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Abstract

The German nursing home industry rapidly grows due to the permanent increase of people in need of long-term care, in particular. At the same time a large share of residents in German nursing homes is in need of social assistance. In a simple spatial competition model we show that the presence of people in need of social assistance increases prices of nursing homes. Bargaining between nursing homes and long-term care insurance companies and social assistance administration can restrain this price-enhancing effect. In addition, price negotiation may help to reach a social optimal number of nursing homes. Thus, our analysis also presents a rationale in favor of negotiations in nursing home markets from a welfare point of view.

JEL classification: H53, I11, I38, L13
Keywords: Spatial competition, nursing homes, social assistance, bargaining

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The Market for Nursing Homes in Germany: A Spatial Competition Approach

1. Introduction

The German nursing home industry has experienced a tremendous growth over the last years. In 1999 0.57 million people in need of long-term care resided in nursing homes while fourteen years later in 2013 we count 0.82 million residents in nursing homes. That is a dramatic increase of 43% or about 2.6% per year. During the same time the number of nursing homes rose from about 8.900 to 13.000 in 2013, i.e. an increase of 47% and 2.8% per year, respectively.[1] According to projections this development will go on driven by the ageing of population, in particular.[2]

We can learn a lot about the market of nursing homes by the large and growing body of economic studies on health care markets.[3] But the German nursing home market is characterized by some specifics which may substantially influence the behavior of the agents acting on this market and, thus, the market outcome. First, on the demand side there are two distinguished groups in need of long-term care: On the one side the so-called self-payers who can afford to pay the price for residential care by themselves, on the other side people whose financial assets do not suffice to pay the price (at least at the margin) and who are in need of social assistance. More than 30% of all residents in nursing homes receive social assistance.[4] Thus, the demand for long-term care in nursing homes is only partially price sensitive allowing nursing homes to set higher prices, if they acted in a pure market economy.

However, as a second specific, prices of long-term care in Germany are not the result of pure market forces but are negotiated between nursing homes on the one side and long-term care insurances and social assistance administration on the other side.[5] The literature on bargaining in health care markets suggests that negotiations between providers and purchasers of health services may alter the market outcome compared to pure market equilibrium.[6] Third,

[1] See Statistisches Bundesamt (2015).
[2] See e.g. Rothgang et al. (2012).
[3] For an actual and comprehensive overview see Handbook of Health Economics edited by Pauly et al. (2012). For an up-to-date detailed survey on the industrial organization of health care markets see Gaynor et al. (2015).
[4] See Dräther and Rehbein (2009).
[5] Rothgang et al. (2005) offer a very good discussion of pros and cons of the price-setting rules in the German nursing home market.
[6] There is a small but growing literature on bargaining in health market, notably Barros and Martinez (2005, 2008), Siciliani and Stanciole (2013), Grennan (2013), and Gowrisankaran et al. (2015).

by German law the price has to be the same for all residents within a nursing home receiving the same long-term care.[7] So a nursing home can not discriminate between the group of self-payers and people in need of social assistance.

In the present paper we integrate these three issues in a simple circular-city model in the line of Salop (1979). In our set-up, nursing homes compete on prices which are simultaneously negotiated with long-term care insurances and social assistance administration. Our findings extend the standard results on spatial competition on prices as reported for example by Salop (1979) and Gravelle (1999), in several respects.

We will show that prices crucially depend on the presence of people in need of social assistance. The price for long-term care will be higher the larger the share of residents in need of social assistance. The intuition is that a higher share of people receiving social assistance damps price competition between nursing homes. Bargaining can restrain this price-enhancing effect of people in need of social assistance. The higher the bargaining power of the long-term insurances and social assistance administration the lower the negotiated price and thus the profit margin of a nursing home. Thus, bargaining reduces the expenditures of the payers of long-term care. This is an important rationale for price negotiations from the viewpoint of all payers and of social assistance administration, in particular.

While the price reducing effect of bargaining *per se* implies only a redistribution of rents between payers and providers of long-term care and is, thus, neutral from a welfare point of view, there are also welfare considerations in favor of price negotiations. As is well known, in a standard circular-city model with free entry too many firms are engaged in the market from a social point of view. The reason is that if the social optimal number of firms is in the market each firm earns a positive profit giving an incentive to new firms to enter until all profit possibilities have vanished. By decreasing the profit margin of nursing homes bargaining alleviates the incentive to enter the market and reduces the number of nursing homes. Thus, bargaining may be seen as an instrument in order to limit the number of nursing homes in a social preferable way.

