Universidad de Navarra

Facultad de Ciencias Económicas y Empresariales

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Entry Regulation in a Linear Market with Elastic Demand

Javier Elizalde
University of Navarra

Markus Kinateder
University of Navarra

Ignacio Rodríguez-Carreño
University of Navarra

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Javier Elizalde
Universidad de Navarra
jelizalde@unav.es

Markus Kinateder
Universidad de Navarra
mkinateder@unav.es

Ignacio Rodríguez-Carreño
Universidad de Navarra
irodriguezc@unav.es

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Key Words: Entry, Regulation, Hotelling, Demand Estimation, Welfare Analysis

JEL Classification: D43, D60, L51

Campus Universitario. Edificio Amigos. 31009 Pamplona, Spain.

Corresponding author: Javier Elizalde

Phone: +34 948425600, ext. 80-2788.

E-mail: jelizalde@unav.es

1. Introduction

Some retail markets, such us drugstores in many countries, have regulations with respect to entry into the market. Two popular ways of regulation are the concession of a number of licenses and a minimum distance between stores. This paper performs a comparative welfare analysis of these types of regulation in a model of competition in a linear market analysing the role of demand elasticity and the nature of the entry game: simultaneous or sequential.

In many countries there are restrictions on opening a pharmacy. While licenses allow for a direct control on the number of drugstores in a city or region, the minimum distance rule softens competition since it prohibits a new pharmacy to open very close to an existing one and, at the same time, it ensures an even distribution of pharmacies across a city thus controlling the transportation costs that have to be travelled by consumers.

This analysis is motivated by a regulatory change in the drugstore market of the Spanish region Navarre. While before 2001, the main restriction to entry into the drugstore market was a fixed number of licenses, in 2001, the conditions to obtain a license were significantly liberalized. As a consequence, in many parts of Navarre, from 2001 on, the minimum distance of 150 metres between drugstores became the binding restriction to open a new store.

The linear market describes competition between products horizontally differentiated along a single dimension. Hotelling (1929) pioneered the analysis of competition with horizontally differentiated products and predicted minimum product differentiation in equilibrium. Some of the original Hotelling assumptions have been relaxed by posterior works showing a tendency towards maximum or, at least, intermediate degree of differentiation.[1] One assumption of the original Hotelling model, which has important consequences for the equilibrium, is that all consumers buy one unit of the good, so demand is completely inelastic. This assumption has been tackled in two ways. One way is to assume that demand is price inelastic up to a reservation price, such that each consumer will purchase one unit of the good if the delivered price (price plus transportation cost) is lower than reservation price.[2] The second approach is to consider that demand is elastic at

[1] A noteworthy contribution is that by d'Aspremont et al. (1979) who find a subgame perfect equilibrium with maximum product differentiation considering quadratic, rather than linear, transportation costs.

[2] This approach was first used by Lerner and Singer (1937) who showed that the *minimum differentiation* result implied by Hotelling (1929) did not necessarily hold. Two more recent works by Economides (1984)

every point of the demand curve, so that the quantity demanded is a continuous and decreasing function of price.[3] In this paper we analyse elasticity of demand under the former approach.

The present paper analyses a modified version of Hotelling's model by considering minimum distance conditions and sequential entry into a market with two firms, in addition to elastic demand. The literature on sequential entry in a linear market has focused mainly on the prediction of the equilibrium locations of firms by comparing the case of a fixed number of firms with the one that considers free entry and fosters entry deterrence strategies. One of the goals of those works is to analyse whether all earlier entrants get a higher profit than later ones.[4] The number of firms in equilibrium with free entry is typically determined by entry deterrence strategies in combination with the level of fixed costs (Prescott and Visscher, 1977; Lane, 1980; Neven, 1987; Economides et al., 2004).[5]

In our model the location of the firms in equilibrium depends on the combination of entry deterrence activities of incumbent firms with the minimum distance fixed by the regulator. We show that minimum distance rules may reach a higher level of both consumer and social surplus than number of licenses rules when demand is sufficiently inelastic. The optimal distance rule is a quarter of the market, which is beneficial for consumers when the reservation value is above some threshold level. The market configuration is also optimal when price is regulated.

The remainder of this paper is organised as follows: in Section 2, we briefly present the model of horizontal product differentiation and the way we analyse welfare. In Section 3, we perform the analysis of regulation through number of licenses under simultaneous entry of firms. In Section 4, we analyse entry with regulation through number of licenses and through minimum distance in the case of sequential entry. Section 5 analyses the optimal minimum distance rule when prices are regulated. Finally, Section 6 concludes the paper.

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and Hinloopen and van Marrewijk (1999) study the existence of equilibria in the two-stage game where firms choose locations in the first stage and set prices in the second.

[3] This approach was introduced by Smithies (1941) who showed that duopolists in equilibrium located between the centre of the market and the quartiles. Rath and Zhao (2001) modify the model in Smithies (1941) by using a quadratic, rather than a linear, transportation cost, finding that a Nash equilibrium in prices exists for each possible pair of locations.

[4] Which follows the literature on *first mover advantages*, see Gal-Or (1985). Other works that analyse the earlier entrant advantages are Anderson (1987), analysing sequential moves in both location and price, Lambertini (2002), who considers an infinite time horizon, and Fleckinger and Lafay (2010), who consider sequential moves in a market where firms choose at the same time location and price.

[5] Götz (2005) analyses a modified version of Neven (1987) by considering changes in market size for given levels of fixed costs.

2. The Model

In this section, we present a modified version of Hotelling's original model in which transportation costs are quadratic in distance, as in d'Aspremont et al. (1979) and Neven (1985), which allow us to reach a subgame perfect equilibrium. Consumers are evenly distributed along a linear city of length 1 where there are two firms located at x_1 (firm 1) and x_2 (firm 2), with $0 \leq x_1 \leq x_2 \leq 1$.

The utility of a consumer located at point ω when she buys from firm j, located at x_j, is:

$$u_\omega(x_j, p_j) = k - p_j - (x_j - \omega)^2,$$

where $k > 0$ is her reservation price, which is assumed to be equal for all consumers, and $j = \{1,2\}$. When entry is simultaneous, the game is played in two stages: in the first stage firms simultaneously choose locations and, in the second stage, firms simultaneously set prices. When entry is sequential, the game is played in three stages: in the first stage firm 1 chooses its location, in the second stage firm 2 chooses its location and in the third stage both firms simultaneously set prices.

