

Affordable Residential Care with Imperfect Competition*

José María Usategui
University of the Basque Country

March 16, 2010

Abstract

In this paper it is stressed that the setting up of a system of affordable (or social) residential care, may have a “collusive effect” in a residential care market where there is imperfect competition among private providers of residential care. That system may decrease the total number of positions of residential care provided, increase the price of (non-social) residential care positions, reduce total surplus and increase the profits of residential care providers. The design of the social system of residential care should take into account the reaction of private providers to the setting up of that system.

JEL classification codes: H 53, H 55, I 38, H 75

Keywords: Affordable-residential care, imperfect competition, supply of residential care positions, price of residential care positions, collusive effect.

*Financial support from the Ministerio de Ciencia e Innovación and Ministerio de Educación y Ciencia (ECO2009-09120 and SEJ20006-06309) and from the Departamento de Educación, Universidades e Investigación del Gobierno Vasco (IT-313-07) is gratefully acknowledged. ADDRESS: Departamento de Fundamentos del Análisis Económico II; Facultad de CC. Económicas y Empresariales; Universidad del País Vasco; Avda. Lehenakari Agirre, 83; 48015 Bilbao; SPAIN. Tel. (34) 94-6013771, Fax (34) 94-6017123. Email: josemaria.usategui@ehu.es.

1 Introduction

Governments intend to provide affordable residential care for elderly persons with low- and moderate-income (or wealth). The costs of direct government provision of affordable residential care are, often, very high. Hence, governments look for other mechanisms to guarantee affordable residential care for those persons. With this objective, they have designed systems where profit-maximizing providers of residential care for older people must reserve some positions in their residential care homes to provide affordable, or social, residential care for elderly persons with low- and moderate-income, when they obtain a permit to provide residential care positions (throughout the paper let us maintain the term "social residential care positions" for those affordable residential care positions provided by profit-maximizing residential care providers).¹

In these systems of affordable residential care the government regulates the price and the number of social residential care positions, the maximum income level that a person may have to be eligible for a social residential care position and the compensation that each owner of a residential care home may obtain from the government for the provision of social residential care positions.

This work considers a social system of residential care with the following characteristics: i) private providers of residential care must provide some social residential care positions when they obtain a permit to provide residential care, ii) the number and price of social residential care positions are decided by the government, and iii) positions of social residential care are allocated at random among elderly persons with incomes below some income level fixed by the regulator.

The analysis below focuses on the "collusive effect" that a social system of residential care for older people may have in a residential care market where there is imperfect competition among private providers of residential care. It is proved that, as a consequence of that effect, the setting up of a social system of residential care may decrease the total number of positions provided in the market of residential care, induce a price of non-social residential care positions greater than the price of residential care positions without that system, reduce total surplus and increase the profits of private providers of

¹In some countries the term social residential care is used only for affordable residential care provided by non-profit organizations or directly by the government.

residential care even in situations where the price of social residential care positions is below the unit cost of provision.

The traditional view on the impact of social residential care accepts that, as social residential care is an alternative for some elderly persons, it reduces the demand for non-social residential care positions. This reduction decreases the quantity of non-social residential care positions and, when the supply curve of residential care positions is increasing, it also decreases the price of residential care positions. The magnitudes of these effects depend on the elasticities of the supply and demand curves in the market of residential care and on the parameters that characterize the social system of residential care. When the supply curve of residential care positions is increasing, the total number of residential care positions provided increases with social residential care as the decrease in the number of non-social residential care positions is smaller than the number of social residential care positions provided.² Perfect competition in the market of residential care is implicitly assumed under this view.

Historical reasons, or the size of the market of residential care, may cause, however, the existence of a limited number of private providers of residential care. The results obtained in this work require the combination of imperfect competition among private providers of residential care and a situation where elderly persons eligible for a social residential care position are not only those who cannot afford to pay a residential care position when there is not social residential care, but also some elderly people who can afford a residential care position in this latter case.

The intuition for the results is as follows: imperfect competition among private providers of residential care implies that the number of residential care positions provided when there are not social residential care positions is above the joint profit-maximization (monopoly) level. Providers would benefit from a reduction in total provision of residential care positions, but they cannot collude and agree on that lower quantity (commitment to collude may not be feasible and collusion is not allowed). Social residential care may make up for the lack of ability of providers of residential care to coordinate, in the market of non-social residential care positions, on a lower level of

²If the supply curve of residential care positions were horizontal, social residential care would not affect the price of non-social residential care positions and the total number of residential care positions would increase when social residential care positions are priced below non-social residential care positions.

provision of residential care positions and a higher price. This may occur as it may be more valuable to provide a lower number of non-social residential care positions, because the expected demand for non-social residential care positions is smaller and it does not have the same slope as the demand for residential care positions without social residential care. These changes induced by the setting up of a social system of residential care may allow private providers of residential care to increase their profits, even if they must sell social residential care positions at a price below provision cost. We may say that social residential care induces a “collusive effect” in the imperfectly competitive market of residential care. The setting up of a social system of residential care may enhance oligopolistic control over residential care provision.