Beside these arguments in favor of price negotiations we investigate the effects of some important and reasonably foreseeable developments in the German nursing home market. First, the growing number of people in need of long-term care brings about a larger number of

[7] The German Social Security Code (SGB) explicitly prescribes that the nursing price of a given severity of care as well as the cost of board and lodging has to be the same for all residents of a nursing home (c.f. para. 84, 3 SGB XI). The investment costs in a single room may be higher than in double or larger rooms.

nursing homes on the circle, i.e. within a given geographical market area. Thus, competition between nursing homes becomes fiercer lowering the prices for residential care. Consequently, the profit margin per resident shrinks and the number of beds per nursing home will increase. These theoretical findings are in the line of the expected development of the German nursing home industry as elaborated by the consultant company Ernst & Young (see Lennartz and Kersel, 2011), for example.

Second, it is feared that as poverty of the elderly increases the share of people in need of social assistance rises, too, tempering competition between nursing homes and resulting in higher prices for residential care (for a given number of people in need of long-term care). Again, the number of nursing homes increases but the number of beds per nursing home will shrink.

Third, due to the excess demand for nursing staff wages and, thus, the cost of long-term care will increase in the future. In general, this cost increase can only be partly shifted in higher prices reducing the profit margin of the nursing homes. Thus, the number of nursing homes will shrink while the number of beds per nursing home will rise.

In summary, these three reasonably future developments have very different and countervailing effects on the nursing home industry from a theoretical point of view and it is an empirical question which forces dominate.

2. The Model

Consider a market for residential long-term care where I identical nursing homes are equidistantly located on a circle with circumference equal to 1. There are N people in need of residential long-term care which are separated in two groups. On the one hand N^P people who have to pay for their care by themselves, the so-called self-payers, and on the other hand N^S people who are in need of social assistance and the social assistance administration pays the nursing homes for them

(1) $N = N^P + N^S$ and $1 = n^P + n^S$,

where n^P denotes the share of self-payers and n^S the share of publicly financed people, respectively. We assume that both groups are uniformly distributed on the circle and that the market is always fully covered so that in equilibrium all people in need of long term care

reside in a nursing home.[8] Each person demands one unit or place from the most preferred nursing home.

The utility of a self-paying person who lives at x and moves to nursing home i, located at z_i, is

$$U^P = v - p_i - t|x - z_i|,$$

where $v > 0$ is the gross utility of residing in a nursing home, p_i is the price charged by nursing home i, and $t > 0$ is a moving cost parameter catching the marginal disutility of distance of the nursing home from the home residence.[9]

The distance between nursing homes is equal to $1/I$. A self-paying person who is indifferent between moving to nursing home i and the neighboring nursing home $i+1$ located at $z_i + 1/I$, is located at $x_i^{P,+}$, defined by

$$v - p_i - t\left|x_i^{P,+} - z_i\right| = v - p_{i+1} - t\left|x_i^{P,+} - \left(z_i + \frac{1}{I}\right)\right|,$$

so that

$$x_i^{P,+} = z_i + \left(\frac{1}{2I} - \frac{p_i - p_{i+1}}{2t}\right).$$

Similarly, a self-paying person living at

$$x_i^{P,-} = z_i - \left(\frac{1}{2I} - \frac{p_i - p_{i-1}}{2t}\right),$$

is indifferent between moving to nursing home i and nursing home $i-1$ located at $z_i - 1/I$. In summary, nursing home i faces total demand of self-paying people from both sides

$$\text{(2a)} \quad D_i^P = N^P\left(x_i^{P,+} - x_i^{P,-}\right) = \frac{N^P}{I} - \frac{N^P}{t}\left(p_i - \frac{p_{i+1} + p_{i-1}}{2}\right).$$

A person in need of social assistance does not pay anything for long term care (at least at the margin).[10] Her nursing home choice only depends on gross utility and moving cost

[8] As is well known, a simple textbook version of the circular-city model exhibits three possible equilibria: a competitive equilibrium in which all the market is covered and the marginal consumer earns a positive rent, a kink equilibrium in which all the market is covered but the marginal consumer earns no rent and a monopoly equilibrium in which not all the market is covered (see e.g. Gravelle, 1999). Interestingly, allowing for two distinct consumer groups a fourth possible equilibrium arises in which not all self-paying consumers reside in a nursing home but all publicly financed people. Throughout this paper we concentrate on competitive equilibria.

[9] Distance is the most important criterion determining the choice of nursing homes. But also prices influence the nursing home decision. See Nyman (1994), Pesis-Katz et al. (2013), and, in particular for the German nursing home market, Schmitz and Stroka (2014).