The game is solved by backward induction. From the condition of the marginal consumer, who is indifferent between buying from firm 1 or 2, we get the equilibrium prices $p_j^*(x)$ and demands $D_j^*(x)$ as a function of the vector of locations x:

(1) $p_1^*(x) = \dfrac{(x_2 - x_1)(2 + x_1 + x_2)}{3}$,

(2) $p_2^*(x) = \dfrac{(x_2 - x_1)(4 - x_1 - x_2)}{3}$,

(3) $D_1^*(x) = \dfrac{2 + x_1 + x_2}{6}$,

(4) $D_2^*(x) = \dfrac{4 - x_1 - x_2}{6}$.

Note that, when the firms change their location, there are two countervailing effects: a price effect (such as price decreases as firms get closer to each other) and a market share effect (as demands increase when the firms move towards the centre of the market). Equilibrium locations are computed depending on the nature of the entry game (simultaneous or sequential) and on the type of regulation (with restrictions, in the case of a minimum distance, or without, in the case of the concession of two licenses).

In order to complete the welfare analysis of each type of regulation analysed in the following sections we need to define the consumer surplus loss.

The consumer surplus loss is associated with the transportation costs incurred by consumers. The consumer surplus loss (CSL) is defined as

$$CSL = \int_0^{x_1} s^2 ds + \int_0^{z-x_1} s^2 ds + \int_0^{x_2-z} s^2 ds + \int_0^{1-x_2} s^2 ds \,,$$

where z is the location of the marginal consumer between x_1 and x_2.

The maximum level of surplus that could be reached in this market is equal to the reservation value k. That area of value k is divided into three components: profits, consumer surplus and consumer surplus loss. Therefore consumer surplus (CS) is equal to $CS = k - \Pi - CSL$, where Π is the sum of firms' profits, and social surplus (SS) is defined as $SS = CS + \Pi = k - CSL$.

3. Simultaneous entry

In this section, we consider the case where the regulator concedes two licenses and the license holders enter the market simultaneously. We omit the analysis of simultaneous entry with minimum distance as, if two firms take the decision of entering the market at the very same time, they could violate the minimum distance condition.

Therefore, the two firms which obtained a license simultaneously choose locations in order to maximise their first-stage profit functions without restrictions, given the second-stage prices and demands in equations (1) to (4). Profit functions are:

$$\Pi_1(x) = \frac{(x_2 - x_1)(2 + x_1 + x_2)^2}{12} \text{ and } \Pi_2(x) = \frac{(x_2 - x_1)(4 - x_1 - x_2)^2}{12}.$$

Let us now introduce the role of elasticity of demand. We analyse it by considering different realisations of the reservation value k: When $k \geq 5/4 = 1.25$, all consumers buy one unit of the good for any non-cooperative configuration of locations and prices, so the demand is completely inelastic. The corresponding maximisations of the profit functions with respect to x_1 and x_2 yield equilibrium locations $x_1 = 0$ and $x_2 = 1$. This is the maximum product differentiation solution of d'Aspremont et al. (1979). Prices are $p_1 = p_2 = 1$ and demands are $D_1 = D_2 = 0.5$. When $k < 1.25$, the solution of maximum product differentiation may imply that some consumers located close to the market centre would not buy the good. The firms increase their profits by locating closer to the market centre and charging lower prices to ensure full coverage. Table 1 shows the equilibrium values of locations, prices and demands for the different ranges of the reservation value k and Table 2 shows the equilibrium profits and surpluses for the same ranges of k. We observe that, when demand becomes very elastic ($k < 3/16 = 0.1875$) there is no full coverage, as some consumers do not purchase the good, and there is multiplicity of equilibria.

k	x_1	x_2	p_1	p_2	D_1	D_2
$[\frac{5}{4},\infty)$	0	1	1	1	$\frac{1}{2}$	$\frac{1}{2}$
$[\frac{9}{16},\frac{5}{4})$	$\frac{3}{2}-\sqrt{1+k}$	$-\frac{1}{2}+\sqrt{1+k}$	$2(\sqrt{1+k}-1)$	$2(\sqrt{1+k}-1)$	$\frac{1}{2}$	$\frac{1}{2}$
$[\frac{3}{16},\frac{9}{16})$	$\frac{1}{4}$	$\frac{3}{4}$	$k-\frac{1}{16}$	$k-\frac{1}{16}$	$\frac{1}{2}$	$\frac{1}{2}$
$[0,\frac{3}{16})$	$[\sqrt{\frac{k}{3}},\frac{1}{2}-\sqrt{\frac{k}{3}}]$	$[\frac{1}{2}+\sqrt{\frac{k}{3}},1-\sqrt{\frac{k}{3}}]$	$\frac{2}{3}k$	$\frac{2}{3}k$	$2\sqrt{\frac{k}{3}}$	$2\sqrt{\frac{k}{3}}$

Table 1: Equilibrium locations, prices and demands as a function of reservation price in the case of two licenses

k	Π_1	Π_2	CS	SS
$[\frac{5}{4},\infty)$	$\frac{1}{2}$	$\frac{1}{2}$	$k-\frac{13}{12}$	$k-\frac{1}{12}$
$[\frac{9}{16},\frac{5}{4})$	$\sqrt{1+k}-1$	$\sqrt{1+k}-1$	$\frac{1}{2}\sqrt{1+k}-\frac{7}{12}$	$\frac{5}{2}\sqrt{1+k}-\frac{31}{12}$
$[\frac{3}{16},\frac{9}{16})$	$\frac{k}{2}-\frac{1}{32}$	$\frac{k}{2}-\frac{1}{32}$	$\frac{1}{24}$	$k-\frac{1}{48}$
$[0,\frac{3}{16})$	$\frac{4}{3}k\sqrt{\frac{k}{3}}$	$\frac{4}{3}k\sqrt{\frac{k}{3}}$	$\frac{k}{3}-\frac{4}{9}k\sqrt{\frac{k}{3}}$	$k-\frac{4}{9}k\sqrt{\frac{k}{3}}$

Table 2: Equilibrium profits, consumer surplus and social surplus as a function of reservation price in the case of two licenses

Figure 1 depicts the locations, prices, demands and profits of the firms for different values of the reservation price and the level of consumer and social surplus. The horizontal axis represents the reservation price which is decreasing from left to right. The blue line represents the values for firm 1, while the red line represents the values for firm 2. In the simultaneous entry case, as firms behave symmetrically, they only differ in locations, while the prices, sales and profits are equal for both firms. Therefore, in the last three graphs, the blue line is shadowed by the red line.

