

on a set of factual matters including the market structure of the industry in question, the information available to organizations before they enter, the costs of leaving the industry, and the efficiency of capital markets. Second, Rose-Ackerman (1982, p. 1021) points out that non-profit organizations "are no more likely to engage in predatory pricing than for-profit." For-profit organizations could be damaged without happenings a predation on prices. Third, when the for-profits enter in the market and can anticipate the competition from non-profit organization in their initial commitment to the industry, the firm would have included that fact in their calculations of expected returns and made their decision to invest in that industry accordingly to that. So, no claims of unfairness can be substantiated even if exit is difficult. Fourth, Rose-Ackerman (1982, p. 1027 and 1029) shows that in a competitive economy:

> "the marginal firms earn no excess "economic" profits, and hence the tax treatment of profits would be irrelevant. For-profit firms would be indifferent to the tax status of their competitors, and no issue of "unfair" competition would arise." And "Since nonprofits control only a small proportion of the economy's resources, one would not expect them to be able to push returns down much below ordinary competitive rates if their funds were evenly spread across the economy."

Fifth, when non-profits compete with for-profits organizations in an oligopolistic market, the organization's tax status may affect its marginal choices, and a tax-exempt organization may have a higher output and a larger effect on market price than a tax-paying organization. Because of that, the prices could be inferior if one of the competitors is a non-profit organization. Finally, as the level of output of the for-profit organization is lower than the level of output of the non-profit organization, a for-profit organization is better off when its competitor is another for-profit organization rather than a non-profit organization.

In a more recent research Rose-Ackerman (1990, p. 13) introduces a different vision for the unfair competition: "the non-profits may have an advantage which

reflects not "unfair competition" but a judgement that their activities are worthy of subsidy."

Lakdawalla and Philpson (2006) with a different approach to this subject predict a competition in quantities where for-profits are modelling as obtaining income from sales and non-profits are modelling as obtaining income from both sales and donations (with the latter being exogenous) and being exempted from taxation, and assumed that the both organizations sell homogenous products. The authors assumed the marginal cost of for-profit and non-profit organizations are different and where the non-profit organization has a cost advantage and considered that organizations maximizes utility function derives from his owner goods consumption (y) as well as their inputs and outputs ($x\ and\ q$) of the firm ($U(y, x, q)$) subject to the constraint that consumption and input costs must be covered by his wealth and sales. If the utility for the owner is to maximize his financial return, then the owner will invest in a for-profit organization. On the other hand, if the utility for the owner is to maximize his nonpecuniary motives, then the owner will invest in a non-profit organization.

The key conclusions of this oligopoly pricing model are the following. First, with the firm's preference for quantity (q) it is possible to sell more quantity at a reduced marginal revenues[7]. And because of the tax exemption, non-profit has the ability to produce more output. Second, if non-profit organization assumes consumer surplus as an altruism indicator, the organizations who choose this status will earn a competitive advantage over similar for-profit organizations, as altruism makes this type of organizations agreeable to sell output at a lower price. So, non-profit organizations are more willing to pricing a lower price compare to their similar competing for-profit organizations. Third, in the short-run, non-profit regulations may impact an industry because of their effect on the for-profit sector and, in particular, through their impact on the entry and exit of

[7] Lakdawalla and Philpson (2006) call this marginal revenues as the 'effective' marginal cost.

for-profit organizations. Although, in the long-run, the market will behave as if there exists only profit-maximizers and regulations will have no impact on industry behaviour when supply is perfectly elastic. Finally, if the wealth of consumers increases, then it will raise demand and for-profit organizations' share. Nevertheless, if is the wealth of producers that increase, then what will raise is the non-profit organizations' share, because it makes nonpecuniary businessmen more willing to produce, while leaving for-profit behaviour unaffected.

3.2. Public organizations

This section seeks to review the literature on the competition between public and private organizations, to highlight the difference towards the results established by the literature on the competition between for-profit and non-profit organizations.

Fraja and Delbono (1989) were one of the first authors to analyse the competition between public and private organizations. In particular, they examine the impact of public organizations on market outcomes in order to evaluate if it is socially optimal to have public organization and, if so, how many. To do so, they considered a homogeneous commodity market, modelled both types of organizations as obtaining income from sales, and assumed that the organizations compete in quantities. They assumed that the marginal costs from both organizations are the same, and considered that private organizations maximize their own profit, while considered that public organizations maximize social welfare.

The key conclusions of their pricing model are the following. First, only with the nationalization of the whole industry can we reach to a situation of complete efficiency. Second, no organization will produce if the marginal cost is higher than the market price. Third, when the public organization competes with private organizations it exists a trade-off to the public organization, which we can explain as, with more competition, it exists a positive impact by reducing the distance between price and marginal cost (which increases the social welfare). However, it exists a negative impact due to the presence of the fixed costs (which decreases the social welfare). Finally, comparing to an oligopoly market when all organizations are profit maximizers, the public organization produces more and the private organizations produce less. When, in this oligopolistic market, the number of organizations competing is close to the optimal one, the public organization should maximize its profit instead of maximize the social welfare.

In this optimal case, if the public organization tries to improve social welfare it will lead to a worst situation than if the public organization had acted as a profit maximizator. In this case it is better not to have the public organization. This result will be reversed by Cremer, Marchand, and Thisse (1989).

Cremer, *et al* (1989) examine a similar question to Fraja and Delbono (1989). To do so, they considered a homogeneous product market, modelled both types of organizations as obtaining income from sales, modelled the public organizations as facing a nondeficit constraint, and assumed that the organizations compete in quantities. They assumed that public organizations have higher marginal costs (resulting e.g. from paying a premium to their workers), and considered that private organizations maximize their own profit, while considered that public organizations maximize total surplus.