[10] In reality, a person in need for social assistance bears a part of her long term care cost, in general. But at least at the margin her financial assets do not suffice to pay the whole price. In order to simplify the analysis we assume that she does not pay anything.

considerations. Thus, the utility of a person allowed for social assistance who lives at x and moves to nursing home i located at z_i is given by

$$U^S = v - t|x - z_i|.$$

A person in need of social assistance who is indifferent between moving to nursing home i and the neighboring nursing home $i+1$ located at $z_i + 1/I$, is located at $x_i^{S,+}$, defined by

$$v - t\left|x_i^{S,+} - z_i\right| = v - t\left|x_i^{S,+} - \left(z_i + \tfrac{1}{I}\right)\right|,$$

so that $x_i^{S,+} = z_i + \frac{1}{2I}$. Similarly, a person in need of social assistance living at $x_i^{S,-} = z_i - \frac{1}{2I}$, is indifferent between moving to nursing home i and nursing home $i-1$ located at $z_i - 1/I$. Thus, nursing home i faces total demand of people in need of social assistance from both sides

$$(2b) \qquad D_i^S = N^S\left(x_i^{S,+} - x_i^{S,-}\right) = \frac{N^S}{I}.$$

Summing up, total demand of nursing home i is given by

$$(3) \qquad D_i = D_i^S + D_i^P = \frac{N}{I} - \frac{N^P}{t}\left(p_i - \frac{p_{i+1}+p_{i-1}}{2}\right).$$

Note that price differences of neighboring nursing homes only affect the demand of self-payers.

Nursing homes are profit maximizers and have identical cost functions.[11] The total cost of nursing home i is $wD_i + F$ where w denotes long-term care cost per resident and F is fixed cost. We interpret F as the market entry cost. Gross profit of nursing home i is

$$(4) \qquad \pi_i = (p_i - w)D_i.$$

Note that a nursing home charges all residents with the same price whether they are self-payers or in need of social assistance. This assumption reflects the legal position in Germany where the payments for long-term care as well as for board and lodging have to be the same for all residents with the same level of care within a nursing home.[12]

Prices of long-term care in nursing homes are not the result of pure market forces but are bargained between each nursing home on the one side and long-term care insurance companies together with the social assistance administration on behalf of the payers on the

[11] The assumption of profit maximization seems to be improper since most of the German nursing homes are run as non-profit organizations. But following Lakdawalla and Philipson (2006), non-profit firms can be analyzed as pure for-profit firms with lower costs.
[12] C.f. para. 84, 3 SGB XI.

other side. Residents do not directly participate in the negotiations. We assume that long-term care insurance companies and social assistance administration, afterwards shortly the purchaser, bargain in the interest of all people in need for long-term care taking into account the expenditures for all residents.[13] The utility of the purchaser is

(5) $V = \sum_{i=1}^{I}(v - p_i)D_i.$

Our bargaining model is similar to Horn and Wolinsky (1988) which has become the workhorse bargaining model for predicting the division of surplus in bilateral oligopoly and is recently used to analyze price negotiations within the American hospital sector.[14] The purchaser negotiates with each nursing home separately and simultaneously on its price. The outcome of each negotiation satisfies the bilateral Nash Bargaining solution. Each bilateral price maximizes the Nash product of the nursing home's profit and purchaser's utility, taking the prices of all other nursing homes as given. The maximization problem is

(6) $\max_{p_i}\left[(v - p_i)D_i + \sum_{j\neq i}^{I}\left(v - \bar{p}_j\right)D_j - \bar{V}\right]^{\gamma}(\pi_i - \bar{\pi}_i)^{1-\gamma}$

where $\gamma = [0,1[$ is the bargaining power of the purchaser while $1-\gamma$ is the bargaining power of nursing home i. $\bar{V}$ is the purchaser's disagreement payoff when no contract with nursing home i is signed. Following Horn and Wolinsky (1988) both bargaining parties assume that the prices of all other nursing homes would not be renegotiated if they do not agree. i.e. $\bar{V} = \sum_{j\neq i}^{I}\left(v - \bar{p}_j\right)\bar{D}_j$.[15] When negotiating a nursing home only claims to it's long-term care cost neglecting its market entry cost.[16] The fallback (gross-)profit of nursing home i if negotiation fails is set to zero, $\bar{\pi}_i = 0$.[17]

Assume that all nursing homes simultaneously bargain its price with the purchaser, the first order conditions for the negotiated price of nursing home i is given by

(7) $p_i = w + (1-\gamma)\left\{\left[1 + \frac{(p_i - w)}{D_i}\frac{\partial D_i}{\partial p_i}\right]\frac{V - \bar{V}}{D_i} + p_i - w\right\} + \gamma\frac{(p_i - w)}{D_i}\frac{\partial D_i}{\partial p_i}\left(p_i - \frac{p_{i+1} + p_{i-1}}{2}\right).$

