

Analysis of price and quantity competition
between public and private housing firms in Sweden



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Abstract:

This bachelor's thesis concerns the Swedish housing market and how the publicly and privately owned firms may differ in goals, costs, and actions. Building upon a theoretical foundation of different models of competition and the Lerner Index's measurement of monopoly power, an empirical investigation is made into whether competition on the Swedish housing market mainly expresses itself in price, quantity, or both, as well as how competition may vary across different kinds of municipalities. Using multiple variable OLS regression, it is shown that competition on the Swedish housing market, at least between public and private firms, is conducted in terms of price and not quantity. Median yearly rent is found to decrease as public market ownership concentration increases, and that rents increase slightly with population size, although at different rates depending on the type of municipality. Using an official categorization for distinguishing Swedish municipalities into different levels of urbanization, it is shown that greater urbanization is correlated with higher expected rent at zero public ownership and rents that are less responsive to increases in either local public sector ownership or population increases, relative to rents in rural municipalities.

Keywords: Housing market, monopoly power, public sector, competition, Lerner Index.

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1. Introduction

In order to understand a market, one must understand what kind of competition the firms face. A perfectly competitive market is normally considered efficient, while markets with a few large firms are associated with putting profits above socially optimal resource allocation. This thesis investigates the Swedish housing market to find the manner in which firms compete and how competition might vary depending on the ownership composition on the local market. Due to Sweden having a substantial public sector that with varying degrees engages in the housing market, an analysis of local competitiveness depending on the relative size of the public housing firms can be made using the Lerner Index as a theoretical foundation. I was raised in a municipality with a strong public housing firm, and my personal experience was that such firms more often tried to maximize profits rather than go out of their way to care for the most economically vulnerable, as is their original purpose. The inspiration for this thesis was to verify whether my perception held true or not, to see how public housing firms vary in size, action, and effect across Sweden, and how relative public and private ownership impacts the rental market in terms of price and quantity.

2. Background and context

2.1 Context for the Swedish housing market

Initially, it is necessary to explain and contextualize the Swedish public sector and housing market. Sweden is a unitary state divided into three levels: national, regional, and municipal, each with their own areas of competencies, as it is called. Very simply, the national level deals with foreign affairs, taxes, and laws, including the rules and regulations for housing and construction, as well as the financing of the public sector as a whole. The twenty-one regions mainly deal with health care and public transportation and have little direct effect on the housing market, but access to public transportation and regional prosperity can have indirect effects on municipal actions and individuals' choice of residence. The 290 municipalities manage most of the public sector services, including housing, and as can be expected from 290 separate local entities, none two are alike, which needs to be accounted for in the methodology. The Swedish Association of Local Authorities and Regions (2021), hereafter referred to as SALAR, handily groups the municipalities into categories that will be used in this thesis.

A short history lesson on Swedish housing history is necessary to contextualize this thesis and inform the reasoning behind the hypothesis. Public housing in Sweden grew out of the construction of the modern welfare state during the 1900's, but it was in 1947 that the

municipalities gained responsibility of accommodating a growing population with adequate housing. In 1965 the government enacted a program to build one million appartements during a ten-year period, which mostly fell onto the municipal organizations to construct with financial support from the government. Rent regulations changed in 1968 so that even private sector rent had to be set in relation to the local public sector rent. This held true until 2011 when rent regulations changed so that from then on rents are set via negotiations between representative organizations for the tenants and landlords (Public Housing Sweden, 2022). Rent regulation is discussed further in section 2.2.

In the early 90's there was a significant tax reform that lowered income taxes, allowing citizens greater choice of consumption. However, at the same time housing benefits were lowered, which raised the average costs of living. The same reform later led to municipal housing firms losing their special status of having financing guarantees from the state and from then on, they had to be financed under the same rules as private firms. However, since they are part of the municipal organization public firms still have the option of tapping into local taxes coffers to cover costs and investments. In 2006 it became legal for municipal housing firms to sell properties to the private sector. Finally, in 2011 a new law for public housing was made, stipulating that all firms should compete in accordance with business-like conditions and operate with normal returns on investments compared to the private housing sector. The main mission of public housing firms today is to invest in construction of rental appartements and maintain the condition of current properties, with the aim of providing affordable housing for and assure tenants their influence in questions regarding their living conditions (Public Housing Sweden, 2022).