The key conclusions of their pricing model are the following. First, if the marginal cost difference between public and private organizations is not too large, the socially optimal market configuration is to have a single public organization in the industry. This implies that if the industry is made up of only private organizations, the nationalization of a single organization is the socially best policy and that if the industry is made up of several public organizations, the privatization of all but one of the public organizations is the socially best policy. Second, if the marginal cost difference between public and private organizations is large, the socially optimal market configuration is to have only public organizations in the industry, which is politically unrealistic.

Anderson, de Palma, and Thisse (1997) examine a similar question from the previous studies. To do so, they considered a differentiated product market, modelled both types of organizations as obtaining income from sales, modelled the public organizations as facing a nondeficit constraint, and assumed that the organizations compete on prices. They assumed that the marginal cost for both organizations are equal, and considered that private organizations maximize

their own profit anticipating the prices of all other organizations, while considered that public organizations maximize social surplus anticipated the prices of the private organizations.

The key conclusions of their pricing model are the following. First, in equilibrium the prices are no longer equal across organizations due to the presence of the public organization. Second, despite of using a price competition, the prices charged for both organizations are higher than the marginal cost. This is because organizations have market power due to the product differentiation[8]. Third, despite of the organizations set a price higher than the marginal cost, even though, the public organization sets an equilibrium price lower than the equilibrium price of the private organizations[9]. Forth, with a public organization the equilibrium price for the for-profit organizations will be lower than in a purely private oligopoly. Finally, in the short run, with privatization the prices will rise which will cause a decrease in the consumer surplus. So, privatization is harmful for the society.

To sum up, when a public organization is elucidated to price in order to maximize its impact to social welfare and if the others organizations in the industry have some market power, a public organization will usually set its price lower than if it were private, since it is not concerned just about profits but also about consumer surplus. The lower price leads the other organizations to lower their prices too, and to a further rise in consumer benefits and the social surplus as a whole. So, the authors conclude that a nationalization has a beneficial role to the society, and hence that privatization would not be desirable.

From the analysis we can perceive that the competition characteristics between one for-profit and one non-profit organizations are different from the

[8] The public firm wants a lower price to increase consumer benefits. However, because the objective function of the public firm is to maximize social surplus, public firms also cares about the profits from for-profit firms.

[9] This happens because public firm cares about consumer surplus whereas the private firms do not.

competition characteristics between private and public organizations. As the characteristics of the competition are different we will have to modelize the different markets in a different way.

	Monopoly	**Duopoly**	**Oligopoly**
Non-profit organizations	• James (1983) • Weinberg (1984) • Ansari *et al* (1996) • Steinberg and Weisbrod (2005)	• Lien (2002) • Liu and Weinberg (2004) • Steinberg and Weisbrod (2005)	• Rose-Ackerman (1982) • Lackwalla and Philipson (2006)
Public organizations			• Fraja and Delbono (1989) • Cremer *et al* (1989) • Anderson *et al* (1997)

Table 1: Summary of the different thoughts.

Chapter 2:
Theoretical Framework

We propose to contribute to the literature on for-profit and non-profit competition by examining the degree to which a for-profit's competitive disadvantage, if any, can be attributed to the favourable policy and regulatory treatments received by the similar competing non-profit organization in the lines of Liu and Weinberg (2004). To do so, we propose a theoretical model of competition that incorporates the following characteristics of for-profit and non-profit organizations: (i) for-profit organizations maximize profit, (ii) for-profit organizations are subject to profit taxation, (iii) the key source of income of for-profit organizations is obtained from sales, (iv) non-profit organizations maximize output, (v) non-profit organizations are exempted from profit taxation, (vi) non-profit organizations face a budget constraint and can not run negative profits, and (vii) the key source of income of non-profit organizations is obtained from sales and contributions, with the latter being the result of costly fundraising activities. In particular, we propose to compare the outcome equilibrium decisions that arise from this theoretical model under competition between for-profit and non-profit organizations with the outcome equilibrium decisions that arise under competition between two for-profit organizations.

We assume two different competition models. First, we consider, as Lien (2002) and Lakdawalla and Philpson (2006), that organizations compete in quantities[10]. Second, we consider, as Liu and Weinberg (2004) and Steinberg and Weisbrod (2005), that organizations compete in prices[11].

[10] This competition in quantities assumes that an organization determines its quantity while price is determined by some unspecified agent so that market demand equals market supply.

[11] This competition in prices assume that a firm determines the price at which it sells its output and is meets the resulting customer demand.

1. Setup

We consider a market with two organizations, each of which produces a homogeneous product. Consumers can purchase from both organizations and, as such, aggregate demand is the sum of the quantity offered by firm 1 and the quantity offered by firm 2:

$$Q = q_1 + q_2,$$

where Q denotes the aggregate demand for the product, q_1 represents the quantity offered by the organization 1, and q_2 represents the quantity offered by the organization 2.

We assume that the demand function is downward sloping, as follows:

$$Q = a - bP,$$

where P indicates its price, $a > 1$ reflects the market dimension[12], and b[13] denotes consumer price sensitiveness. This demand function implies that consumers' willingness to pay is given by:

$$P = a - Q,$$

which establishes the maximum amount that a buyer is willing to pay for any given quantity.

[12] As a increases, the aggregate quantity increases for a given price.

[13] Without loss of generality, we will assume that $b = 1$.

1.1. For-profit organizations

As discussed above, we assume that for-profit organizations are subject to profit taxation and obtain their key source of income from sales. These characteristics are translated, in the lines of Liu and Weinberg (2004), in the following profit function for the for-profit organization i:

$$\pi_{i_{FP}} = (1-t)\big(P(Q)q_i - TC_{i_{FP}}\big),$$

where $\pi_{i_{FP}}$ represents the profit of for-profit organization i, t represents the tax rate, and $TC_{i_{FP}}$ represents the total costs of for-profit organization i.

We assume that the total cost of for-profit organization i can be represented by a linear function between the fixed costs and the variable costs of the organization, as follows:

$$TC_{i_{FP}} = c + dq_i,$$

where c and d represent the fixed and marginal costs of for-profit organization i, respectively. In order to simplify the analysis, we assume that $c = d = 0$.