The negotiated price for nursing home i consists of three elements. First, the price must at least cover the long-term care cost per resident of nursing home i. Second, the price consists

[13] Alternatively, we could assume that the purchaser takes only the benefits and expenditures of people in need of social assistance into account. In equilibrium we get the same results.
[14] See e.g. the studies by Grennan (2013) and Gowrisankaran et al. (2015).
[15] Note that the variables $\bar{p}_j$ and $\bar{D}_j$ denote the values of the Nash bargaining solution for nursing home j, which are taken as given by both bargaining parties.
[16] This assumption is in line with the German Social Security Code (SGB) which postulates that a nursing home payment must not cover the entry and exit cost (c.f. para. 82, 2 and 3 SGB XI).
[17] This assumption is justified since there is a single purchaser, nursing homes are not capacity constrained, and each nursing home exhibits constant marginal cost for a given quality level.

also of a margin representing the additional surplus per resident emerging from a contract with nursing home i to both negotiating parties weighted with the bargaining power of nursing home i. Though the share of the additional surplus allotted to the purchaser has to be adjusted by a term taking into account that an increase in price also repels people in need for long-term care from nursing home i. Third, the price may be used by the purchaser to allocate people in need for long-term care to the more beneficial nursing home from its point of view. To illustrate this suppose that the price in nursing home i is lower than in the neighboring nursing homes $i+1$ and $i-1$. Then, the negotiated price will be relative lower in the more beneficial nursing home than in the other one, as this channels people to the more favorable (cheaper) nursing home i. This third effect vanishes if the purchaser has no bargaining power, $\gamma = 0$, because in this case the purchaser has in fact no influence on the negotiated price.[18]

Assuming symmetry, in equilibrium the bargained prices are the same for all nursing homes, $p_i = p$, and the third element of the price equation (7) vanishes. Moreover, all nursing homes will accommodate the same number of residents, $D_i = D = N/I$. Finally, using equation (3) we can rewrite equation (7)

$$(8) \qquad p = w + (1-\gamma)\left\{\left[1 - (p-w)\frac{n^P}{t}I\right](v-p) + p - w\right\}.$$

This equation describes the bargained price of all nursing homes in the (unique) symmetric equilibrium. To get a better understanding of this equilibrium let us suppose that the purchaser has no bargaining power, $\gamma = 0$, so that in fact there is pure spatial price competition between nursing homes undisturbed by the purchaser. In this case the equilibrium price is

$$(9) \qquad p = w + \frac{t}{n^P I}.$$

In equilibrium, the price is equal to the long-term care cost per resident plus the moving cost parameter divided by the share of self-paying residents and the number of nursing homes. Thus, the price will be higher the lower the share of self-paying residents and the higher the share of residents in need of social assistance, respectively. The intuition is, the lower the share of self-paying residents the lower is the price responsiveness of demand and, thus, the higher is the price setting power of a nursing home. Here we see the price pushing effect of

[18] This third effect also disappears if the purchaser is only interested in the well-being of people in need of social assistance because price differentials between nursing homes do not affect the residence decision of this group of people in need of long-term care.

the existence of residents in need of social assistance which may give a rationale why in Germany nursing home prices are negotiated in order to limit remunerations.

Moreover, as in a standard circular-city model the price will be lower the higher the number of nursing homes. Intuitively, a higher number of nursing homes within a given (geographical) market area increases competition lowering the price setting power of a nursing home ceteris paribus.

To close the model with free entry and exit of nursing homes we impose the zero-profit condition for a symmetric equilibrium,

$$(10) \quad \pi = (p - w)\frac{N}{I} = F.$$

Using equations (8) and (10) we can calculate the negotiated price, the number and the size of nursing homes in equilibrium for a given bargaining power of the purchaser, given number of people in need of long-term care, given shares of self-payers (and people in need of social assistance, respectively), and given long-term care cost.

Due to the aging of society and the shortage of nursing staff in Germany it is predicted that the number of people in need of long-term care as well as the cost of long-term care will increase in the future.[19] Thus, an investigation how these developments may affect the German nursing home market is of special interest. At the same time it is feared that the share of nursing home residents in need of social assistance will also rise, because the price of long-term care will grow faster than the available resources of people in need of long-term care. Here the question arises whether and how the purchaser may alter the market outcome by strengthen her bargaining power. These arguments motivate a detailed comparative static analysis of these parameters in the following section.

3. Comparative Statics of the equilibrium

In this section we analyze the effects of a higher number of people in need of long-term care, higher long-term care cost, a larger share of people in need of social assistance, and of higher bargaining power of the purchaser on equilibrium prices, the number and the sizes of nursing homes as stated by the equations (8) and (10).[20]

[19] A further long-term care cost driver may be the minimum wage for nursing staff (c.f. Augurzky et al., 2009).
[20] See the Appendix for details of the comparative statics.