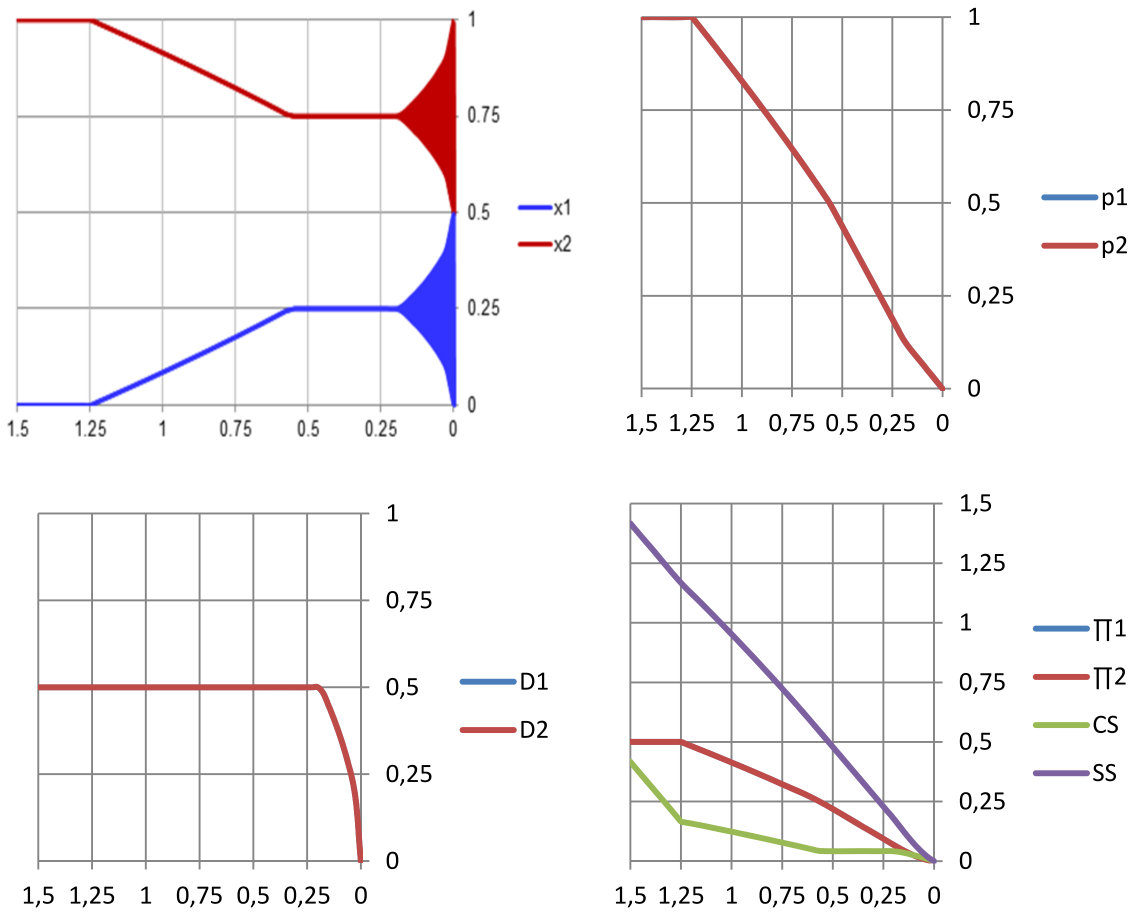


Figure 1: Firms' locations, prices, demands and profits as a function of reservation price in the case of two licenses

In this model we get the result that, when the reservation price is between 0.1875 and 1.25, the equilibrium corresponds to the *touching equilibrium* found by Economides (1984) where the marginal consumer who is indifferent between buying from either firm is also indifferent between buying the good or not, as she is extracted the whole surplus.

4. Sequential entry

In this section, we present the model of sequential entry into the market described in Section 2. In this case the game is played in three stages. In the first stage, the first entrant (firm 1) chooses its location; in the second stage, the second entrant (firm 2) chooses its location; and, in the third stage, firms simultaneously choose prices. The first entrant will therefore choose its location anticipating the location reaction of the second entrant.

For each range of the reservation value, we analyse the solutions under the two policies: first, when the regulator concedes two licenses and, second, when the regulator states a minimum distance rule. We will see that we reach different equilibria for different values of the minimum distance. We will also see that, when $k \geq 9/16 = 0.5625$, the minimum distance rule benefits the consumers in detriment of the firms while this benefit disappears when $k < 0.5625$. The minimum distance rule has another consequence: the multiplicity of equilibria only exists for very low values of the reservation price ($k < 3/64 = 0.046875$).

4.1.Case 1: $k \geq 1.25$

When the regulator concedes **two licenses**, we get the same solution as in Economides et al. (2004, p. 7). Firm 1 locates at the end of the market ($x_1 = 0$) anticipating that firm 2 will locate at the other end of the market ($x_2 = 1$). The second entrant does this in order to relax price competition as much as possible even though it would gain a higher market share if it located closer to the first entrant. This happens as, for this range of the reservation value, the price effect dominates the market share effect. The price is equal to 1 and the consumer and social surpluses take the same values as in the case of simultaneous entry.

For the case of **minimum distance**, define d >0 such that the distance between two stores has to be higher than d, so d is non-inclusive. We focus on the range of values of minimum distance for which we have a duopoly in equilibrium: $0.25 \leq d < 0.5$.[6] Here, we have two relevant ranges of the minimum distance: between one-half and one-third and between one-third and one-quarter. Figure 2 depicts the locations, prices and demands of the firms for the different values of minimum distance for all the values of $k \geq 1.25$.

If the minimum distance between firms' locations is some value between $1/3$ and $1/2$, then firm 1 will take some location between 0 and $1/3$, always keeping a distance of $2d$ to firm 2, and the latter will be located at 1. Firm 1 accepts the entry of one firm 2 but acts in order to deter the entry of an additional one in the segment between the two firms. Firm 2 will choose the farthest possible location, which is the edge of the market segment as, for these high values of the reservation price, the price effect dominates the market share effect.

[6] For $d \geq 0.5$, there is only one firm located in the market centre, and for $d < 0.25$, there are more than two firms.