Such is the context of the market we are examining. A public housing sector born out of a growing welfare state, used as a baseline for the entire housing market in the beginning but over time losing special status and financing, being forced to act more and more like private firms. Yet, they are controlled by a public organization, the municipality, and are funded by tax money, which can encourage other aims and methods than those in the private sector. They are also to some extent still seen as the fundamental provider of housing. If the private sector were to underdeliver in quantity or set rents such that it would force people into homelessness, it is considered the duty of the public housing sector to accommodate the economically vulnerable. This is why Sweden does not have social housing in the sense that is common internationally, since the public housing firms are supposed to assure the availability of housing for all members of society.

2.2 Current state of the Swedish housing market

It ought to be mentioned that Sweden has rent control regulations and therefore market forces, although still very much present, are lessened in magnitude on the Swedish housing market. Swedish rents are negotiated between the Tenants' Association and individual landlords or their representative organizations. For reference this is similar to, although not exactly like, a workers' union negotiating wages with employers. The rent negotiations lead to something that I translate as utility-rent, called such due to it being the perceived, not monetary, value of the apartment that the two sides try to agree upon and set rents according to. How the perceived value is calculated has many variables and can have local variations for how each variable is weighted, so it is best not to delve deeper into it here. The point to take away is that rents are not decided by simple supply and demand, although it is a factor that must be accounted for in the perceived value. From here on out I will regard the rent regulation as a dampener on market forces, rather than a hard price roof (Tenants' Association, 2022).

The County Administrative Boards (2022) can be thought of as the government's local officials, representatives and enforcers with jurisdiction covering the same geographical areas the twenty-one publicly elected regions. These CABs often ensure that laws and regulations are followed, and governmental goals are achieved on the local and regional levels of the public sector, often by approving permits and collecting statistics on certain areas of special interest. One such area is the availability of housing and therefore the twenty-one CABs present a yearly report on the housing situation in each region. By reading through all the 2021 reports I summarize the current general national rental housing situation as the following:

Rural areas have better balance between supply and demand but major and minor towns in most municipalities normally have a deficit in housing supply. Deficits are the rule in cities and urban areas. Housing prices are generally going up and the rate of construction varies from region to region. Some report acceleration, some deceleration. Often an unpredictable population growth from international migration and intranational moving flows is the given cause for construction lagging behind demand. In all regions one or more groups are especially vulnerable on the housing market, such as elderly, students or immigrants. Whether rental apartments, tenant-owned apartments or individual houses are most popular in each region mostly depends on if it is mostly rural or urban, with rental units being more popular in urban regions and municipalities (County Administrative Boards, 2022).

Interestingly, most economic models would predict supply meeting this clearly high demand, especially since prices are rising. The most prominent obstacles causing this market failure varies from region to region, but lack of profitable or attractive land for construction projects, regulations causing expensive construction, and difficulty acquiring lucrative loans are the most cited causes for the overall deficit. This is important to have in mind further on in this thesis, since these are cost factor causing the market to be rather imperfect in terms of matching supply with demand. From here on out, keep in mind that housing deficiency is rampant.

What is the impact of the housing shortage? Well, since the market is undersupplied and the population is growing, demand is moving from D_1 to D_2 while supply is stuck at S_1 . This raises prices from P^* to P' since demand is increasing faster than supply. At the old price P^* , Q_2 would be needed to meet the growing demand, but instead the Swedish national housing market is at Q_1 . The difference between these two is the housing shortage. Due to the increasing price less than Q_2 will be demanded, and due to the nature of housing as a good, the effect is rather that economically weak households live under overcrowded conditions and that people generally move less frequently, slowing moving chains and climbs up the housing ladder. In Sweden 16% of households fall under the EU's definition of overcrowded living, which is the greatest percentage among the Nordic countries (Statistics Sweden, 2021).