Number of people in need of long-term care

We start the comparative static analysis by studying the effects of higher number of people in need of long-term care, the most pressing development of the German nursing home market. Using Cramer's rule, the effects of an increase in N on the equilibrium price and the number of nursing homes are formally given by

$$(11) \quad \frac{\partial p}{\partial N} = \frac{n^P(1-\gamma)(p-w)^2(v-p)}{tI\Delta} < 0,$$

$$(12) \quad \frac{\partial I}{\partial N} = -\frac{(p-w)\left\{\gamma+(1-\gamma)\left[(v-p)\frac{n^P}{t}I+1-(p-w)\frac{n^P}{t}I\right]\right\}}{I\Delta} > 0,$$

where $\Delta := -\frac{N}{I^2}(p-w)\left\{\gamma+(1-\gamma)\left[2(v-p)\frac{n^P}{t}I+1-(p-w)\frac{n^P}{t}I\right]\right\} < 0.$

A higher number of people in need of long-term care decreases the equilibrium price but increases the number of nursing homes. The intuition runs as follows: Starting from an equilibrium an increase of the number of people in need of long-term care boost the demand for long-term care. For a given price (and no capacity constraint of nursing homes) gross profit of nursing homes increases, too. Lured by profit possibilities new nursing homes enter the market. Within a given geographical market area competition between nursing homes gets fiercer and prices decrease. Thus, gross profit of each nursing homes shrinks due to a decline in profit margin per resident and a decrease in number of residents since new nursing homes steal demand from the established institutions until gross profit again just cover the fixed market entry cost. In the new equilibrium prices and, thus, profit margin per resident of each nursing home are lower, so the number of beds of each nursing home has to be increased. To sum up we get

Proposition 1: *If people in need of long-term care increases the number of nursing homes increases as well. But prices fall while the size of nursing homes grows.*

This theoretical result is in line with predictions of consulting companies with regard to the future development of the German nursing home industry. For instance the consultants of Ernst & Young (see Lennartz and Kersel, 2011) expects that the number of beds of nursing homes will increase in order to be rentable since competition on the market will get fiercer.

Long-term care cost

Beside the tremendous growth of people in need of long-term care an increase of long-term care cost is expected by economists and consultants. The main cost driver in long-term care is labor cost since nursing is very labor intensive. The German labor market for nursing staff is

already very tense. Since years we observe excess demand which will be intensified by further growth of the nursing home industry.[21] Not astonishing, it is expected that labor cost for nursing staff will increase. How will the nursing home industry be affected by this expected increase in long-term care cost?

In our model using Cramer's rule, the effects of an increase in w on the equilibrium price and the number of nursing homes are formally given by

(13) $$\frac{\partial p}{\partial w} = -\frac{(p-w)N\left\{\gamma+2(1-\gamma)(v-p)\frac{n^P}{t}I\right\}}{I^2\Delta} > 0, \text{ and } 1 \geq \frac{\partial p}{\partial w} > 0$$

(14) $$\frac{\partial I}{\partial w} = \frac{(1-\gamma)N\left[1-(p-w)\frac{n^P}{t}I\right]}{I\Delta} \leq 0,$$

where $$\Delta := -\frac{N}{I^2}(p-w)\left\{\gamma+(1-\gamma)\left[2(v-p)\frac{n^P}{t}I+1-(p-w)\frac{n^P}{t}I\right]\right\} < 0.$$

Higher long-term care cost will increase the remunerations of nursing homes but will decrease the number of nursing homes, in general. As we know, in equilibrium the bargained price consists of two elements, the long-term care cost per resident and a margin representing the additional surplus per resident for both negotiating party weighted by the bargaining power of the nursing home. When the long-term care cost rise the first element increases in the same amount. But secondly, an increase in long-term care cost reduces the additional surplus for the negotiating parties and, thus, the second element decrease, in general. In sum, the bargained price increases when long-term care cost rise but not in the same amount as the increase in long-term care cost, in general. Only if the nursing home has all the bargaining power, $\gamma = 0$, i.e. the case of a pure market, the price is determined according to equation (9) and an increase in the long-term care cost will increase the price in the same amount.

If the price increase is smaller than the causing increase in long-term care cost, profit margin per resident of the nursing homes will decrease. Thus, nursing homes will exit the market until the gross profit is again high enough to cover the fixed cost. In this case, the number of beds per nursing home will be larger than before the cost increase. Only if the purchaser has no bargaining power and the price increase is equal to the cost increase, the number and the size of nursing homes will not alter. Thus we conclude

Proposition 2: *If the long-term care cost increase prices will increase as well. In general, the number of nursing homes will decline and the number of beds per nursing home will*

[21] Rothgang et al. (2012) predict additional nursing staff in the amount of 260.000 up to 490.000 FTE in order to provide long-term care for all people in need until 2030.

increase. Only if the purchaser has no bargaining power, the case of a pure spatial competition, the number and the size of nursing homes will not alter.