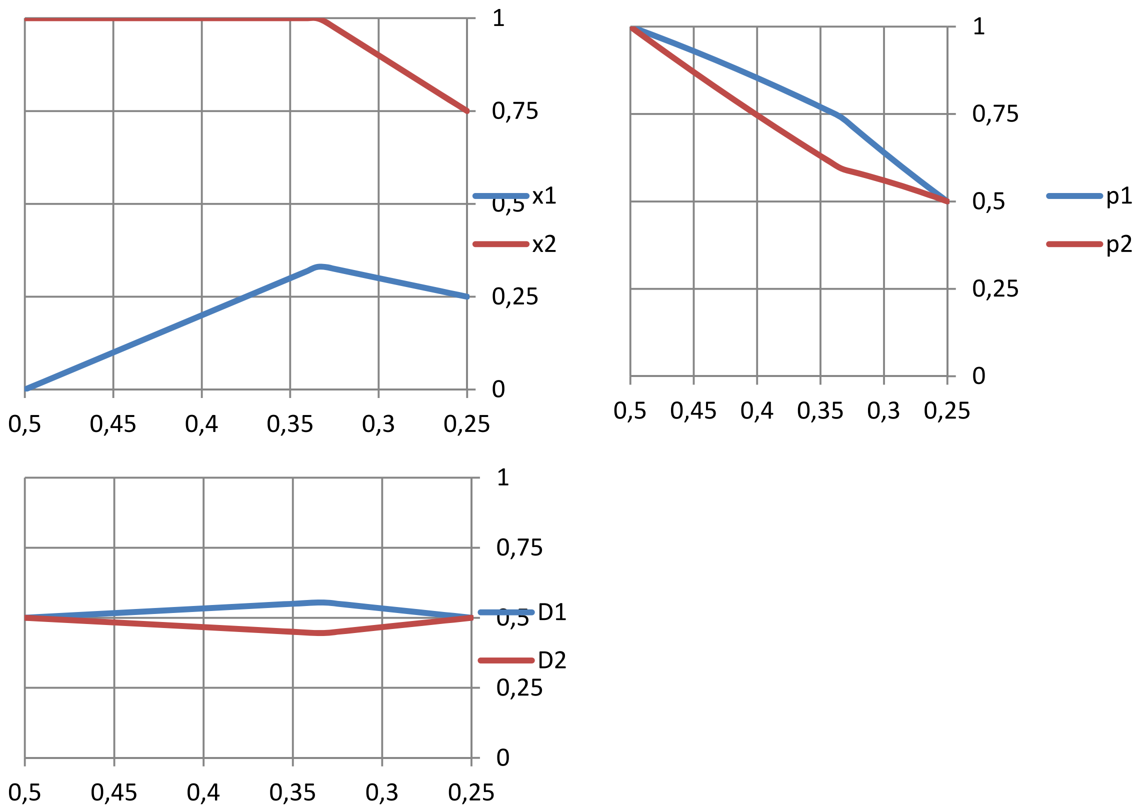


Figure 2: Firms' locations, prices and demands as a function of the minimum distance when reservation price is $k \geq 1.25$

When the minimum distance is between $1/4$ and $1/3$, entry is not blocked if firm 2 remains at the edge. So it has to move towards the middle of the market segment. Firm 1 will move towards its end in order to be farthest from firm 2 still avoiding the entry of an additional firm as the distance between firm 1 and its closer end is d and the distance between the two firms is $2d$.

The evolution of the prices and demands show that there are first mover advantages, as some of the literature on sequential entry had predicted, because the first entrant (firm 1) enjoys a higher price and a higher demand than the second entrant (firm 2).

Comparison of policies: For every value of d, in the range [0.25,0.5), the firms' profit is higher under the license rule and both consumer and social surplus are higher under the minimum distance rule. The highest social surplus is reached when minimum distance is $1/4$ with firms located at the quartiles. We can see the equilibrium profits and surpluses under the license rule, indicated by (l), and under the minimum distance rule, indicated by (d), for the different levels of minimum distance analysed for $k = 1.5$ (Figure 3) and for $k = 1.25$ (Figure 4).

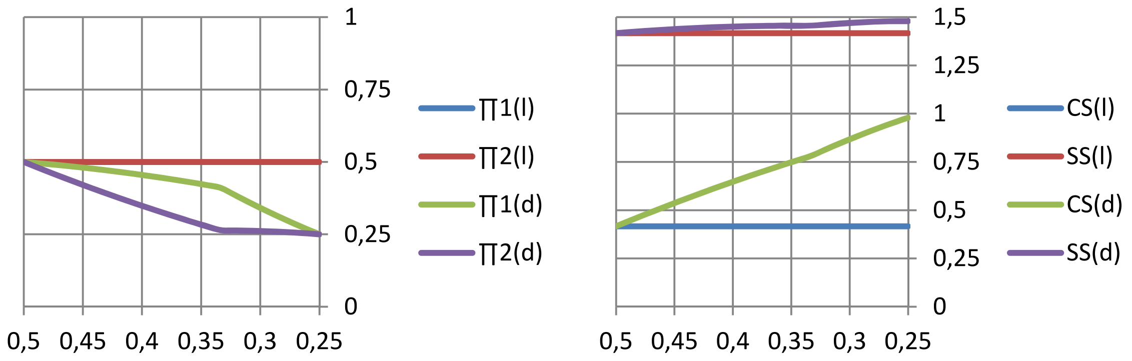


Figure 3: Firms' profits, consumer surplus and social surplus under the license rule (l) and under the minimum distance rule (d) when $k = 1.5$

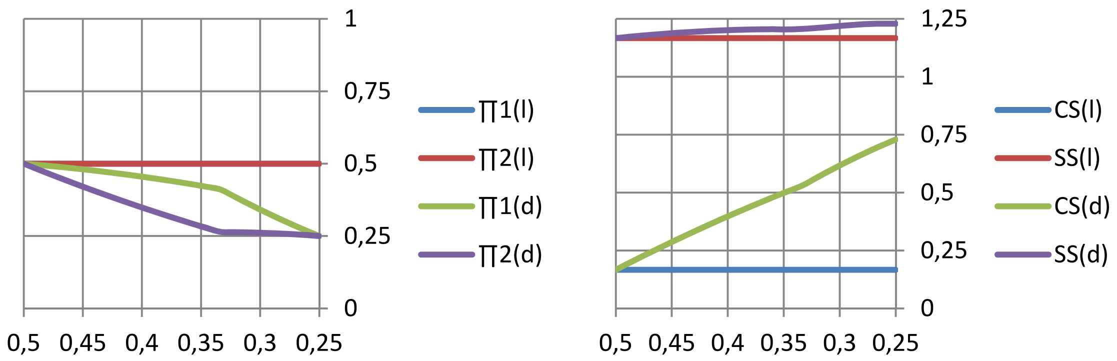


Figure 4: Firms' profits, consumer surplus and social surplus under the license rule (l) and under the minimum distance rule (d) when $k = 1.25$

4.2.Case 2: $0.5625 \le k < 1.25$

When the regulator concedes **two licenses**, the two firms follow the same behaviour as in the simultaneous entry case of Chapter 3.