1.2. Non-profit organizations

As discussed above, we assume that non-profit organizations are exempted from profit taxation and obtain their key source of income from sales and contributions, with the latter being the result of costly fundraising activities. These characteristics are translated, in the lines of Weinberg (1984), in the following profit function for the non-profit organization i:

$$\pi_{i_{NP}} = \big(P(Q)q_i + C(F_i) - TC_{i_{NP}}\big),$$

where $\pi_{i_{NP}}$ represents the profit of non-profit organization i, $C(F_i)$ represents the donation response to the fundraising expense F_i of non-profit organization i, and $TC_{i_{NP}}$ represents the total costs of non-profit organization i.

We assume, as Steinberg (1986), that the donation response to the fundraising expense F_i of non-profit organization i can be given by:

$$C(F_i) = \delta F_i - {F_i}^2,$$

where $\delta > 1$ denotes the donation response to fundraising expense F_i. With this fundraising function we are showing that non-profit organizations are only willing to solicit donations up to the point where fundraising expense no longer helps improve their objective function (Liu and Weinberg, 2009). Further, we assume that the total costs of non-profit organization i can be represented by a linear function between the fixed costs, the variable costs and the fundraising expense of the organization, as follows:

$$TC_{i_{NP}} = c + dq_i + F_i,$$

where, as before, c and d represent the fixed and marginal costs of non-profit organization i, respectively. Again, in order to simplify the analysis, we assume that $c = d = 0$.

Chapter 3:
Equilibrium Outcomes

In this section, we will solve the Nash-equilibrium outcomes for the model described in the previous section. To do so, we propose to maximize the objective functions of both for-profits and non-profits organizations. We will then solve the system of first order conditions to determine Nash-equilibrium prices and quantities for the two types of organizations, as well as the Nash-equilibrium expenses of fundraising for the non-profit organization.

As discussed above, we propose to solve the Nash-equilibrium outcomes for markets with two for-profit organizations and for markets with one for-profit and one non-profit organizations. The purpose is to compare the Nash-equilibrium outcomes of the two markets to conclude if there is, in fact, unfair competition from the non-profit organization. We begin by addressing the case in which organizations compete in quantities and then address the case in which organizations compete in prices.

1. Competition in quantities

We begin by examining the case of markets with two for-profit organizations. In doing so, we assume that there is no cooperation between the organizations, so each searches to maximize its profits taking the decision of the competitor organization as a given.

1.1. For-profit markets

In markets with two for-profit organizations, the Nash-equilibrium outcomes are the solution to the following problem:

$$Max_{q_1}\pi_{1_{FP}} = (1-t)P(Q)q_1,$$
$$Max_{q_2}\pi_{2_{FP}} = (1-t)P(Q)q_2.$$

The first order conditions associated to this problem are given by:

$$\frac{\partial \pi_{1_{FP}}}{\partial q_1} = 0 \iff (1-t)(a-2q_1-q_2) = 0,$$
$$\frac{\partial \pi_{2_{FP}}}{\partial q_2} = 0 \Leftrightarrow (1-t)(a-q_1-2q_2) = 0.$$

We can perceive the trade-off that exists. When quantity increases, the profit of a for-profit organization increases by an amount equal to the market price of the product: $P = a - q_1 - q_2$. However, the increase on the quantity offered affects the price. As the quantity offered increases, the market price decreases by one unit. This decrease will affect the revenues from the quantity previously sold in the market, which causes a decrease in the profit of the organization.

As the characteristics of the organizations are similar, the Nash-equilibrium quantities will be symmetric. As a consequence, the Nash-equilibrium is unique and equal to:

$$q^*_{1_{FP}} = \frac{1}{3}a,$$

and,

$$q^*_{2_{FP}} = \frac{1}{3}a.$$

As the aggregated quantity sold is the summation of the quantity sold by both organizations, we have that:

$$Q^*_{FP} = q^*_1 + q^*_2 = \frac{2}{3}a.$$

Thus, we can substitute the Nash-equilibrium quantity in the inverse demand function. This yields the Nash-equilibrium market price:

$$P^*_{FP} = a - Q^*_{FP} = a - \frac{2}{3}a = \frac{1}{3}a.$$

Now, we can substitute the Nash-equilibrium quantity and price in the profits of both organizations. This yields that the Nash-equilibrium market profits are given by:

$$\pi^*_{1_{FP}} = (1-t)P(Q)q_1 = (1-t)\left(\frac{1}{3}a.\frac{1}{3}a\right) = \frac{1}{9}(1-t)a^2,$$

and,

$$\pi^*_{2_{FP}} = (1-t)P(Q)q_2 = (1-t)\left(\frac{1}{3}a.\frac{1}{3}a\right) = \frac{1}{9}(1-t)a^2.$$

From these results, we can compute the Nash-equilibrium wellbeing of consumers and the society as a whole, measured by the consumer surplus and the total surplus, respectively.

The consumer surplus is the difference between the maximum value that consumers are willing to pay for that quantity and the amount actually paid. That is, it is a measure of the net benefit of the group of consumers who purchase the product at the market price, as a result of the consumption of the product. This yields:

$$CS^*_{FP} = \frac{1}{2}.\frac{2}{3}a.\left(a - \frac{1}{3}a\right) = \frac{2}{9}a^2.$$

The total surplus is the sum of the consumer surplus, the producer surplus (which is equal to the sum of the profits of both organizations) and the taxes collected by the government. It constitutes a measure of the wellbeing attainable in the market. This yields:

$$TS_{FP}^{*} = CS_{FP}^{*} + \pi_{1_{FP}}^{*} + \pi_{2_{FP}}^{*} + taxes = \frac{2}{9}a^2 + \frac{2}{9}(1-t)a^2 + \frac{2}{9}ta^2 = \frac{4}{9}a^2.$$