In the analysis of the market of residential care it is often implicitly assumed that there is perfect competition in residential care provision. However, there are local markets of residential care where this is not a correct assumption. Some local markets of residential care are far enough apart for mainly local supply and demand conditions to affect prices and output, and the number of private providers of residential care in each market is limited. When there is not strategic interaction between local markets of residential care, or strategic interaction between those markets is small, we may have imperfect competition in some local markets of residential care and, hence, private providers of residential care in those markets may have market power.

In this work it is considered that there are more elderly persons eligible for a social residential care position than the number of social residential care positions available, and it is also assumed that the available social residential care positions are allocated at random among the eligible elderly people. The regulator could eliminate the excess demand for social residential care positions by reducing the maximum income level that qualifies for a social residential care position. But he prefers to maintain that excess demand. A reason for this preference may be that the regulator wants to make sure that all elderly persons with low- and moderate-incomes are eligible for a social residential care position. Another reason could be that the regulator does not know well the income of each elderly person, as a consequence of some non uniformly distributed fraud in income disclosure among elderly people, and the regulator cannot distinguish well who are the elderly persons with low- and moderate-incomes.

It is also assumed in the analysis that this behavior of the regulator causes that some elderly persons, who could afford to rent a residential care position when there is not social residential care, obtain a social residential care position. Hence, the regulator considers that not all elderly persons that would rent a residential care position without social residential care must be non-eligible for a social residential care position as some of them do not have high incomes. As it will be shown below, if only elderly persons who cannot afford to rent a residential care position when there is not social residential care obtained a social residential care position, the price and number of non-social residential care positions would be the same as the price and number of residential care positions without social residential care. In this latter case the profits of private providers of residential care would decrease if social residential care positions were priced below cost and they did not receive a compensation from the government.

The reaction of private providers of residential care, with market power, to the setting up of the social system of residential care must be taken into account when deciding on the design of the social system of residential care and on the way to compensate private providers of residential care. If the setting up of the social system of residential care, combined with permits to provide non-social residential care positions, increased the expected profits of private providers of residential care, no direct government funding, through tax credits or any other transfer mechanism, would be required for that system.

The paper is organized as follows: Section 2 presents the model used in this work and the equilibrium in the market of residential care when there are not social residential care positions. Section 3 analyzes the consequences of the setting up of a social system of residential care on the number of residential care positions provided, the price of non-social residential care positions and the expected profits of private providers of residential care. The effects on total surplus of the social system of residential care are studied in section 4. Section 5 extends the results obtained to the situation where affordable residential care positions have lower quality and to situations with different relationships between valuation of residential care, income of elderly persons and eligibility for a social residential care position. Finally, section 6 concludes.

2 Model and equilibrium without affordable residential care provision

Consider a residential care market where there are many price-taking elderly persons. Each elderly person demands a residential care position. All residential care positions offered are identical from the elderly people point of view.

As it will be explained below the results in this work do not require a linear demand function. However, a linear demand for residential care positions will allow us to obtain the results. Hence, for tractability, we assume that the inverse demand function for residential care positions is: $p = a - bQ$, where Q represents the quantity of residential care positions in the market, $b > 0$ and $a > c > 0$.³ Under this demand function, there are $\frac{a-p}{b}$ elderly persons that are willing to pay at least p for a residential care position.

We assume that there are n private providers of residential care. Historical reasons, or the size of the market of residential care, may be the cause of this limited number of providers. We consider that private providers of residential care compete *à la Cournot* ($n \geq 2$). Each residential care provider has the same opportunities of providing residential care positions and the unit cost of provision of residential care positions, represented by c , is constant.⁴ Private providers of residential care know the demand function for residential care positions and are neutral to risk.

There may be an important stock of pre-existent residential care positions in the market of residential care. Moreover, those pre-existent residential care positions may be a good substitute for the new residential care positions supplied by private providers of residential care. In the analysis, however, we consider that all pre-existent residential care positions are already rented to some elderly persons and we focus in the demand for new residential care positions.

When there is not a social system of residential care each active residential care provider i , $i = 1, \dots, n$, will solve the following problem:

$$\max_{q_i} (a - bQ - c)q_i,$$

³The level of the inverse demand function depends on the number of elderly persons in the market considered.