For the case of **minimum distance**, there are three relevant ranges:

- Minimum distance in the range $[\sqrt{1+k}-1, 1/2)$

In this case, the equilibrium is the same as in the case of two licenses.

- Minimum distance in the range $[-1/6+1/3\sqrt{1+k}, \sqrt{1+k}-1)$

In this case, firm 2 remains at the same location as in the previous range but firm 1 locates closer to its rival in order not to allow the entry of an additional competitor. The distance between both firms is $2d$.

- Minimum distance in the range $[1/4, -1/6+1/3\sqrt{1+k})$

In this case, entry is not blocked if firm 2 remains at the previous location. It thus locates closer to the market centre at a location $x_2 = 3d$. Firm 1 keeps a distance of $2d$ between the two firms.

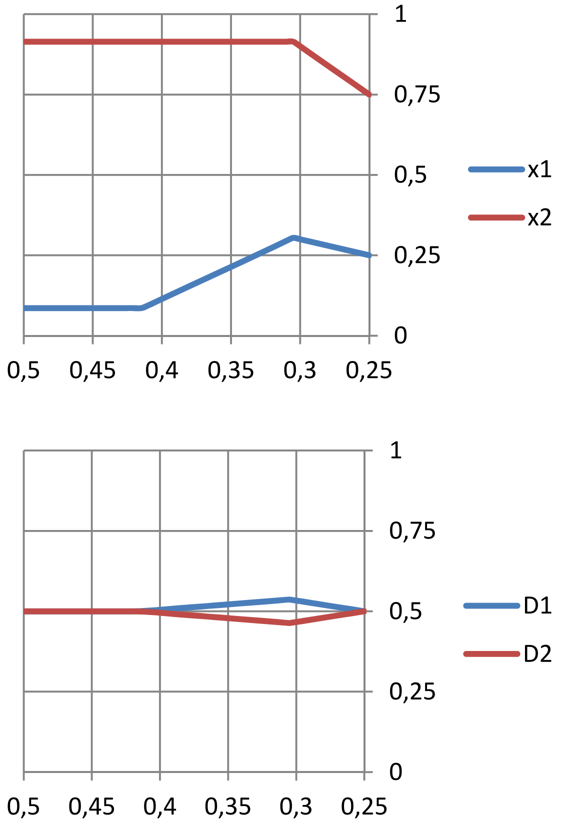
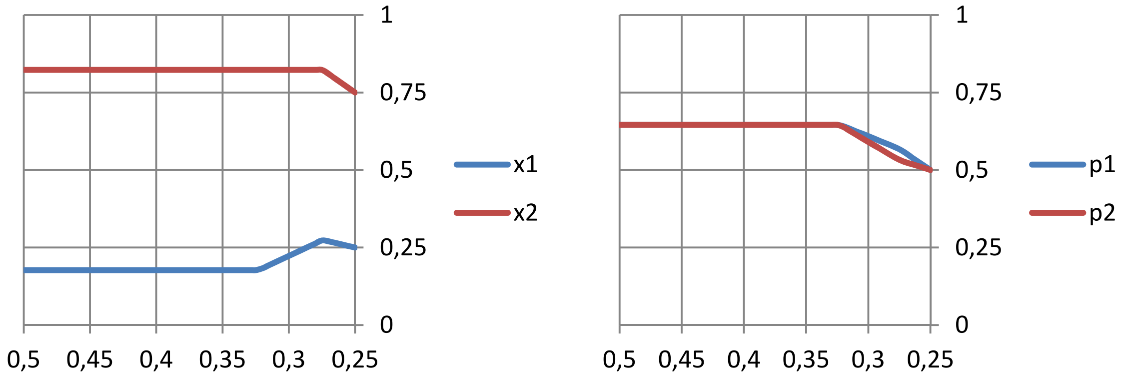


Figure 5: Firms' locations, prices and demands as a function of the minimum distance when reservation price is $k = 1$



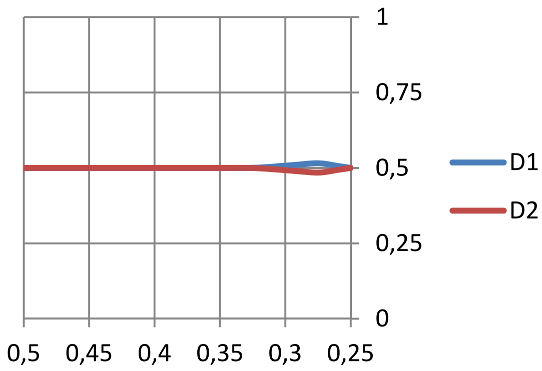


Figure 6: Firms' locations, prices and demands as a function of the minimum distance when reservation price is $k = 0.75$

Here we still have first mover advantages but they are smaller and take place for a lower range of the reservation price as that value decreases.

Comparison of policies: For every value of d in the range $[0.25, 0.5)$, the firms' profit is again higher under the license rule and the consumer and social surpluses are higher under the minimum distance rule. The highest social surplus is reached when minimum distance is $1/4$ with firms located at the quartiles. We can observe the equilibrium profits and surpluses under the two rules for $k = 1$ (Figure 7) and for $k = 0.75$ (Figure 8).