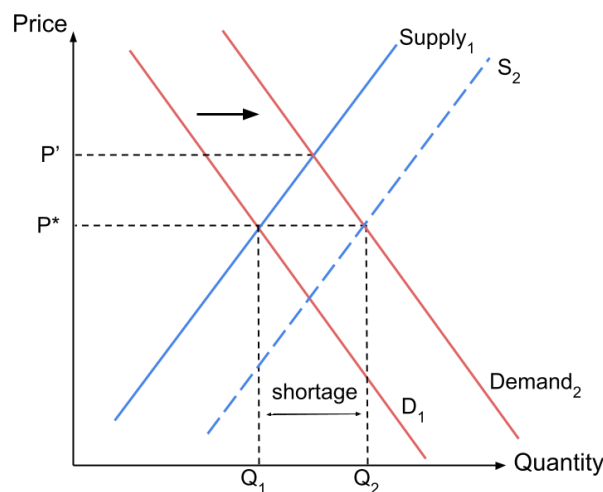


Figure 1. Graphical representation of the Swedish housing market

3. Economic theories

3.1. Perfect and imperfect competition

The Lerner index is an important concept that will be featured in this thesis. It attempts to measure the extent at which a market deviates from perfect competition, so accordingly both perfect and imperfect competition must be discussed so the Lerner index and the subsequent market structure analysis can be properly understood.

Perfect competition is a theoretical model that centers around retail prices being equal to the cost of the product, more precisely the marginal cost, which is the cost of producing the last unit sold. It also involves assumptions about many small firms being on the market such that none have power enough to force a higher price without being undercut by the other firms. These markets concern substitute goods so that every firm have products that in the eyes of the consumer are interchangeable and no firm can clearly distinguish themselves from the others. This is what causes prices to equalize in the entire market, since all consumers would just buy the cheapest of the substitutes. Of course, these assumptions paint a picture of a quite imaginary market, but it is a theoretical base line with which we can compare real-world markets to. In the end, what concerns the Lerner Index is the assumption that in a perfectly competitive market price is equal to marginal cost.

What then defines imperfect competition? It is necessary to be familiar with both sides in order to place the real-world example somewhere along the scale of degrees of competitiveness. Totally imperfect competition would be monopoly, the total lack of competition. However, we already know that this is not the case here since we are pitting two aggregated groups of firms against each other. Rather, it is plausible that the Swedish housing market falls into either an oligopolistic or monopolistic market structure, depending on the kind of municipality. An oligopolistic market is defined by a few powerful firms highly dependent on the actions of the other firms on the market. Monopolistic markets act similarly to perfectly competitive markets but with greater distinguishability, fewer but many rivals, and non-perfect substitute products, such that prices can have some variation due to consumer preference and product quality.

In imperfect markets competition can be conducted via price, quantity, or both. Due to the smaller number of firms in an oligopolistic market, each firm holds some market power which it can wield to impact the sales prospects of its rivals. If one large firm lowers its price they will cut into the margins of its rivals, forcing them to also lower their price or forego some quantity of sales. Unlike in perfect competition not all consumption is lost since some

consumers are willing to pay for a certain brand or convenience. This gives rise to two types of competition strategies: Cournot and Bertrand. These are based in game theory and meant to find the optimal strategy given every other competitor's decision if the so-called "game" is a one-shot, meaning that the firms interact once, make their sales, and do not interact again. Cournot describes quantity competition and Bertrand price competition. These models are useful to describe how firms may reason in certain markets and how the nature of a product impacts whether competition is conducted in terms of price or quantity. However, neither model is fully applicable in real-world situations. To model more real-life-like conditions the Stackelberg model is used instead, since it accounts for repeated sales and interactions, where revenge, barriers of entry and cooperation can be used to explain decisions.

Cournot competition follows from two firms saturating the market with their combined quantity, so market price is given by $P = A - B(q_1 + q_2)$, where A and B are constants describing the features of a certain market. The revenue for one of the firms is then $R = P \cdot Q = P \cdot (q_1 + q_2) = A(q_1 + q_2) - B(q_1 + q_2)^2$, and the marginal revenue, its derivative, is $MR = A - 2B(q_1 + q_2)$. Profits are maximized at the point where marginal revenue equals marginal costs, such that the last unit sold gains the firm as much as it cost to produce. Solving for the firms' optimal quantity under these conditions gives $q_1 = \frac{A-MC}{2B} - \frac{q_2}{2}$ and $P_1 = \frac{A+MC}{2} - \frac{B}{2}q_2$.