1.2. Markets in which for-profit and non-profit coexist

In markets in which one for-profit organization competes with one non-profit organization, the Nash-equilibrium outcomes are the solution to the following problem:

$$Max_{q_1}\pi_{1_{NP}} = (1-t)P(Q)q_1$$
$$Max_{F_2,q_2}q_2$$
$$subject\ to\ \pi_{2_{NP}} \geq 0.$$

For the non-profit organization, we have a constraint of nondeficit. This implies that in order to perform the maximization, we need to compute the Lagrange function, which is defined by:

$$\mathcal{L}(F_2, q_2, \lambda) = q_2 - \lambda\big(P(Q)q_2 + \delta F_2 - {F_2}^2 - F_2\big).$$

The first order conditions associated to the for-profit and non-profit problem are given by:

$$\frac{\partial \pi_{1_{NP}}}{\partial q_1} = 0 \Leftrightarrow\ (1-t)(a - 2q_1 - q_2) = 0,$$
$$\frac{\partial \mathcal{L}_{NP}}{\partial q_2} = 0 \Leftrightarrow\ a\lambda - \lambda q_1 - 2\lambda q_2 + 1 = 0,$$

Here, we can conclude, as in the previous section, that quantity decisions involve a trade-off. The explanation for the for-profit is similar to the one discussed above. For the non-profit organization when the quantity offered increases, this implies that the profit increases by an amount equal to the market price of the product: $P = a - q_1 - q_2$, which will meet the nondeficit constraint. However, the increase on the quantity offered affects the price. As the quantity offered increases, the market price decreases by one unit. This decrease will affect the revenues from the quantity previously sold in the market, which causes a decrease in the profit of the organization and could not meet the nondeficit constraint.

$$\frac{\partial \mathcal{L}}{\partial F_2} = 0 \Leftrightarrow -\lambda(2F_2 - \delta + 1) = 0,$$

$$\frac{\partial \mathcal{L}}{\partial \lambda} = 0 \Leftrightarrow F_2\delta - F_2 + aq_2 - q_2^2 - q_1q_2 - {F_2}^2 = 0.$$

Further, there also exists a trade-off involving fundraising expenses. When the fundraising expenses increase, there is an effect on revenue (and consequently, on profit), since there is an increase in donations by $(\delta - 2F)$. However, the increase in fundraising expenses also affects the costs of the organization, decreasing the profits of the non-profit organization.

The Nash-equilibrium quantity is unique and it is given by:

$$F_{NP}^* = \frac{1}{2}\delta - \frac{1}{2},$$

$$q_{1_{NP}}^* = \frac{1}{4}a - \frac{1}{4}\sqrt{a^2 + 2(\delta - 1)^2},$$

and,

$$q_{2_{NP}}^* = \frac{1}{2}a + \frac{1}{2}\sqrt{a^2 + 2(\delta - 1)^2}.$$

The aggregated quantity sold is the summation of the quantity sold by both organizations, given by:

$$Q_{NP}^* = q_{1_{NP}}^* + q_{2_{NP}}^* = \frac{3}{4}a + \frac{1}{4}\sqrt{a^2 + 2(\delta - 1)^2}.$$

Thus, we can substitute the Nash-equilibrium quantity in the inverse demand function. This yields the following Nash-equilibrium market price:

$$P_{NP}^* = a - Q_{NP}^* = a - \left(\frac{3}{4}a + \frac{1}{4}\sqrt{a^2 + 2(\delta - 1)^2}\right) = \frac{1}{4}a - \frac{1}{4}\sqrt{a^2 + 2(\delta - 1)^2}.$$

Now, we can substitute the Nash-equilibrium quantity and price in the profits of both organizations. This yields that the Nash-equilibrium market profits are given by:

$$\begin{aligned}\pi_{1_{NP}}^* &= (1 - t)P(Q)q_1 \\ &= (1 - t)\left(\left(\frac{1}{4}a - \frac{1}{4}\sqrt{a^2 + 2(\delta - 1)^2}\right).\left(\frac{1}{4}a - \frac{1}{4}\sqrt{a^2 + 2(\delta - 1)^2}\right)\right) \\ &= \frac{1}{16}\left(-a + \sqrt{a^2 + 2(\delta - 1)^2}\right)^2 (1 - t),\end{aligned}$$

and,

$$\pi^*_{2_{NP}} = P(Q)q_2 + \delta F_2 - {F_2}^2 - F_2$$
$$= \left(\frac{1}{4}a - \frac{1}{4}\sqrt{a^2 + 2(\delta-1)^2}\right)\left(\frac{1}{2}a + \frac{1}{2}\sqrt{a^2 + 2(\delta-1)^2}\right)$$
$$+ \delta\left(\frac{1}{2}\delta - \frac{1}{2}\right) - \left(\frac{1}{2}\delta - \frac{1}{2}\right)^2 - \left(\frac{1}{2}\delta - \frac{1}{2}\right) = 0.$$

As discussed above, for the competition between two for-profit organizations, we can now derive the Nash-equilibrium consumer surplus and total surplus, as follows:

$$CS^*_{NP} = \frac{1}{2}\left(a - \left(\frac{1}{4}a - \frac{1}{4}\sqrt{a^2 + 2(\delta-1)^2}\right)\right).\left(\frac{3}{4}a + \frac{1}{4}\sqrt{a^2 + 2(\delta-1)^2}\right)$$
$$= \frac{1}{32}(\sqrt{a^2 + 2(\delta-1)^2} + 3a)^2,$$

and,

$$TS^*_{NP} = CS^*_{NP} + \pi^*_{1_{NP}} + \pi^*_{2_{NP}} + taxes$$
$$= \frac{1}{32}(\sqrt{a^2 + 2(\delta-1)^2} + 3a)^2$$
$$+ \frac{1}{16}\left(-a + \sqrt{a^2 + 2(\delta-1)^2}\right)^2(1-t) + 0$$
$$+ \frac{1}{16}t\left(a - \sqrt{a^2 + 2(\delta-1)^2}\right)^2 = \frac{3}{16}(\delta-1)^2 + \frac{7}{16}a^2.$$

1.3. Comparison

We can now compare the results for the two markets.