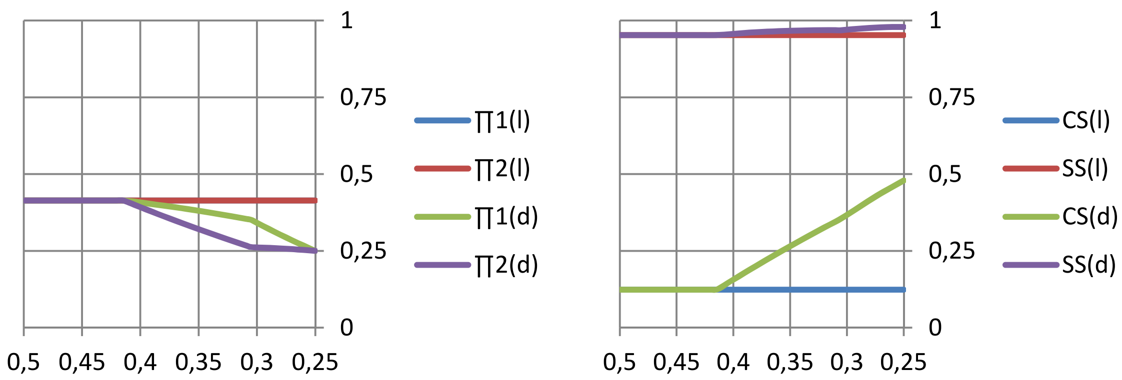


Figure 7: Firms' profits, consumer surplus and social surplus under the license rule (l) and under the minimum distance rule (d) when $k = 1$

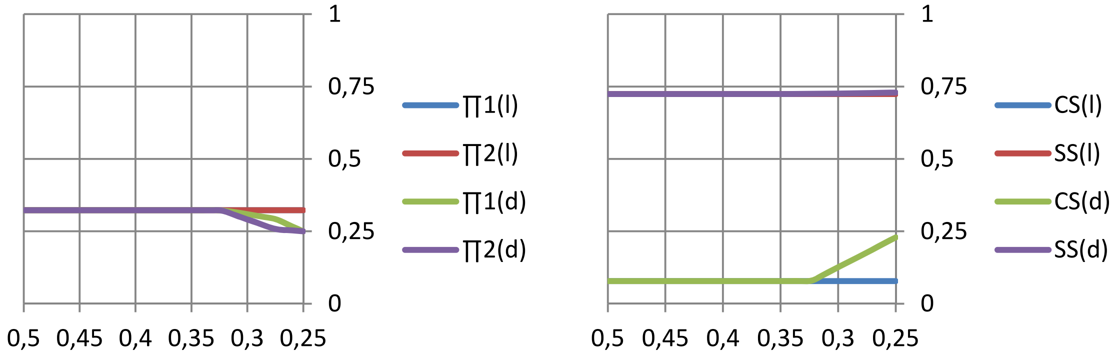
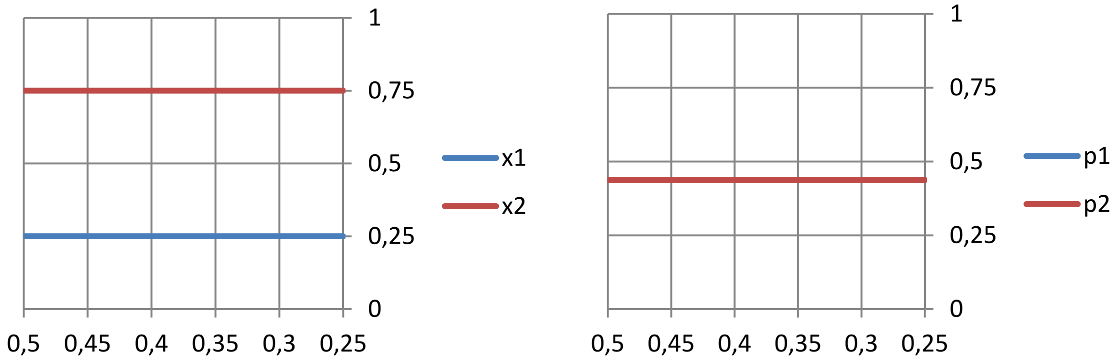


Figure 8: Firms' profits, consumer surplus and social surplus under the license rule (l) and under the minimum distance rule (d) when $k = 0.75$

4.3. Case 3: $0.1875 \leq k < 0.5625$

When the regulator concedes **two licenses**, the locations and prices are the same functions of the reservation value as in the simultaneous entry case, so are the profits and surpluses. In this case, the relevant feature of the **minimum distance** rule is that, when minimum distance is higher than 0.25, the firms will choose the quartiles, so with each minimum distance lower than 0.5 the firms will always choose the quartiles in order to avoid further entry, so they choose the same locations as with two licenses. Even though the locations are the same for all the range of reservation price, prices are reduced when demand becomes more elastic in order to have all consumers purchasing the good.



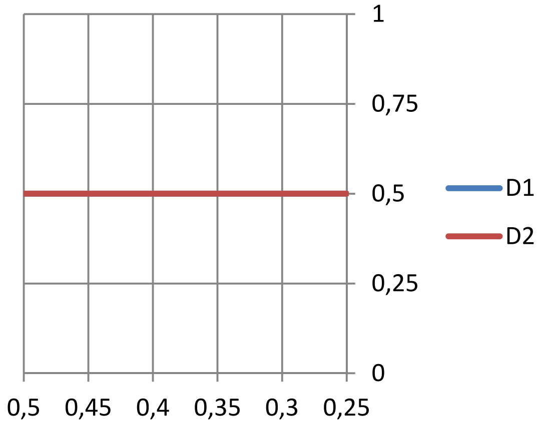
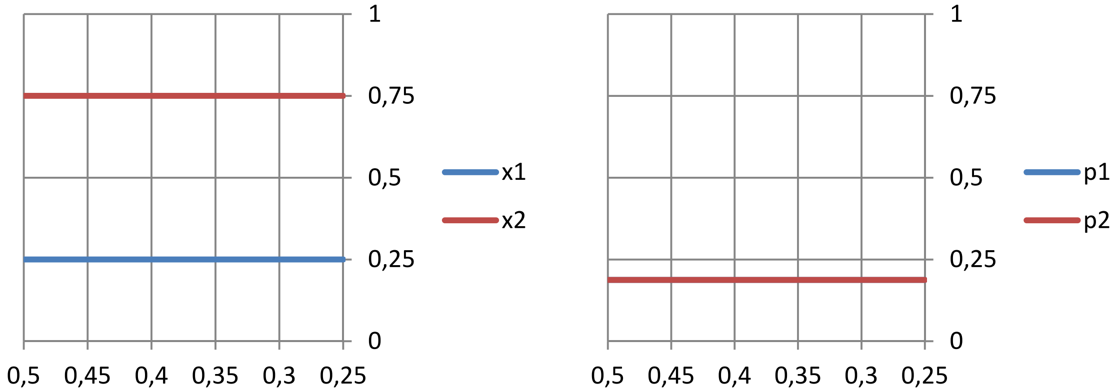


Figure 9: Firms' locations, prices and demands as a function of the minimum distance when reservation price is $k = 0.5$

In Figures 9 and 10, we see locations, prices and demands for $k = 0.5$ and $k = 0.25$ respectively. In both cases firms are located in the quartiles and each firm gets 50% of the market. Prices decrease in k and are the same for both firms, so there are no first mover advantages.