⁴Each private provider of residential care owns one or several buildings that allow for provision of residential care of a given quality.

where q_i is the number of residential care positions supplied by residential care provider i and $Q = \sum_{i=1}^n q_i$. The first order condition of this problem is:

$$a - bQ - c - bq_i = 0.$$

From the n first order conditions we get:

$$q_i^* = \frac{a - c}{b(n + 1)}.$$

Hence,

$$p^* = a - bQ^* = a - \frac{n(a - c)}{n + 1} = \frac{a + nc}{n + 1},$$

and the total profits of private providers of residential care are:

$$\pi^* = \frac{n(a - c)^2}{b(n + 1)^2}.$$

3 Social provision of residential care

Consider that the regulator establishes that private providers of residential care must rent D social residential care positions ($\frac{D}{n}$ residential care positions each residential care provider⁵) at a price equal to r (it may even be $r < c$). Moreover, each residential care provider is free to decide the number of non-social residential care positions to provide, besides the $\frac{D}{n}$ social residential care positions required by the regulator. There may be a zone within each residential care home where social residential care positions are built. Social residential care positions and non-social residential care positions have the same quality and the same provision cost. The situation where social residential care positions are of inferior quality is discussed in section 5.2.

The regulator wants to make sure that all elderly people with low- and moderate-incomes are eligible for a social residential care position.⁶ Nevertheless, the regulator does not know well the income of each elderly person, due to some non uniformly distributed fraud in income disclosure

⁵The results would be the same for any other distribution of social residential care positions among private providers.

⁶Hence, the social residential care policy considered in this work is a policy of the kind considered in Nichols and Zeckhauser (1982): a targeting policy. However, sometimes the social residential care policy is more a policy of the type suggested by Akerlof (1978): a tagging policy, that classifies elderly persons according to characteristics over which they have no control (disability, for instance).

among elderly people, and the regulator cannot distinguish well who are the elderly persons with low- and moderate-incomes. As a consequence, the elderly people eligible for social residential care positions are not only those elderly persons with the D lowest incomes (reported incomes if there is asymmetric information on personal income between the regulator and each elderly person). Assuming that the willingness to pay for residential care increases with income, let us consider that there is an m such that the elderly people eligible for a social residential care position are those elderly persons (or the families of elderly persons) with willingness to pay for the services of a residential care position smaller than m . We assume that $r < m < \frac{a+c}{2}$ ($\frac{a+c}{2}$ is the monopoly price in the market of residential care). The number of elderly people eligible for a social residential care position is $T = \frac{m-r}{b} > D$.⁷

In section 5.1 it will be shown that the analysis and results are analogous when we consider that for any x such that $r < x < m$, the number of elderly persons with willingness to pay for a residential care position between x and m that are eligible for a social residential care position is $g(x) < \frac{m-x}{b}$, with $g(x)$ continuous and $g'(x) < 0$. This latter situation includes the case where the valuation of residential care does not increase with income, as when elderly people have different alternatives for care and decide to expend different proportions of their incomes in residential care. That situation also includes the case where the valuation of residential care increases with income but there is a non uniformly distributed fraud in income disclosure among elderly people and, as a consequence of the difference between incomes and reported incomes, some elderly people with willingness to pay for a residential care position below m are not eligible for a social residential care position.

In the analysis it is considered that it is $r < p^* = \frac{a+nc}{n+1} < m$. This implies that some elderly people that would rent a residential care position without social residential care are eligible for social residential care positions. The regulator considers that these persons must be eligible for a social residential care position as they do not have high incomes.

If $m < p^* = \frac{a+nc}{n+1}$ there would not be elderly persons that value residential care in at least p^* and that are eligible for a social residential care position. In this case the change in the profits of private providers of residential care would be $(r-c)D$, as the equilibrium in the residential care market would be the same as that obtained in the previous section for the situation without

⁷Therefore, the value of m is in the interval $(r + bD, a)$. Elderly persons with willingness to pay for residential care smaller than r will not ask for a social residential care position.

social residential care. The setting up of the social system of residential care would increase the number of residential care positions provided and it would allow providers of residential care to price discriminate between elderly persons with low willingness to pay for residential care and the rest of elderly persons.

The available social residential care positions are allocated at random among the eligible elderly people. The probability of obtaining a social residential care position for an eligible elderly person is, therefore, equal to $\frac{bD}{m-r}$.

The allocation at random of social residential care positions among the eligible elderly persons implies that the demand for non-social residential care positions will depend on the resultant allocation. In this work it is considered that the decision on residential care provision is a long or middle-term decision and, hence, that private providers of residential care have to choose the number of non-social residential care positions to provide in a context where they are uncertain about the demand for non-social residential care positions. As private providers of residential care are neutral to risk, they will only take into account the expected price of a non-social residential care position that would be obtained for each number of non-social residential care positions built (that is, the expected inverse demand function for non-social residential care positions).

In this context we can prove:

Proposition 1 *When the demand for residential care is linear, the setting up of a social system of residential care that allocates the positions available in the system at random among the eligible elderly people and is such that $r < \frac{a+nc}{n+1} < m < \frac{a+c}{2}$ and $r + bD < m$:*

- i) increases the expected price of non-social residential care positions,*
- ii) decreases the total number of residential care positions provided in the market if $m + nc < (n + 1)r$ or $\left[a + nc + \frac{(a-m)bD}{m-r-bD} \right] \frac{1}{n+1} \geq m$, and*
- iii) may increase the expected profits of private providers of residential care, even in situations where the price of social residential care positions are below the unit cost of provision.*

Proof: See the Appendix.