Note that these derivations are symmetric, so we can find an equilibrium for each firm as the following: $q_1 = \frac{A-MC}{2B} - \frac{1}{2} \left(\frac{A-MC}{2B} - \frac{q_1}{2} \right) = \frac{A-MC}{4B} + \frac{q_1}{4} \rightarrow q_1^* = \frac{4}{12} \frac{A-MC}{B} = \frac{A-MC}{3B}$. In our case the firms should be thought of as all public housing being aggregated into firm 1 and all the private housing firms being aggregated into firm 2. Cournot-type oligopoly models a saturated market where the two firms are highly dependent on each other's choice of quantity, in this case the amount of undertaken construction, due to prices and profits depending on total market supply. As discussed above, the Swedish housing market has a general deficit, the opposite of saturation, but the logic that one firm's choice of quantity can force the hand of the rival firms is still noteworthy. Also note that firms with a large presence on the local market have coordination advantages, which often will concern the public firms since we aggregate all smaller private firms in our analysis, despite them not actually acting as a single entity.

Bertrand competition uses inverse demand functions, so $Q = a - bP$ where $a = \frac{A}{B}$ and $b = \frac{1}{B}$. If the products are substitutes, consumer will go for the cheapest option, so for the two firms price will be $P_1 = P_2$. This causes a non-continuous demand since if $P_1 > P_2$ then the entire market will go to firm 2, and none of the market will go to firm 2 if $P_1 < P_2$. Rather, both firms profit from keeping the $P_1 = P_2$ condition, which splits the market equally between them with sold quantity $q_1 = \frac{a-bP_1}{2}$, which is symmetric for firm 2. Profit maximization still occurs at $MR = MC$, which derives to $P_1^* = \frac{a+bMC_1}{2b}$, which will be the equilibrium outcome if costs are the same for firms 1 and 2. If prices are not equal to costs one of the firms can just undercut the other slightly and steal the whole market, which both will try to do, causing prices to squeezed equal to costs. Therefore, the only sustainable equilibrium in Bertrand duopoly is $P_1 = P_2 = MC$, if $MC_1 = MC_2$. In real life it is unlikely that a slight undercut steals the entire market, both in terms of consumer behavior and supply capacity. However, the idea holds that housing of roughly equal quality in equivalent circumstances, like in the same municipality, should equalize around a similar price. Any price deviation therefore needs to be explained by other factors, such as consumer preference or non-competitive circumstances.

Stackelberg competition is basically a repeated sequence of Cournot games, but it is the repeated and dynamic aspects that makes it so vital to this analysis, since it allows for a first mover advantage due to production decisions not being made simultaneously. We continue from Cournot quantity and price: $q_1 = \frac{(A-MC)}{2B} - \frac{q_2}{2}$ and $P_1 = \frac{A+MC}{2} - \frac{B}{2}q_2$. However, now q_1 is not determined by q_2 , since firm 1 makes the first move. Now $q_1^* = \frac{(A-MC)}{2B}$, and firm 2's only viable decision is to pick up the rest of the market left after firm one's decision, which is $q_2^* = \frac{(A-MC)}{2B} - \frac{q_1}{2} = \frac{(A-MC)}{2B} - \frac{1}{2} \cdot \frac{(A-MC)}{2B} = \frac{(A-MC)}{4B}$, so firm 2 can only sell half as much as firm 1 when the competitive game is sequential. In real life there is no actual first mover, but there are reactionary and leading firms. In municipalities where the public housing is large relative to the private sector, it could act like a leading firm, such that the private firms must react in accordance with the public firm's decisions. In municipalities where the public housing sector only focuses on those who cannot afford the private sectors' rents, then the public housing firm will of course be reactionary, making decisions according to the private sector's decisions.

3.2 Asymmetric costs

Furthermore, I would like to focus on the assumption that all firms compete under to the same rules and frameworks. This, I claim, is not the case in competition between public and private housing firms in Sweden. Economic theory covers the possibility of firms innovating new production methods to lower their costs, allowing them to undercut each other. Such sudden undercuts are often not the case on the housing market, although adoption of new innovative methods may be asymmetrical. However, costs can be asymmetrical for other reasons.