Proposition 1: $Q_{FP}^{*} = \frac{2}{3}a < Q_{NP}^{*} = \frac{3}{4}a + \frac{1}{4}\sqrt{a^2 + 2(\delta - 1)^2}$.

When organizations compete in quantities, the Nash-equilibrium aggregated quantity is always higher in the situation when one for-profit competes with one non-profit organization comparing to the situation when two for-profit compete.

Proposition 2: $P_{FP}^{*} = \frac{1}{3}a > P_{NP}^{*} = \frac{1}{4}a - \frac{1}{4}\sqrt{a^2 + 2(\delta - 1)^2}$.

When organizations compete in quantities, the Nash-equilibrium price is always smaller in the situation when one for-profit competes with one non-profit organization comparing to the situation when two for-profit compete.

Proposition 3: $CS_{FP}^{*} = \frac{2}{9}a^2 < CS_{NP}^{*} = \frac{1}{32}(\sqrt{a^2 + 2(\delta - 1)^2} + 3a)^2$.

When organizations compete in quantities, the Nash-equilibrium consumer surplus is always higher in the situation when one for-profit competes with one non-profit organization comparing to the situation when two for-profit compete.

Proposition 4: $TS_{FP}^{*} = \frac{4}{9}a^2 < TS_{NP}^{*} = \frac{3}{16}(\delta - 1)^2 + \frac{7}{16}a^2$.

When organizations compete in quantities, the Nash-equilibrium total surplus is always higher in the situation when one for-profit competes with one non-profit organization comparing to the situation when two for-profit compete.

Proposition 5: $\pi_{1_{FP}}^{*} = \frac{1}{9}(1 - t)a^2 < \pi_{1_{NP}}^{*} = \frac{1}{16}\left(-a + \sqrt{a^2 + 2(\delta - 1)^2}\right)^2 (1 - t)$, when:

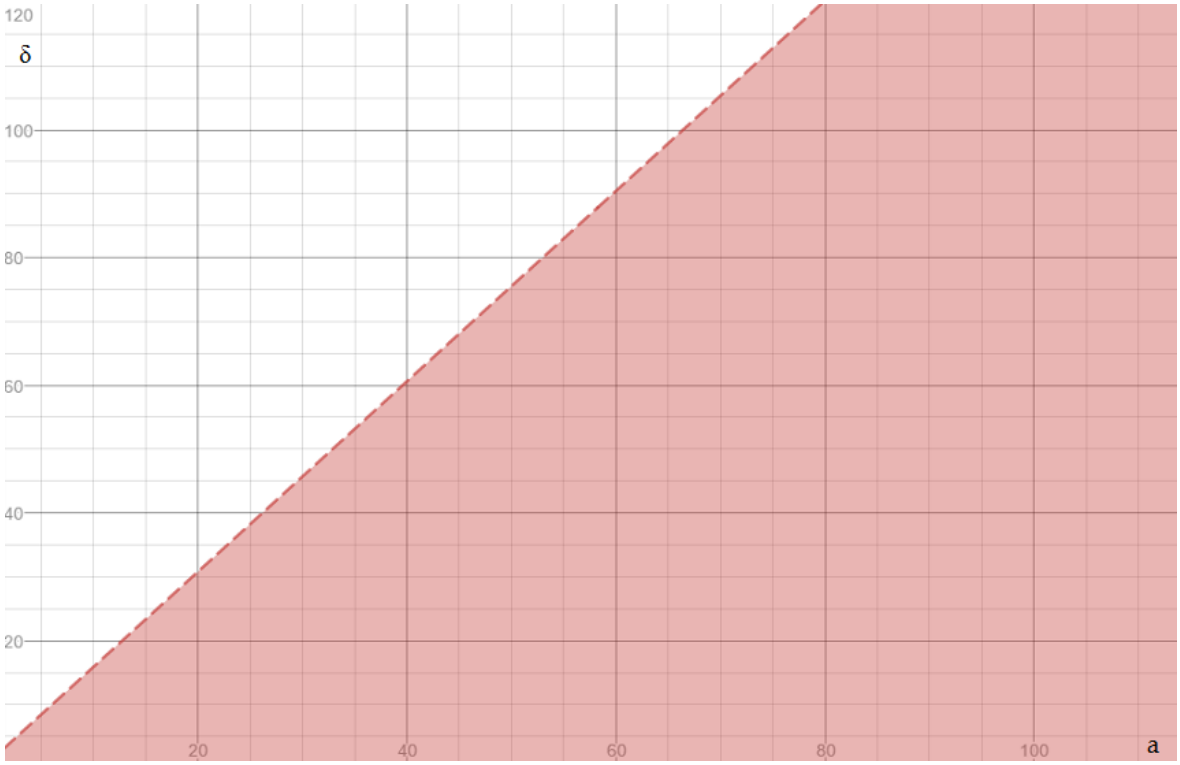

Figure 1: Profit of the for-profit organization.

When organizations compete in quantities, the Nash-equilibrium profit for the for-profit organization can be higher or lower in the situation when one for-profit competes with one non-profit, as displayed in Figure 1. For the values of a and δ comprised in the red region of the Figure 1, the profit obtained from the for-profit organization is higher when competing with a non-profit organization than when competing with a for-profit organization, whereas for the values comprised in the white region, the profit obtained from the for-profit organization is smaller when competing with a non-profit organization than when competing with a for-profit.

2. Competition in prices

We now address the case in which organizations compete in prices. As before, we begin by examining the case of markets with two for-profit organizations. In doing so, we assume that there is no cooperation between the organizations, so each searches to maximize its profits taking the decision of the competitor firm as a given.