Here we see how negotiations on prices may influence the development of the nursing home industry. The bargaining power of the purchaser restrains the possibility of nursing homes to simply shift higher cost in higher prices one by one.

People in need of social assistance

It is feared that the share of people in need of long-term care, who cannot afford the financial burden of residing in a nursing home and thus may depend on social assistance, will increase since nursing home prices grow faster than their financial assets. In our model the effects of an increase in the share of people in need of social assistance (a decrease in the share of self-payers n^P) on the equilibrium price and the number of nursing homes are formally given by

$$(15) \quad \frac{\partial p}{\partial n^P} = \frac{N(1-\gamma)(p-w)^2(v-p)\frac{n^P}{t}}{I\Delta} < 0,$$

$$(16) \quad \frac{\partial I}{\partial n^P} = \frac{N(1-\gamma)(p-w)(v-p)}{t\Delta} < 0,$$

where $\Delta := -\frac{N}{I^2}(p-w)\left\{\gamma + (1-\gamma)\left[2(v-p)\frac{n^P}{t}I + 1 - (p-w)\frac{n^P}{t}I\right]\right\} < 0.$

An increase in the share of people in need of social assistance increases the price and the number of nursing homes. As already mentioned above, an increase in the share of people in need of social assistance lowers the price responsiveness of demand. Given the number of nursing homes, the bargained price rises and, thus, the profit margin per resident and gross profits as well. Due to new profit possibilities new nursing homes will enter the market. Within a given geographical market area competition between nursing homes gets fiercer and prices decrease. Thus, gross profit of each nursing homes shrinks due to a decline in profit margin per resident and a decrease in number of residents since new nursing homes steal demand from the established institutions until gross profit again just cover the fixed market entry cost. In the new equilibrium prices and, thus, profit margin per resident of each nursing home are higher, so the number of beds of each nursing home has to be decreased. We get

Proposition 3: *If the share of people in need of social assistance rises prices and the number of nursing homes increase while the size of nursing homes decrease.*

Taking propositions 1 to 3 together these three expected trends on the market for long-term care have very different and countervailing impacts on the German nursing home industry.

From a theoretical point of view the overall performance is ambiguous and it remains an empirical question which trends are strong enough to determine the future development. But this is not the scope of this paper. We are rather interested in how negotiations and the bargaining power of the purchaser, in particular, may alter the structure of the German nursing home industry.

Bargaining Power

The last of our comparative static exercises studies the effects of higher bargaining power of the purchaser. Using Cramer's rule, the effects of an increase of γ on the equilibrium price and the number of nursing homes are formally given by

(17) $$\frac{\partial p}{\partial \gamma} = \frac{N(p-w)^2}{I^2(1-\gamma)}\frac{1}{\Delta} < 0,$$

(18) $$\frac{\partial I}{\partial \gamma} = \frac{N(p-w)}{I(1-\gamma)}\frac{1}{\Delta} < 0,$$

where $\Delta := -\frac{N}{I}(p-w)\left\{\frac{\gamma}{I} + (1-\gamma)\left[2(v-p)\frac{n^P}{t} + 1 - (p-w)\frac{n^P}{t}\right]\right\} < 0.$

A higher bargaining power of the purchaser always decreases the equilibrium price and the number of nursing homes. The intuition runs as follows: Starting from an equilibrium the purchaser prevails a lower price for long-term care due to her increased bargaining power decreasing the profit margin per resident of the nursing homes. Thus, for a given number of nursing homes the gross-profit does no longer cover the fixed market entry cost. In the following nursing homes will exit the market and gross profit will rise due to two reasons. First, when nursing homes exit the number of residents per nursing home rises so that for a given profit margin the gross profit rises, too. Second, the profit margin will also rise, since the bargained price will increase while competition gets weaker when nursing homes exit. But in the new equilibrium the bargained price is lower than in the starting point as is the number of nursing homes. Of course, the size of each nursing home is larger since all people in need of long-term care will reside in a nursing home. So we state

Proposition 4: *A higher bargaining power of the purchaser always lowers the negotiated price. The number of nursing homes shrinks while the size of nursing homes increase.*

The bargaining power of the purchaser influences the structure of the nursing home industry. By affecting nursing home prices it alters the number and the size of nursing homes. From this point of view bargaining power may be seen as an instrument to determine the structure of the nursing home industry in the line with the market. In the next section we

investigate whether this instrument can be used to ensure a preferable allocation of long-term care from a welfare point of view.