To this end I would like to note that all municipal conglomerates, in which public housing firms are included, are guaranteed the highest credit score rating: AAA (Kommuninvest, 2022). Although it is possible for construction firms and private housing firms to have equally good rating, it is likely the case that there is some variation of credit worthiness in the private sector. It is also plausible that at the same credit rating, investors may consider the public sector a safer option for repayments and consequently provide them with lower interest rates for equivalent construction projects and loans. In our model this means that, on average, the public sector can potentially have lower loan repayments and lower costs for equivalent projects, causing lower marginal costs compared to their private sector competitors. That would give public housing firms an edge, to either have higher profit margins if pricing at the marginal cost of the private firms or expand their quantity above that of comparable private competitors, yet matching the marginal revenue, the gain from the last unit sold. However, it can be equally true that public housing firms can use this lower average cost to keep rents low and make housing more available, as is their original purpose. See figure 1 for graphical representation in a perfectly competitive model but note that varying costs affects equilibria in Cournot, Bertrand and Stackelberg oligopolistic markets. In other words, it does not matter if the housing market is modeled by perfect or imperfect competition; if public housing firms have a lower cost for equivalent construction, they will have a theoretical advantage over private firms.

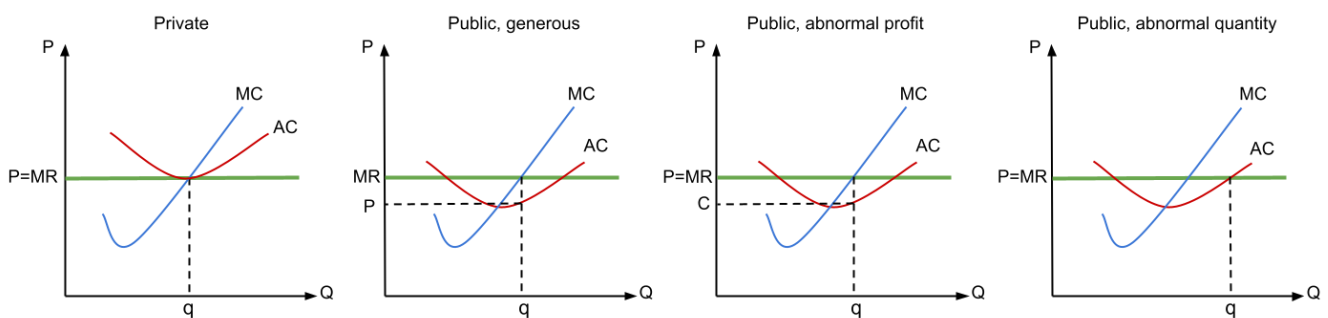


Figure 2. Possible outcomes in a perfect competition housing market

Another aspect to discuss is vertical integration and the concept of double marginalization. In short marginalization refers to the profit maximization of each firm in a vertical chain, consisting of upstream production firms, in this case construction companies, and downstream retailing firms, in this case those responsible for the rental agreements and upkeep. If both firms are in imperfect markets both up- and downstream firms will sell the profit maximizing amount at which marginal revenue equals marginal cost, which is why it is called marginalization. Therefore, doubled marginalization occurs when both vertical firms try to maximize their profits. This raises retail price, in this case rent, above what would otherwise be an efficient allocation. If the two firms coordinated or integrated into one firm, they could remove one marginalization to lower the retail price and increase the quantity sold for a net gain in profitability.

In the case of the Swedish housing market both public and private firms are, as a rule, subject to double marginalization. The norm in the private sector is that landlords outsource construction projects to other firms, although some have resources to manage their own construction projects. In the public sector there is a law that states that all outsourced construction projects must be made available for open bidding to ensure lowest possible cost and responsible use of tax money (Swedish Parliament, 2016). This decreases the marginalization effect but does not eliminate it completely since it is very possible to win the bidding while retaining markup prices. In 2019 the public firms in Stockholm and Malmö, Sweden's first and third most populous cities, managed some internal construction projects. (World of Property, 2019). In essence, double marginalization is the rule, but some minor exceptions can be found.