The expected demand for non-social residential care positions is smaller and it does not have the same slope as the demand for residential care

positions without social residential care. The differences between these demand functions, induced by the setting up of a social system of residential care, may allow private providers to increase their profits. Hence, the setting up of a social system of residential care may enhance oligopolistic control over residential care provision.

For demand functions which are non-linear it also occurs that, when a social residential system is established, the expected demand for non-social residential care positions is smaller and may have different slopes than the demand for residential care positions without social residential care. Hence, we have:

Corollary 2 *When the demand for residential care positions is non linear, the setting up of a social system of residential care may:*

- i) increase the price of non-social residential care positions,*
- ii) reduce the total number of residential care positions provided in the market, and*
- iii) increase the expected profits of private providers of residential care, even in situations where the price of social residential care positions are below the unit cost of provision.*

If the total number of residential care positions provided decreases when the social system of residential care is established, some elderly persons that would have got a residential care position without social residential care will not have a social residential care position or a non-social residential care position in the new situation. Moreover, in this case the price of non-social residential care positions will be greater than the price of residential care positions without social residential care. This latter relationship between prices of residential care may also occur when the total number of residential care positions built increases with the social system of residential care. If the price of non-social residential care positions were greater than the price of residential care positions without social residential care, the social system of residential care would provide affordable residential care positions to some elderly persons, but the price that other elderly persons would have to pay for residential care would increase.

Private providers of residential care would be willing to participate in a social system of residential care that increases their expected profits. No direct government funding (tax credits or any other transfer mechanism)

would be required to make that social system of residential care acceptable to private providers of residential care.⁸ Private providers of residential care may even try to convince the regulator to design a social system of residential care profitable for them.⁹ However, under that system the renters of non-social residential care positions would pay for the increase in profits of private providers of residential care. Moreover, if social residential care positions were rented at a price below provision cost, there would be a cross subsidy from the renters of non-social residential care positions to elderly persons that obtain a social residential care position.

The results in Proposition 1 and Corollary 2 could be unexpected as it may be thought that the setting up of a social system of residential care implies that non-social residential care positions face more competition. The explanation for those results lies on the assumption of imperfect competition in residential care provision. Cournot oligopolists are producing above the monopoly level when there are not social residential care positions. The setting up of a social system of residential care may help private providers of residential care to increase the price of non-social residential care positions, as it may make less valuable to provide a greater number of non-social residential care positions. Social residential care may make up for the lack of ability of producers to coordinate on a lower provision level and a higher price in the market of non-social residential care positions. We may say that social residential care induces a “collusive effect” in the imperfectly competitive market of residential care.

If social residential care positions induced a decrease in the price of non-social residential care positions, the social system of residential care might still increase the profits of private providers of residential care. This increase might occur only if r were greater than c , as there would be a decrease in the profits that private providers of residential care would obtain from the sale of non-social residential care positions.

From the proof of Proposition 1 we have that, in the linear case, the quantity of non social residential care positions decreases with D and with r , the expected price of non social residential care positions decreases with

⁸Nevertheless, as it will be pointed out in the following section, some government expenses may be required to control the correct implementation of the social system of residential care.

⁹This possibility would depend on the ability of private providers of residential care to capture the regulator of the social system of residential care. See Laffont and Tirole (1993) for a general analysis of the problem of capture of the regulator by economic agents.

m and increases with D and with r , and the expected profits of private providers of residential care may increase with D , even in situations where social residential care positions have to be sold at a price below the unit cost of provision. When D increases the reduction in the expected demand for the services of non-social residential care positions for prices between r and m is greater. When r increases or when m decreases the number of consumers eligible for social residential care positions that are willing to pay the price of a social residential care position decreases. Hence, in these latter cases the probability that an eligible elderly person obtains a social residential care position increases and, thus, the reduction in the expected demand for non-social residential care positions for prices between r and m is also greater. Moreover, the absolute value of the slope of the expected inverse demand function for non-social residential care positions decreases with m and it increases with D , with r and with the setting up of a social system of residential care.

Some of the effects pointed out in the previous paragraph are as expected. However, we have obtained:

Corollary 3 *An increase in the number of social residential care positions may increase the price of non-social residential care positions and the expected profits of private providers of residential care, even if social residential care positions had to be rented at a price below the unit cost of provision.*

4 Welfare analysis

The setting up of a social system of residential care is grounded on equity reasons. The analysis in this section, however, focuses on total surplus. It often occurs that to increase equity, total surplus has to be reduced. In this section it is shown that the setting up of the social system of residential care may reduce total surplus. The relevance of the result rests on the fact that total surplus is not at the first best without social residential care, as there is imperfect competition in the market of residential care. When the social system of residential care is established, total surplus may be even lower than that non-optimal level.