4. Welfare Considerations

It is well-known that in the standard circular-city model with pure price competition, in equilibrium, there are too many firms in the market from a welfare point of view. The reason is that if there is a social optimal number of firms at work in the market they earn positive profits (after-fixed market entry cost) attracting new firms to the market. These new firms have a private incentive to enter the market and take business from the other firms. But this business stealing does not add to welfare as this just amount to a transfer of profits from one firm to another. The *business-stealing effect* is also present in our model of the nursing home market (and even more pronounced, since due to the existence of people in need of social assistance prices and profit margin are higher than in the standard circular-city model). Since bargaining power of the purchaser may help to restrain prices and profits of nursing homes the question arises whether and how the bargaining power may be used as an instrument to ensure a social optimal number of nursing homes.

To answer this question we first derive the optimal allocation from a welfare point of view. Suppose that a benevolent planer can directly control the number of nursing homes. Taking into account that all people in need of long-term care reside in a nursing home he maximizes the welfare function[22]

(19) $$W = 2I\int_0^{1/(2I)}(v - w - tx)Ndx - I \cdot F = \left(v - w - \frac{t}{4I}\right)N - I \cdot F.$$

by choosing I. The first order condition of a social optimum is

(20) $$\frac{\partial W}{\partial I} = \frac{t}{4I^2} - F = 0.$$

The optimal number of nursing homes is achieved when the marginal benefit of an additional nursing home consisting of lower (average) moving cost for people in need of long-term care just cover the additional market entry cost of this nursing home. Solving equation (20) for I we get the social optimal number of nursing homes as

[22] Note that in our setting under welfare considerations prices are ignored since they are only transfers between self-payers and purchasers on the one side and nursing homes on the other side. If we take into account that expenditures of social assistance has to be financed by distortionary taxes nursing home prices should be as low as possible, i.e. equal to the cost per resident from a welfare point of view.

(21) $I^* = \frac{1}{2}\sqrt{\frac{t \cdot N}{F}}$.

Now suppose that the purchaser has no bargaining power, $\gamma = 0$, so that in fact there is pure competition between nursing homes undisturbed by price negotiations and the price is given by equation (9). Using equation (10), too, we get the number of nursing homes in equilibrium with pure market competition as

(22) $I^C = \sqrt{\frac{t \cdot N}{n^P F}}$.

Comparing equations (21) and (22) reveals that the number of nursing homes in a pure competition equilibrium is higher than the social optimal number. The reason is the well-known business-stealing effect which is even more pronounced in our model, since due to the existence of people in need of social assistance prices and profit margins per resident are higher than in the standard circular-city model.

By restraining the negotiated prices and the profit margins per resident the purchaser may be able to steer the number of nursing homes towards the social optimum. So let us look for the bargaining power of the purchaser ensuring an optimal number of nursing homes from a welfare point of view. For this we first determine the negotiated price providing the social optimal number of nursing homes, p^*, which has to satisfy condition

(23) $(p^* - w)\frac{N}{I^*} - F = 0$.

Using equation (21) and solving for p^* we get the price ensuring the welfare optimum as

(24) $p^* = w + \frac{1}{2}\sqrt{\frac{t \cdot F}{N}}$.

Inserting this result in equation (8), where $I = I^*$, we get the bargaining power of the purchaser generating the price p^* and thus the optimal number of nursing homes I^*

(25) $\gamma^* = \frac{(v-p^*)(1-n^P/4)}{(v-p^*)(1-n^P/4)+(p^*-w)} < 1$.

The optimal bargaining power of the purchaser depends on the share of self-payers. If this share gets smaller and the share of people in need of social assistance gets larger, respectively, γ^* rises. The intuition is that a smaller share of self-payers weakens competition between nursing homes. So the bargaining power of the purchaser must rise to offset the price increasing effect of weaker competition. Note that γ^* is smaller than one. From a welfare

point of view the purchaser could also have too much bargaining power restraining the number of nursing homes on a suboptimal low level.[23] In general, we can state

Proposition 5: *In a pure market economy there are too many nursing homes from a welfare point of view. Price negotiations may help to restrain the number of nursing homes.*

Of course, this technical finger exercise should not be taken too literally. Bargaining power is not an instrument which can be chosen as tax rates or allowances to pursue a nursing home. It rather depends on the bargaining abilities and skills of all negotiating parties. But the bargaining power of the purchaser can be influenced by norms and processes, e.g. the number of cost items which are considered and have to be documented in the negotiation process or the right of inspection of books of accounts of nursing homes. Thus, bargaining power is not a given constraint but a policy instrument which may be difficult to handle.[24]

5. Concluding Remarks

The German nursing home market faces great challenges. The number of people in need of long-term care is steadily and strongly increasing. It is expected that the cost of long-term care will rise. And it is feared that share of people in need of social assistance residing in a nursing home will grow. These challenges will influence the German nursing home industry in manifold ways.