2.1. For-profit markets

In markets with two for-profit organizations, the Nash-equilibrium outcomes are the solution to the following problem:

$$Max_{p_1}\pi_{1_{FP}} = (1-t)p_1q_1,$$
$$Max_{p_2}\pi_{2_{FP}} = (1-t)p_2q_2$$

where the demand for the output is given by:

$$q_1 = \begin{cases} q_1 = Q & if\ p_1 < p_2 \\ q_1 = 0 & if\ p_1 > p_2 \\ q_1 = \dfrac{Q}{2} & if\ p_1 = p_2 \end{cases},$$

and,

$$q_2 = \begin{cases} q_2 = Q & if\ p_2 < p_1 \\ q_2 = 0 & if\ p_2 > p_1 \\ q_2 = \dfrac{Q}{2} & if\ p_2 = p_1 \end{cases}.$$

As we are maximizing with respect to price, we can not take the first-order conditions because the demand function of each organization is not continuous. So, we are going to proceed as follows[14]:

- Could $p^*_{1_{FP}} > p^*_{2_{FP}} > 0$ be a Nash-equilibrium? Organization 1 would not sell any quantity because all consumers would go to the organization with the smallest price (organization 2). This could not be a Nash-equilibrium because organization 1's best response to $p^*_{2_{FP}}$ is not $p^*_{1_{FP}}$ but

[14] Recall that the marginal cost of both firms is assumed, without loss of generality, to be zero.

$p'_{1_{FP}} = p^*_{2_{FP}} - \varepsilon$, where ε is a small infinitesimal variation, yielding a profitable deviation for organization 1 (the profit of organization 1 would be positive and the profit for organization 2 would be zero, since in this case it would lose all the demand).

- Could $p^*_{1_{FP}} = p^*_{2_{FP}} > 0$ be a Nash-equilibrium? In this case, the two organizations share the market equally, yielding a profit higher than zero. This could not be a Nash-equilibrium because the best response for firm 1 to $p^*_{2_{FP}}$ is not $p^*_{1_{FP}}$ but $p'_{1_{FP}} = p^*_{2_{FP}} - \varepsilon$, yielding a profitable deviation for organization 1 that will capture all the demand (the profit of organization 1 would be positive and the profit for organization 2 would be zero). The same is true for organization 2.
- Could $p^*_{1_{FP}} > p^*_{2_{FP}} = 0$ be a Nash-equilibrium? In this case, organization 1 would not sell any quantity because all the consumers would go to the organization offering the smallest price (organization 2). This could not be a Nash-equilibrium because organization 2's best response to $p^*_{1_{FP}}$ is not $p^*_{2_{FP}}$ but $p'_{2_{FP}} = p^*_{1_{FP}} - \varepsilon$, yielding a profitable deviation for organization 2 that would still capture all the demand and obtain a positive profit.
- Could $p^*_{1_{FP}} = p^*_{2_{FP}} = 0$ be a Nash-equilibrium? In this case, the two organizations share the market equally with a zero profit. This constitute the unique Nash-equilibrium since no organization has an incentive to unilaterally deviate from it. If organization 1 decreases price, it will make a loss because it is pricing below marginal cost. Similarly, if organization 1 increases the price, it will make a loss since it would lose all the demand for organization 2. The same is true for organization 2.

The Nash-equilibrium prices would be given by:

$$p^*_{1_{FP}} = p^*_{2_{FP}} = 0$$

As a consequence,

$$q^*_{1_{FP}} = \frac{a}{2},$$

and,

$$q^*_{2_{FP}} = \frac{a}{2},$$

yielding that the Nash-equilibrium aggregated quantity is given by:

$$Q^*_{FP} = a.$$

Now, we can substitute the Nash-equilibrium quantity and price in the profit functions for both organizations. This yields that the Nash-equilibrium profits are given by:

$$\pi^*_{1_{FP}} = (1-t)P(Q)q_1 = (1-t)\left(0.\left(\frac{a}{2}\right)\right) = 0,$$

and,

$$\pi^*_{2_{FP}} = (1-t)P(Q)q_2 = (1-t)\left(0.\left(\frac{a}{2}\right)\right) = 0.$$

From this results, we can derive the consumer surplus and the total surplus, as follows:

$$CS^*_{FP} = \frac{1}{2}.a.a = \frac{1}{2}a^2,$$

and,

$$TS^*_{FP} = CS^*_{FP} + \pi^*_{1_{FP}} + \pi^*_{2_{FP}} + taxes = \frac{1}{2}a^2 + 0 + 0 + 0 = \frac{1}{2}a^2.$$

2.2. Markets in which for-profit and non-profit coexist

In markets in which one for-profit organization competes with one non-profit organization, the Nash-equilibrium outcomes are the solution to the following problem:

$$Max_{p_1}\pi_{1_{NP}} = (1-t)p_1q_1$$

$$Max_{F_2,p_2}q_2$$

$$subject\ to\ \pi_{2_{NP}} \geq 0.$$

where the demand for the output is given by:

$$q_1 = \begin{cases} q_1 = Q & if\ p_1 < p_2 \\ q_1 = 0 & if\ p_1 > p_2 \\ q_1 = \dfrac{Q}{2} & if\ p_1 = p_2 \end{cases},$$

and,

$$q_2 = \begin{cases} q_2 = Q & if\ p_2 < p_1 \\ q_2 = 0 & if\ p_2 > p_1 \\ q_2 = \dfrac{Q}{2} & if\ p_2 = p_1 \end{cases}.$$

As we are maximizing with respect to price, we can not take the first-order conditions because the demand function of each organization is not continuous. We only can take the first order conditions of F and λ. Those first-order conditions are the same as we already demonstrate earlier in the quantity competition. So,

$$\frac{\partial \mathcal{L}}{\partial F} = 0 \Leftrightarrow -\lambda(2F - \delta + 1) = 0,$$

$$\frac{\partial \mathcal{L}}{\partial \lambda} = 0 \Leftrightarrow\ F\delta - F + aq_2 - q_2^2 - q_1q_2 - F^2 = 0.$$