Let us study the effects of the setting up of a social system of residential care on total surplus, on the surplus of elderly persons and on the profits of private providers of residential care. Without social residential care, total

surplus is defined as elderly persons surplus plus profits of private providers of residential care (π^*). Expected total surplus with social residential care is defined as expected surplus of elderly persons (ECS) plus expected profits of private providers of residential care minus the cost of implementation of the social system of residential care (CI). With a social system of residential care let us denote by ECS_1 and ECS_2 , respectively, the expected surplus of the renters of non social residential care positions and the expected surplus of elderly persons that obtain a social residential care position (hence, $ECS = ECS_1 + ECS_2$).

As it was pointed out in the previous section we focus in the case where some elderly persons that would rent a residential care position without social residential care are eligible for social residential care positions. If the setting up of the social system of residential care reduces the total number of residential care positions provided in the market, we know that the the expected profits of private providers of residential care may increase. However, the expected total surplus diminishes, and this occurs even if $CI = 0$, as less residential care positions are provided and as the elderly persons that rent a residential care position without social residential care are those elderly persons that are willing to pay more for a residential care position.

When the setting up of the social system of residential care increases the total number of residential care positions provided in the market, the expected total surplus may also decrease. This decrease may occur even if $CI = 0$. The reason is that with social residential care the price of non-social residential care positions may be higher, even if the total number of residential care positions provided increased. In this case some elderly persons that would rent a residential care position without social residential care do not rent a non-social residential care position, and they may not obtain a social residential care position. The surplus lost by those elderly persons, that do not obtain a residential care position, may not be compensated with the additional total surplus generated with the rentals of the social residential care positions. Nevertheless, the expected profits of private providers of residential care may increase.

We thus have:

Proposition 4 *The setting up of a social system of residential care may reduce the expected total surplus, even in situations where there are no costs*

of implementation of that system.

If only elderly persons who cannot afford a residential care position without social residential care obtained a social residential care position, the expected surplus of elderly persons that obtain a social residential care position would increase, and the change in the profits of private providers of residential care would be equal to $(r - c)D$. Hence, the variation in total surplus would be $ECS_2 + (r - c)D - CI$. If CI were big enough, total surplus might also decrease with this social system of residential care even if $(r - c)D \geq 0$.

If the expected total surplus increased with the setting up of a social system of residential care, there might be a decrease in the expected surplus of each renter of a non-social residential care position and a decrease in the expected profits of private providers of residential care. In this case the winners with the social system of residential care would be those elderly persons that obtain a social residential care position.

Finally, if social residential care induced a decrease in the price of non-social residential care positions and if CI were not big, the setting up of a social system of residential care might increase expected total surplus, the expected surplus of each renter of a non-social residential care position, the surplus of elderly persons that obtained a social residential care position and the profits of private providers of residential care. The profits of private providers of residential care might increase in this case only if the price of social residential care positions were greater than the unit cost of provision of residential care positions, as there would be a decrease in the profits that private providers of residential care would obtain from the renting of non-social residential care positions.

5 Extensions

5.1 Valuation of residential care, income of elderly persons and eligibility

It has been considered in section 3 that all elderly persons with willingness to pay for a residential care position smaller than m are eligible for a social residential care position. This may not be the case. The valuation of residential care may not increase with income as elderly persons may have

different alternatives for care (related, for instance, to the ability of the family to help in care) or decide to expend different proportions of their incomes in residential care. There may also be a non uniformly distributed fraud in income disclosure among elderly persons and, as a consequence of the possible difference between incomes and reported incomes, some elderly persons with willingness to pay for a residential care position below m may be non-eligible for a social residential care position, even if the valuation of residential care increases with income.

To obtain the demand for non-social residential care positions in these cases we need to know the number of elderly persons that rent a non-social residential care position at price p such that $r < p < m$. For any p such that $r \leq p < m$ denote by $g(p)$ the number of elderly persons with willingness to pay for a residential care position between p and m that are eligible for a social residential care position. Note that $g(p) < \frac{m-p}{b}$ and consider that $g(p)$ is continuous and $g'(p) < 0$. The probability of obtaining a social residential care position for an eligible elderly person would be $\frac{D}{g(r)}$, and the number of non-social residential care positions sold at a price p such that $r < p < m$ would be $\frac{a-p}{b} - g(p)(\frac{D}{g(r)})$. Considering that the private providers of residential care have a good estimation of the function $g(p)$, the results obtained will be the same as the ones presented above as, again, at rental prices between m and r , the expected demand for non-social residential care positions, when there are social residential care positions, is smaller and it does not have the same slope as the demand for residential care positions without social residential care. However, $g(p)$ may not be linear in p .