To get an idea how the nursing home industry may react to these predicted developments we expanded Salop's (1979) seminal circular-city model by two elements notably characterizing the German nursing home market. First, prices are not the result of pure market forces, but are negotiated between nursing homes on the one side and long-term care insurances and social assistance administration on the other side. Second, there is a substantial share of residents in need of social assistance to cover long-term care cost.

We have shown that these two characteristics may substantially influence prices as well as the number and the size of nursing homes. In detail, not astonishing, a higher bargaining power of the long-term care insurances and social assistance administration always decreases prices. Thus, profit margin per resident decreases, too, and nursing homes will exit the market

[23] Including distortionary taxation to finance expenditures of social assistance as discussed in footnote 21 would generate a typical second-best problem. Having only the instrument of bargaining power at hand, the purchaser is not able to minimize the welfare cost of taxation and to ensure the optimal number of nursing homes. Both aims can only be achieved if the purchaser has a second instrument available, e.g. entry control.

[24] Here the question arises whether a remuneration of nursing homes according to a payment system of the DRG type, which is used in the German hospital industry, would be preferable.

while the size of the residual nursing homes will rise. In contrast, a larger share of people in need of social assistance dampens competition between nursing homes and negotiated prices increase. Ceteris paribus new nursing homes enter the market and the size of nursing homes decreases. These two specifics describe important constraints for the effects of the three major challenges of the German nursing home market, as mentioned above.

The most pressing challenge of the nursing home market is the rapid increase of the number of people in need of long-term care. Of course, this rise evokes an increase in the number of nursing homes as well. But, since competition between nursing homes gets fiercer the price of long-term care will fall and the size of nursing homes must rise in order to earn enough profit to cover fixed entry cost. In contrast, the expected increase in long-term care cost will raise the bargained price but by less than the causative cost increase, in general. Ceteris paribus, the number of nursing homes decreases while the size of them will increase. Finally, the feared increase in the share of people in need of social assistance may boost prices and the number of nursing homes while reducing the number of residents per nursing home. So, from a theoretical point of view the overall effect of these three challenges is ambiguous and we need deliberate empirical work to predict the future development of the German nursing home market.

From the author's point of view, the most promising empirical strategy to investigate these issues is to follow a structural approach building on a fully-specified bargaining model as outlined in this paper. This kind of approach became prominent in recent years and is well documented in the studies by Gowrisankaran et al. (2015), Grennan (2013), and Ho and Lee (2013) for the American health care market. An application of the structural approach (without bargaining) for the Wisconsin nursing home market is presented by Ching et al. (2014). Using a high quality data set combined with recent theoretical and econometric advances point to this line of work leading to important finding in the near future.

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Appendix

In this Appendix we derive the comparative static results illustrated in Section 3 in the main text. The equilibrium price and quality are given by the equations (10) and (11). Total differentiating these two equations gives the system

$$\begin{bmatrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{bmatrix} \begin{bmatrix} dp \\ dI \end{bmatrix} = \begin{bmatrix} B_{11} & B_{12} & B_{13} & B_{14} \\ B_{21} & B_{22} & B_{23} & B_{24} \end{bmatrix} \begin{bmatrix} dN \\ dw \\ dn^P \\ dt \end{bmatrix},$$

with

$A_{11} = \frac{N}{I} \geq 0,$

$A_{12} = -(p-w)\frac{N}{I^2} < 0,$

$A_{21} = -\left\{\gamma + (1-\gamma)\left[(v-p)\frac{n^P}{t}I + 1 - (p-w)\frac{n^P}{t}I\right]\right\} < 0,$

$A_{22} = -(1-\gamma)(p-w)\frac{n^P}{t}(v-p) < 0,$

$B_{11} = 0,$

$B_{12} = -(p-w)\frac{1}{I} < 0,$

$B_{13} = 0,$

$B_{14} = \frac{N}{I} > 0,$

$B_{21} = \frac{(p-w)}{(1-\gamma)} > 0,$

$B_{22} = 0,$

$B_{23} = (1-\gamma)(v-p)(p-w)\frac{I}{t} > 0,$

$B_{24} = -\left[\gamma + (1-\gamma)(v-p)\frac{n^P}{t}I\right] < 0.$

The Hessian determinant is $\Delta = A_{11}A_{22} - A_{12}A_{21} < 0$.

The comparative statics results reported in equations (11) – (18) are then easily found by using Cramer's rule.