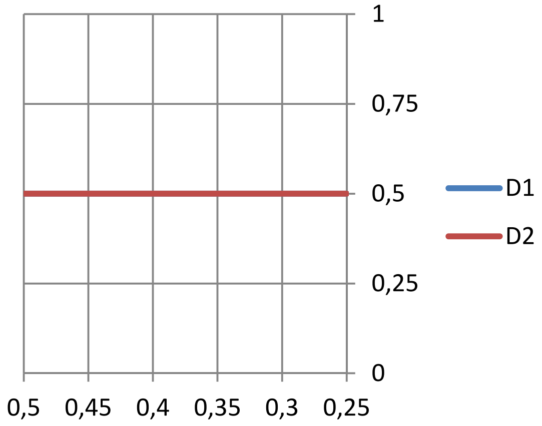


Figure 10: Firms' locations, prices and demands as a function of the minimum distance when reservation price is $k = 0.25$

When we perform the **comparison of policies** for this range of k we see that the minimum distance rule provides the same welfare as the license rule, so no group benefits nor is hurt by the change of rules. We can see this in Figures 11 and 12.

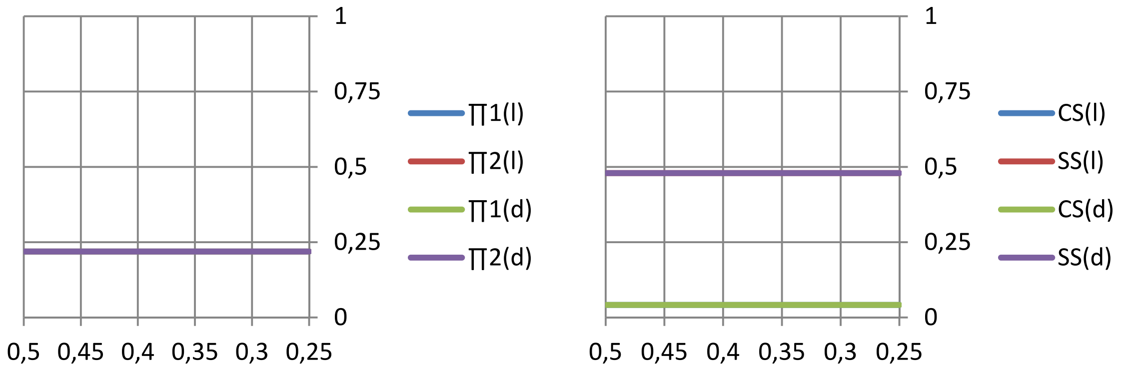


Figure 11: Firms' profits, consumer surplus and social surplus when $k = 0.5$

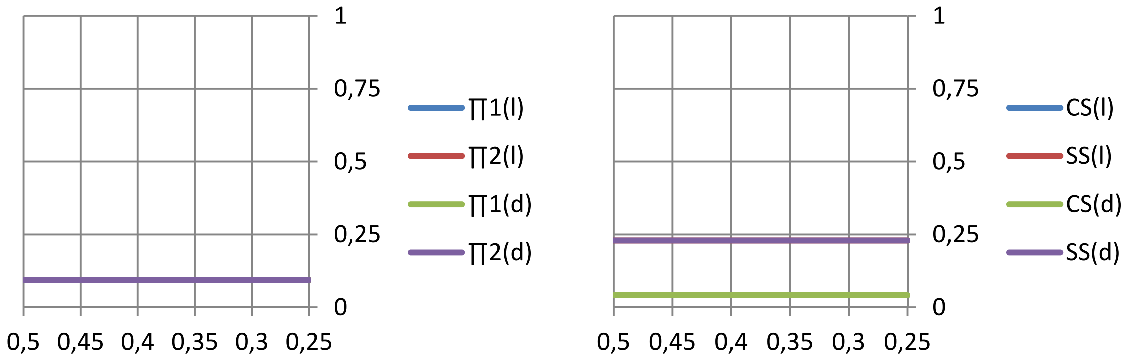


Figure 12: Firms' profits, consumer surplus and social surplus when $k = 0.25$

4.4. Case 4: $0.046875 < k < 0.1875$

In this case, demand is too elastic for firms to serve the entire market. When the regulator concedes **two licenses**, the locations and prices are the same functions of the reservation value as in the simultaneous entry case, so are the profits and surpluses, and we have multiplicity of equilibria. With the **minimum distance** rule, the multiplicity of equilibria disappears as firms locate at the quartiles in order to avoid the entry of additional firms.