5.2 Lower quality of affordable residential care positions

The quality of social residential care positions could be smaller than the quality of non-social residential care positions. To generalize the analysis in the previous sections, let us consider that the quality of a non-social residential care position is 1 and the quality of a social residential care position is α , with $0 < \alpha \leq 1$. The value of α is given by minimum requirements on the characteristics of social residential care positions established by the regulator, while the quality of non-social residential care positions is the usual quality of non regulated residential care positions in

that market of residential care.¹⁰ Consider also that the constant unit cost of provision of residential care positions of quality s is $c(s)$, with $c(s) > 0$, $c'(s) > 0$ and $c(1) = c$. Moreover, assume that, for each elderly person, the willingness to pay for the services of a residential care position of quality s is equal to her willingness to pay for the services of a non-social residential care position multiplied by $f(s)$, with $f(s) > 0$, $f'(s) > 0$ and $f(1) = 1$. In this context, the analysis and results follow as in the previous sections considering that social residential care positions of quality α are sold at a price $f(\alpha)r$, $c(\alpha)$ is used for those residential care positions instead of c , and, furthermore, $f(\alpha)$ and r are such that any eligible elderly person prefers to obtain a social residential care position at a price $f(\alpha)r$ rather than a non-social residential care position of quality 1 at the resultant market price of non-social residential care positions.¹¹

There may be, however, situations where some eligible elderly persons prefer to get a non-social residential care position at the resultant market price of non-social residential care positions rather than a social residential care position at a price $f(\alpha)r$. When there are residential care positions with two different quality levels, we may consider that elderly persons select the type of residential care position to rent as in a vertical differentiation context.¹² In that context elderly people's preferences may be described as follows: an elderly person, identified by j , enjoys (indirect) utility $U(j) = js - p$ when using a service of quality s sold at a price p (j represents the taste for quality of that elderly person).¹³ An elderly person who does not rent a residential care position obtains a utility equal to 0. In this context we have $f(s) = s$. Consider in the analysis below that the valuation of quality increases with income.

If $p_n(H) \in \tilde{p}$ happens to be the price of non-social residential care positions when H non-social residential care positions are provided and social

¹⁰The selection of quality of non-social residential care positions by private providers of residential care is not considered in this work. Hence, we consider situations where the quality of social residential care positions does not affect, or it has a very small effect, on the quality of non-social residential care positions.

¹¹When the price of a social residential care position is equal to $f(\alpha)r$, the set of eligible elderly persons that are willing to pay that price for a social residential care position does not depend on α .

¹²Gabszewicz and Thisse (1979) and Shaked and Sutton (1982) settled the basis for many later analyses of quality differentiation.

¹³This structure of preferences is very usual in the literature on vertical differentiation, following Mussa and Rosen (1978). See Peitz (1995) for the construction of a direct utility function that has as its counterpart an indirect utility function as the one proposed.

residential care positions are rented at a price αr we may have $\frac{p_n(H)-\alpha r}{1-\alpha} < m$. In this case, elderly persons with willingness to pay for a non-social residential care position between $\frac{p_n(H)-\alpha r}{1-\alpha}$ and m prefer to rent a non-social residential care position at a price $p_n(H)$, while elderly persons with willingness to pay for a non-social residential care position between r and $\frac{p_n(H)-\alpha r}{1-\alpha}$ prefer to obtain a social residential care position (note that $\frac{p_n(H)-\alpha r}{1-\alpha} > p_n(H)$). Hence, it may occur that some eligible elderly persons prefer to have a non-social residential care position at the resultant market price of non-social residential care positions rather than a social residential care position at a price αr . To apply the analysis in the previous sections we should use $\frac{p_n(H)-\alpha r}{1-\alpha}$, for each H , instead of m . In this context we may still obtain the results in the previous sections, as the expected demand for non-social residential care positions, when there are social residential care positions, is, also in this context, smaller and it does not have the same slope as the demand for residential care positions without social residential care.¹⁴ The market of non-social residential care positions will be affected by the setting up of the social system of residential care only for those values of H such that $\frac{p_n(H)-\alpha r}{1-\alpha} > p^*$ (the price of residential care positions without social residential care). In this case, as $\frac{p_n-\alpha r}{1-\alpha}$ increases with p_n , we have that the higher the price of non-social residential care positions the greater the set of eligible elderly persons that would prefer a social residential care position, but the lower the probability of obtaining a social residential care position for an eligible elderly person.

The effects of a reduction in the quality of social residential care positions, and in their corresponding price, depend on the variation of $\frac{p_n(H)-\alpha r}{1-\alpha}$ with α for each H (note that $p_n(H)$ may change with α). When the regulator does not know well the income of each elderly person, a reduction in the quality of social residential care positions would serve to overcome in part that asymmetry of information on income between the regulator and each elderly person, if it induced the selection of a non-social residential care position by those eligible elderly persons with higher incomes.

¹⁴However, now $\frac{p_n(H)-\alpha r}{1-\alpha}$ depends on the decision on residential care provision of private providers of residential care.