Resolving those first order conditions we can derive that the fundraising expenses are:

$$F_{NP}^{*} = \frac{1}{2}\delta - \frac{1}{2}.$$

Though, as we can not deduct the first order conditions of the price we are going to proceed as prove follows[15]:

- Could $p^*_{1_{NP}} > p^*_{2_{NP}} > 0$ be a Nash-equilibrium? Organization 1 would not sell any quantity because all consumers would go to the organization with the smallest price (organization 2). This could not be an Nash-equilibrium because organization 1's best response to $p^*_{2_{NP}}$ is not $p^*_{1_{NP}}$ but $p'_{1_{NP}} = p^*_{2_{NP}} - \varepsilon$, where ε is a small infinitesimal variation, yielding a profitable deviation for organization 1 (the profit of organization 1 would be positive).
- Could $p^*_{1_{NP}} = p^*_{2_{NP}} > 0$ be a Nash-equilibrium? In this case, the two organizations share the market equally, yielding a profit higher than zero. This could not be an Nash-equilibrium because the best response for firm 1 to $p^*_{2_{NP}}$ is not $p^*_{1_{NP}}$ but $p'_{1_{NP}} = p^*_{2_{NP}} - \varepsilon$, yielding a profitable deviation for organization 1 that will capture all the demand (the profit of organization 1 would be positive and the profit for organization 2 would be zero). However, in this case, the objective function of organization 2 is not the maximization of the profit but the maximization of the quantity sold. So, organization 2, will decrease the price in order to sell more quantity. In this case, organization 2 has the possibility of charge a price less than the marginal cost because it receives the donations. So, it is possible for the non-profit organization charging a price less than the marginal cost and still have a nonnegative profit. However, organization 1 will only stay in the market until the price equals the marginal cost.
- Could $p^*_{1_{NP}} > p^*_{2_{NP}} = 0$ be a Nash-equilibrium? In this case, organization 1 would not sell any quantity because all the consumers would go to the organization offering the smallest price (organization 2). As organization 2 seeks to maximize the quantity sold and have the possibility of charges a price less than the marginal cost this could not be a Nash-equilibrium because organization 2's best response is to decrease the price until zero profit in order to sell more output.
- Could $p^*_{1_{NP}} = p^*_{2_{NP}} = 0$ be a Nash-equilibrium? In this case, the two organizations share the market equally. However, the organization 2 has a different objective function comparing to the organization 1. The objective function of organization 2 is the maximization of quantity restrict to a nondefict constraint. In this case, and because organization 2 receives donations, the organization 2 can improve the quantity sold in the market

[15] Recall that the marginal cost of both firms is assumed, without loss of generality, to be zero.

and have a nonnegative profit. So, there exist an incentive to organization 2 to deviate from this result. So, we conclude that this solution is not a Nash-equilibrium.

- So, the only Nash-equilibrium that exist is when organization 2 sell at a price less than the marginal cost but always have in consideration the nondeficit budget constraint. At that price, organization 1 won't to be able to compete with organization 2, so the best response to organization 1 is leave the market and receive a zero profit rather than a loss. We conclude that the Nash-equilibrium is $p^*_{1_{NP}} = 0 > p^*_{2_{NP}}$.

The Nash-equilibrium prices would be given by:

$$p^*_{1_{NP}} = a - Q^*_{NP} = 0,$$

and

$$p^*_{2_{NP}} = \frac{1}{2}a - \frac{1}{2}\sqrt{(a^2 + (\delta - 1)^2)}.$$

As a consequence, as the price is negative the for-profit organization will decide not to produce, so:

$$q^*_{1_{NP}} = 0,$$

and

$$q^*_{2_{NP}} = a - P^*_{2_{NP}} = \frac{1}{2}a + \frac{1}{2}\sqrt{a^2 + (\delta - 1)^2}.$$

yielding that the Nash-equilibrium aggregated quantity is given by:

$$Q^*_{NP} = q^*_{1_{NP}} + q^*_{2_{NP}} = \frac{1}{2}a + \frac{1}{2}\sqrt{a^2 + (\delta - 1)^2}.$$

Now, we can substitute the Nash-equilibrium quantity and price in the profit functions for both organizations. This yields that the Nash-equilibrium profits are given by:

$$\pi^*_{1_{NP}} = 0,$$

and

$$\pi^*_{2_{NP}} = 0.$$

As discussed above, for the competition between two for-profit organizations, we can now derive the Nash-equilibrium consumer surplus and total surplus, as follows:

$$CS^*_{NP} = \frac{1}{2}.\left(\frac{1}{2}a + \frac{1}{2}\sqrt{a^2 + (\delta - 1)^2}\right).\left(\frac{1}{2}a + \frac{1}{2}\sqrt{a^2 + (\delta - 1)^2}\right)$$

$$= \frac{1}{4}a^2 + \frac{1}{4}a\sqrt{a^2 + (\delta - 1)^2} + \frac{1}{8}(\delta - 1)^2,$$

and,

$$TS^*_{NP} = CS^*_{NP} + \pi^*_{1_{NP}} + \pi^*_{2_{NP}} + taxes$$

$$= \frac{1}{4}a^2 + \frac{1}{4}a\sqrt{a^2 + (\delta - 1)^2} + \frac{1}{8}(\delta - 1)^2 + 0 + 0 + 0$$

$$= \frac{1}{4}a^2 + \frac{1}{4}a\sqrt{a^2 + (\delta - 1)^2} + \frac{1}{8}(\delta - 1)^2.$$

2.3. Comparison

We can now compare the results for the two markets.

Proposition 6: $Q_{FP}^{*} = a < Q_{NP}^{*} = \frac{1}{2}a + \frac{1}{2}\sqrt{a^2 + (\delta - 1)^2}$.

When organizations compete in prices, the Nash-equilibrium aggregated quantity is always higher in the situation when one for-profit competes with one non-profit organization comparing to the situation when two for-profit compete.

Proposition 7: $P_{FP}^{*} = 0 > P_{NP}^{*} = \frac{1}{2}a - \frac{1}{2}\sqrt{a^2 + (\delta - 1)^2}$.