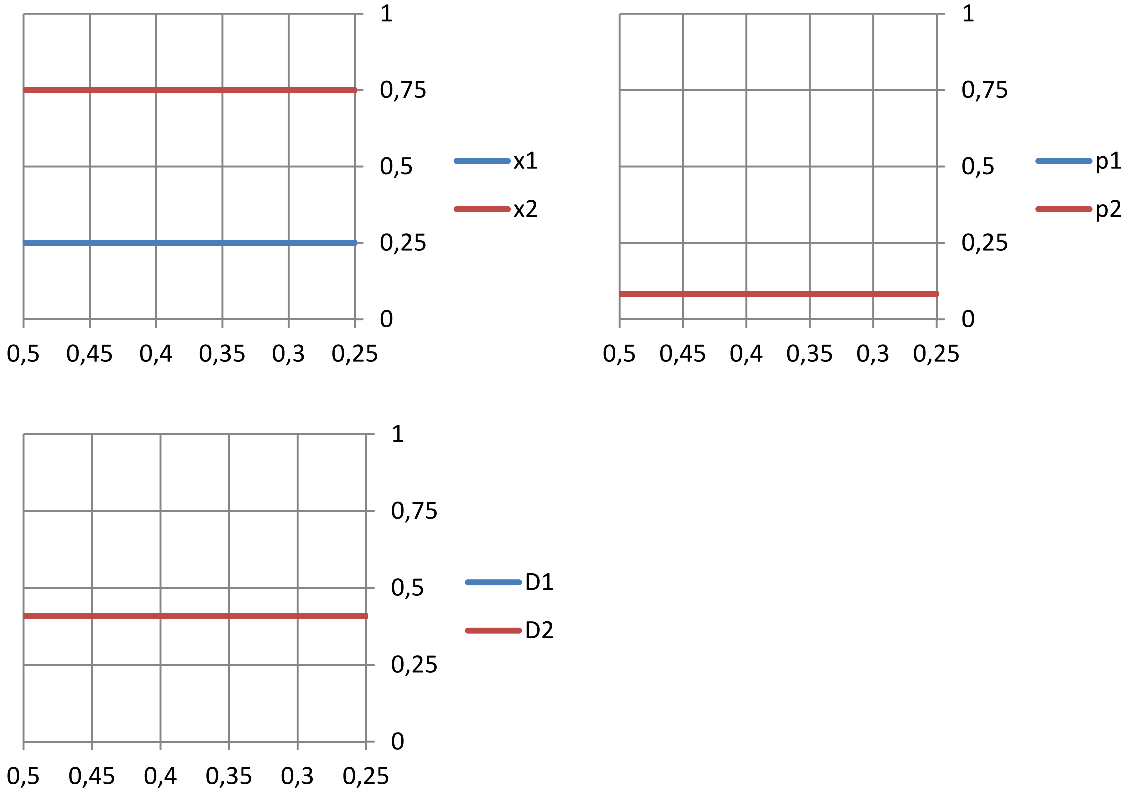


Figure 13: Firms' locations, prices and demands as a function of the minimum distance when reservation price is $k = 0.125$

In Figure 13, we see the equilibrium locations, prices and demands as a function of the minimum distance for $k = 0.125$. Prices keep decreasing and the demands of both firms are now lower than 0.5. Again there are no first mover advantages.

When we perform the **comparison of policies** for this range of k, we get the same level of profits, consumer surplus and social surplus under both types of regulation. The main change between the two policies is that the consumers under one rule may not be the same as under the other rule as, under the minimum distance rule the consumers are the ones closer to the quartiles but, under the license rule (given that we have multiplicity of equilibria), the firm can serve any group of consumers between the edges and the centre.

4.5. Case 5: $k \leq 0.046875$

When $k \leq 3/64 = 0.046875$, the firms cannot serve more than $1/4$ of the market so, under the **minimum distance** rule, they don't mind to accept the entry of an additional firm as long as they keep the same demand and price as if they deter entry. For this range of the reservation value we have multiplicity of equilibria again. The optimal locations become the same as in the **two license** case: $x_1 \in [\sqrt{k/3}, 1/2 - \sqrt{k/3}]$ and $x_2 \in [1/2 + \sqrt{k/3}, 1 - \sqrt{k/3}]$. **Comparing the policies**, we have that the prices, demands and profits of firms 1 and 2 are the same under both policies but it may be the case that, under the minimum distance rule, more than two firms enter the market increasing the overall level of profits, the consumer surplus and the social surplus.

4.6. Profitability of entry deterrence

Let us now show that it is more profitable for the two firms to avoid the entry of an additional firm rather than to allow entrance and to accommodate to the existence of a third firm. Without loss of generality, we show this for the case where $k \geq 1.25$.

If the firms act in order to deter entry satisfying the minimum distance condition, they get outputs, prices and profits as exhibited in Table 3.

Firm number	Location	Price	Output	Profits
1	0.75	0.5	0.5	0.25
2	0.25	0.5	0.5	0.25
TOTAL				0.5

Table 3: Equilibrium results for $k \geq 1.25$ with minimum distance and entry deterrence

If the two incumbent firms accommodate to the entry of a third firm, Economides et al. (2004) show the equilibrium summarised in Table 4, where the firm number corresponds to the order of entry.

Firm number	Location	Price	Output	Profits
1	0.58	0.1972	0.4750	0.0935
2	0.09	0.2627	0.2681	0.0704
3	0.94	0.1850	0.2569	0.0475
TOTAL				0.2116

Table 4: Equilibrium results for $k \geq 1.25$ for three firms under sequential entry

Note that prices and profits decrease significantly with respect to the case with two firms. Therefore, firms 1 and 2 will act to avoid the entry of a third firm as described above.

5. Entry regulation with regulated prices

In some sectors, such as prescription drugs, prices are regulated so that competition in prices does not take place. In these cases firms only choose locations. In the equilibrium without distance restrictions, both firms would locate at the centre of the market segment (see Eaton and Lipsey, 1975, p. 30), where the average distance travelled by consumers is $1/4$. If the regulator tried to maximise social welfare, by minimising the average distance travelled by consumers, it would locate the stores at the quartiles ($x_1 = 0.25, x_2 = 0.75$), where the average distance travelled is $1/8$ (see Church and Ware, 2000, p. 392). These locations are reached when minimum distance is $d = 0.5$. If $k \geq 0.1875$, the highest optimal regulated price is $p = k - 1/16$. If $k < 0.1875$, then the optimal regulated price is $p = 2k/3$.

6. Conclusions

In this work, we have performed a comparative welfare analysis for two types of entry regulation in a duopolistic linear market: number of licenses and minimum distance. We have considered different ranges of the reservation price, therefore all consumers do not necessarily buy one unit of the good, so demand may be price-elastic.

With two licenses, firms choose the same location both under simultaneous entry and sequential entry. When demand is completely inelastic, firms are located at the edges of the market and all consumers purchase one unit of the good. As demand becomes more elastic, firms locate closer to the market centre and charge lower prices.

When locations are regulated through minimum distance and entry is sequential, firms choose their locations in order to avoid the entry of an additional firm. When demand is sufficiently inelastic, firms locate closer to the market centre than with two licenses. Prices decrease and both consumer and social surpluses increase. When the reservation price reaches the level of $9/16$, firms choose the quartiles under both policies so the surplus of each group is the same. The optimal rule is a minimum distance of $1/4$, with which firms will be located at the quartiles. This rule benefits the consumers when the reservation value is above the mentioned level.

When prices are regulated, so that firms only compete in locations, the optimal minimum distance rule is $1/2$ with firms located at the quartiles again.

The result about the multiplicity of equilibria when the demand is very elastic and there is no full coverage may deserve some discussion. In the case of two licenses the multiplicity of equilibria exists for more levels of reservation price than with minimum distance. In this work, all consumers are homogeneous in terms of valuation of the good and transportation cost and consumers are uniformly distributed along the market. There is also no fixed cost of entry. As a consequence of these assumptions, there are no welfare differences across the different policies when there is no full coverage. In many cities, town centres are usually more populated than the suburbs, so they attract more shops but, at the same time, the fixed cost of entry is higher as the real estate prices increase with the density of population. With minimum distance, earlier entrants may prefer to establish in the more populated areas than to choose the locations that deter entry. However, this analysis is left for future research.

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