6 Conclusion

This work has considered a social system of residential care where private providers of residential care must provide some social residential care positions when they obtain a permit to provide non-social residential care positions. The regulator determines the number of social residential care positions to provide, their price and the maximum income level that an elderly person may have to be eligible for a social residential care position. Social residential care positions are allocated at random among eligible elderly persons, and there are some elderly persons who are eligible for a social residential care position and that would be able to afford a residential care position if there were not a social system of residential care. The number of private providers of residential care is given to the regulator and there is imperfect competition among those providers in the supply of non-social residential care positions.

In this paper it has been shown that a social system of residential care may have a “collusive effect” in the market of non-social residential care, when there is imperfect competition among private providers. As a consequence of this effect, the setting up of the social system of residential care may reduce the total number of residential care positions provided, increase the price of non-social residential care positions, reduce total surplus and increase the profits of private providers of residential care even in situations where the price of social residential care positions is below the unit cost of provision. After the setting up of a social system of residential care, elderly persons that do not obtain a social residential care position may face a higher price for a (non-social) residential care position and some of those that would have rented a position without the social system of residential care will not rent a position when the system is established.

Hence, the reaction of private providers of residential care with market power to the setting up of the social system of residential care must be taken into account when deciding on the design of the social system of residential care and of the scheme to compensate private providers of residential care. If the profits of private providers of residential care increased with social residential care, direct government funding of the social system of residential care (through tax credits or any other transfer mechanism) would not be required.

A reduction in the asymmetry of information on income between the

regulator and each elderly person (for instance, through an increase in fiscal inspection), when that asymmetry of information exists, may make the “collusive effect” discussed in this work less likely. If the asymmetry of information on income were smaller there would be less eligible elderly persons that would rent a residential care position without social residential care.

If the situation were such that only elderly persons with very low incomes were eligible for a social residential care position, there would not be eligible elderly persons who could afford to rent a residential care position when there is not social residential care. The price and number of non-social residential care positions would be the same as the price and number of residential care positions without social residential care. In this case the social system of residential care would not induce a “collusive effect”.

The consideration of a linear demand function does not matter for the results. The results also follow for other demand functions as it occurs that, when a social residential system is established, the expected demand for non-social residential care positions is smaller and may have different slopes than the demand for residential care positions without social residential care.

The change in the expected demand for non-social residential care positions when a social system of residential care is established does not depend on the form of competition among private providers of residential care. Hence, the results, obtained for the case of Cournot competition among private providers of residential care in this work, could also be valid with other forms of competition among private providers of residential care.

7 References

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8 Appendix: Proof of Proposition 1

Let us proceed first to obtain the expected inverse demand function for non-social residential care positions. Let H denote the total number of non-social residential care positions provided and h_i the number of residential care positions offered by residential care provider i . Note that $H < \frac{a-r}{b} - D$ is required to have non-social residential care positions that are more expensive than social residential care positions. The total number of positions of residential care provided will be $H + D$.

If $0 < H \leq \frac{a-m}{b}$, the price of non-social residential care positions would be $a - bH$ (given by the inverse demand function without social residential care). The reason is that, in this case, there would not be elderly persons eligible for a social residential care position that value the services of a non-social residential care position in, at least, $a - bH$ ($a - bH \geq a - b\frac{a-m}{b} = m$).

When $\frac{a-m}{b} < H < \frac{a-r}{b} - D$, elderly persons with willingness to pay for a residential care position between $a - bH$ and m are eligible for a social residential care position and some of them may obtain a social residential care position. In that interval, the price of non-social residential care positions for each number of non-social residential care positions provided will, thus, depend on the result of the allocation process of social residential care positions. As these residential care positions are allocated at random among the eligible elderly persons, the price of non-social residential care positions for H between $\frac{a-m}{b}$ and $\frac{a-r}{b} - D$ might take many different values and, in general, will be smaller than $a - bH$. That price will be a random variable: \tilde{p} . However, as private providers of residential care are neutral to risk they will take into account only the expected price of non-social residential care positions, $E(\tilde{p}(H))$, for each level H of non-social residential care positions.

The expected price of non-social residential care positions when $\frac{a-m}{b} < H < \frac{a-r}{b} - D$ is equal to the price of non-social residential care positions that

is obtained when social residential care positions happen to be distributed among the eligible elderly persons in a particular way. This particular distribution corresponds to the case where, for any group of eligible elderly persons, the proportion of those elderly persons that obtain a social residential care position is equal to the probability that any eligible elderly person has of obtaining a social residential care position $(\frac{bD}{m-r})$.¹⁵

With that particular distribution of social residential care positions among the eligible elderly persons, the number of non-social residential care positions rented at a price p of non-social residential care positions such that $m > p > r$ would be $\frac{a-p}{b} - \frac{m-p}{b}(\frac{bD}{m-r})$.¹⁶ Hence, if H non-social residential care positions were built when private providers of residential care are uncertain about the allocation of social residential care positions, with $\frac{a-m}{b} < H < \frac{a-r}{b} - D$, the expected price of non-social residential care positions, $E(\tilde{p}(H))$, would be such that

$$H = \frac{a - E(\tilde{p}(H))}{b} - \frac{m - E(\tilde{p}(H))}{b} \left(\frac{bD}{m-r} \right),$$

that is,

$$E(\tilde{p}(H)) = \frac{a(m-r) - mbD}{m-r-bD} - \frac{b(m-r)}{m-r-bD} H.$$

Note that $a > m > r + bD \Rightarrow \frac{a(m-r) - mbD}{m-r-bD} > a$ and $\frac{b(m-r)}{m-r-bD} > b$.