When organizations compete in prices, the Nash-equilibrium price is always smaller in the situation when one for-profit competes with one non-profit organization comparing to the situation when two for-profit compete. Using price competition we notice that the price in the situation with one for-profit and one non-profit organization is always less than zero (the price is negative, this situation can be explained because of the fundraising. With fundraising, non-profit organization could charge a price less than zero without having negative revenues).

Preposition 8: $CS_{FP}^{*} = \frac{1}{2}a^2 < CS_{NP}^{*} = \frac{1}{4}a^2 + \frac{1}{4}a\sqrt{a^2 + (\delta - 1)^2} + \frac{1}{8}(\delta - 1)^2$.

When organizations compete in prices, the Nash-equilibrium consumer surplus is always higher in the situation when one for-profit competes with one non-profit organization comparing to the situation when two for-profit compete.

Preposition 9: $TS_{FP}^{*} = \frac{1}{2}a^2 < TS_{NP}^{*} = \frac{1}{4}a^2 + \frac{1}{4}a\sqrt{a^2 + (\delta - 1)^2} + \frac{1}{8}(\delta - 1)^2$.

When organizations compete in prices, the Nash-equilibrium total surplus is always higher in the situation when one for-profit competes with one non-profit organization comparing to the situation when two for-profit compete.

Preposition 10: $\pi_{1_{FP}}^{*} = \pi_{1_{NP}}^{*} = 0$

When organizations compete in prices, the profit for the for-profit organization is always zero because in the situation when the competition is between two for-profit organizations the price charged is always zero and in the

situation when the competition is between one for-profit and one non-profit organizations the for-profit organization will leave the market in order not to have a negative profit. So, we can conclude that the for-profit organization is always in the same situation (profit is always zero). So, in this case there, we can conclude that it does not exist unfair competition when a for-profit and a non-profit organizations compete in a market where the products are homogenous.

3. Competition in quantities and in prices – comparison

We can now compare the results for the competition in quantities and competition in prices. So:

Proposition 11: Comparing the proposition 1 and 6, the Nash-equilibrium aggregated output in the market is always higher in the situation when one for-profit competes with one non-profit organization comparing to the situation when two for-profit competes.

Proposition 12: Comparing the proposition 2 and 7, the Nash-equilibrium market price is always smaller in the situation when one for-profit competes with one non-profit organization comparing to the situation when two for-profit competes. However, in price competition, the Nash-equilibrium price is negative while in quantity competition, the price is positive.

Proposition 13: Comparing the proposition 3 and 8, the Nash-equilibrium consumer surplus is always higher in the situation when one for-profit competes with one non-profit organization comparing to the situation when two for-profit competes.

Proposition 14: Comparing the proposition 4 and 9, the Nash-equilibrium total surplus is always higher in the situation when one for-profit competes with one non-profit organization comparing to the situation when two for-profit competes.

Proposition 15: Comparing the proposition 5 and 10, the Nash-equilibrium profit obtained by the for-profit organization can be higher or lower when the competitor is a non-profit organization instead of a for-profit organization depending on the values for market dimension (a) and the sensibility of the donation in the fundraising activities (δ) in quantity competition, whereas in price competition, it is always zero.

To sum up, we can conclude that the qualitative results are similar when organizations compete in quantities or in prices, with the only qualitative differences being on the profit obtained by the for-profit organization.

Chapter 4:
Concluding Discussion and Future Research Issues

We propose to examine whether, in fact, exists unfair competition when a for-profit competes with a non-profit. To analyse this research question, we consider a duopoly setting where, first, the competition is between two for-profit organizations and, second, the competition is between a for-profit and a non-profit organization. We consider that the organizations produce a homogenous product and that marginal costs are equal. We separately consider that the competition may be in quantities or in prices.

Typically, the term "unfair" competition has been to often used in contexts to limit entry, preserve monopoly power and harm consumers. So, we should treat sceptically the issue of unfair competition. Our key results contradict the argument of unfair competition. In fact, the competition between a for-profit and a non-profit organization benefits society as a whole.

In the end, we can identify the following key findings. In a market where a for-profit competes with a non-profit organization, aggregated output will be higher and price lower when compared to a market where two for-profit organizations compete (see propositions 11 and 12). As output increases and price decreases, the surplus of consumers and the society as a whole will improve (see propositions 13 and 14). However, for the for-profit organization, competition with a non-profit organization can result in higher or lower profit, depending on the market dimension (a) and the sensibility of donations to fundraising activities (δ), when the for-profit and the non-profit organizations are competing in quantities (see figure 1). When the for-profit and the non-profit organizations compete in prices, competition from the non-profit organization

has no impact in the profit of the for-profit organization (see proposition 9). From the proposition 4 and 9, we perceive that taxes have no influence on equilibrium outcomes. So, we conclude that the tax exemption on the non-profit organization does not create unfair competition. This result contradicts Lien (2002), who concludes that an increase in the tax rate reduces the total production and increases price, but agree with Liu and Weinberg (2004) conclusion that (i) it does not exist unfair competition when a for-profit organization competes with a non-profit organization, and (ii) the tax exemption has no impact in the Nash-equilibrium.

One of the biggest limitations that we found in the course of this research was that our model is not suitable to analyse the situation in which for-profit and non-profit organizations sell heterogeneous products. As such, our theoretical results leave several questions to be addressed by further research. For example, it would be worthwhile to examine the same question but with heterogeneous products. Further, it would be interesting to examine a particular industry.

Finally, it could be important for future works to analyse a model where the decisions in price or quantity are not simultaneous. In this case, a stackelberg analysis could be interest to see what would happen to the Nash- equilibrium if the for-profit organization was the first mover or if the non-profit organization was the first mover.

Nevertheless, despite its limitations, the present investigation contributes to the identification of a set of ideas that, if extended in future research, could help to improve the understanding of the competition between for-profit and non-profit organizations.

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