Therefore, the expected inverse demand function for non-social residential care positions when a social system of residential care has been established is

$$E(\tilde{p}(H)) = \begin{cases} \frac{a(m-r) - mbD}{m-r-bD} - \frac{b(m-r)}{m-r-bD} H & \text{for } \frac{a-m}{b} \leq H < \frac{a-r}{b} - D, \\ a - bH & \text{for } H \leq \frac{a-m}{b}. \end{cases}$$

We also have that the expected inverse demand function for residential care positions by those elderly persons that obtain a social residential care position is $m - \frac{m-r}{D}z$, for $0 \leq z \leq D$.

As $r < p^* = \frac{a+nc}{n+1} < m$, we know from the analysis in section 2 that the price of non-social residential care positions, when there is social residential care, will be at most m . Hence, the equilibrium in the market of non-social residential care positions may correspond to a corner solution, with

¹⁵This distribution would result if we considered a continuous of elderly persons with respect to the willingness to pay for a residential care position.

¹⁶Note that there are $\frac{a-p}{b} - \frac{a-m}{b} = \frac{m-p}{b}$ eligible elderly persons that are willing to pay between p and m for a residential care position.

the expected price of non-social residential care positions equal to m , or to an interior solution, with the expected price of non-social residential care positions in the interval (r, m) . To obtain this interior solution we proceed as in section 2, using $\frac{a(m-r)-mbD}{m-r-bD}$ instead of a and $\frac{b(m-r)}{m-r-bD}$ instead of b , and assuming that the situation is such that the n private providers of residential care remain active.¹⁷ Then, we get¹⁸

$$h_i^* = \left[\frac{a-c}{b} - \frac{(m-c)D}{m-r} \right] \frac{1}{n+1} < q_i^* \quad (1)$$

and the expected price of non-social residential care positions will be¹⁹

$$E(\tilde{p})^* = \left[a + nc + \frac{(a-m)bD}{m-r-bD} \right] \frac{1}{n+1} > p^*. \quad (2)$$

The interior solution given by (1) and (2) requires $E(\tilde{p})^* < m$ ($\Leftrightarrow H^* > \frac{a-m}{b}$). If $\left[a + nc + \frac{(a-m)bD}{m-r-bD} \right] \frac{1}{n+1} \geq m$ the corner solution $p^c = m$ and $h_i^c = \frac{a-m}{bn}$ will be obtained.

From (1) we obtain

$$H^* + D = \left[\frac{a-c}{b} - \frac{(m-c)D}{m-r} \right] \frac{n}{n+1} + D = \frac{(a-c)n}{b(n+1)} + \frac{m+nc-(n+1)r}{(m-r)(n+1)} D.$$

It cannot be guaranteed that the setting up of a social system of residential care as the one considered in this paper will increase the total number of residential care positions provided, even considering a linear demand function for residential care positions. At the interior solution given by (1), the total number of residential care positions provided will increase if and only if $m+nc > (n+1)r$ (we already know that the total number of residential care positions provided will decrease if the corner solution results after the setting up of the social residential care system).

The variation in expected profits of private providers of residential care with the setting up of the social system of residential care is

$$E(\pi(D, r, m))^* - \pi^* = (E(\tilde{p})^* - c)H^* + (r-c)D - \pi^*$$

¹⁷We have to add the term $(r-c)\frac{D}{n}$ in the expression of the total profits of each provider of residential care, but the (interior) solution in the market of non-social residential care does not depend on this additional term, as long as the n providers of residential care remain active.

¹⁸Note that $r+bD < m < a$ implies $(a-c)(m-r) - (m-c)bD \geq (a-c)(m-r-bD) > 0$ and $h_i^* > 0$.

¹⁹The price of non-social residential care positions for some allocations at random of social residential care positions may be below p^* .

$$= nD \frac{a(m-r)(a-2m) + c(m-r-bD)(2m-c) + bDm^2}{(m-r-bD)(m-r)(n+1)^2} + (r-c)D. \quad (3)$$

Therefore, the setting up of a social system of residential care may increase the expected profits of private providers of residential care (for instance, when $r \geq c$ and $a \geq 2m$ it is $E(\pi(D, r, m))^* - \pi^* > 0$). Moreover, from (3) we have that the expected profits of private providers of residential care may increase even if $r < c$, that is, even in situations where they have to rent social residential care positions at a price below provision cost. ■