3.3 The Lerner Index and degrees of monopoly

As stated in the introduction, the Lerner Index is an essential theoretical concept for this thesis. In his article A. P. Lerner (1934) outlines different ways of characterizing perfect competition and monopoly, going on to define a measure of deviation with a score of 0 being a perfectly competitive market and a score of 1 being a perfect monopoly. Lerner's definitions involve both costs and elasticities in order to avoid issues that a more simplified model might incur on his method. Firstly, he distinguishes between monopoly and monopsony revenue for a perfect monopoly, where the former is the difference between marginal costs and price and comes from being the sole seller on the market, and the latter is the difference between average cost and marginal revenue which comes from being the sole employer, renter, and producer on the

market, which allows for cost compression. This is why the Lerner Index is usually given as: $LI = \frac{P-MC}{P}$, although this variation only applies to industries with a constant cost function no matter quantity. The Index can also be expressed as the inverse of the price elasticity of demand: $LI = \frac{1}{\varepsilon} = \frac{\Delta P}{\Delta Q} \cdot \frac{Q}{P}$ but this version assumes that the market is in equilibrium since the marginal revenue must equal the marginal cost for the first equation to be correctly derived to the second. For the purposes of this thesis the most important aspect of the Lerner Index is the implication that monopoly power can reveal itself in its effects on price and quantity.

When deriving cost curves and indifference curves of individuals' general preference between two goods, Lerner shows that the socially optimal resource allocation is the highest point where these curves tangent since the available quantity is maximized, subject to consumers' preferences and firms' costs. Therefore, the social optimum does not improve by movement along the curve, which would occur with expansion of housing supply. Rather, social optimum improves only if the curves move along the axis of relative price between two goods, which would be the case when consumers have different preferences for private or public ownership of their rental apartments, or if the cost per unit function varies between municipalities such that some are inherently cheaper than others. Lerner also points out that tastes cannot be measured. The best way for an economist to understand consumer tastes is to understand consumption patterns and the magnitude of demand. Due to Sweden experiencing an overall housing shortage, this effect is dampened, since economic circumstance takes higher priority than taste. However, the argument remains that the ownership composition on the local market can impact demand. I will assume that greater variation in housing firms implies greater degrees of separation in consumer preference satisfaction, which would lead to greater demand since most preferences could be fulfilled accordingly.

4. Hypothesis

My hypothesis is that the public housing firms will fall into one of two categories, which I call competitive and supplementary. Competitive public housing firms try to expand and extract additional profit to feed into the municipal organization and other public works. Such firms should set rent equal to or above private levels, and possibly attempt to outgrow private competitors in terms of quantity. Supplementary public housing firms rather stick to providing housing for those in need. Those would be smaller firms overall but might be large in relation to private rental appartements, since single-family houses are the most common form of housing in several municipalities. They would use the theoretical profit margin to provide

lower rents, undercutting private firms but providing housing for those who would not afford the private options. As such, I assume that the result will vary between groups of municipalities. I expect smaller municipalities to lean towards supplementary firms and lower rents. It is also worth noting that in smaller municipalities it may be easier for the citizenry to exert influence over municipal organizations. In larger municipalities pressure to finance expensive public works might be higher and citizens' influence over politicians might be less strong. Some evidence of wealth extraction from tenants to the municipal coffers have been found by the Tenants' Association and reported in their membership magazine (2020).

5. Methodology

All the quantitative data for this thesis will be taken directly from the Statistics Sweden's database. The categories chosen for the exportation of each data set will be described below. Since this data is easily exported as Excel files and the planned regressions are not awfully complicated, I have decided to perform the data processing and calculations in Microsoft Excel using the Analysis ToolPak add-in. This might be slightly time consuming but allows for precise control over the data as well as easy and useful visualizations, such as color coding the municipality groups in graphs.

For the number of apartments, I chose all the municipalities, multiple homes buildings and special housing for all ownership categories except "other owner" and "data missing" during the years 2015-2020. I do not include single home housing since public housing firms do not compete in that market and I include special housing since that includes student- and elderly housing, which some municipalities provide or can in some cases be run by separate private but semi-publicly funded firms. Some housing can in some cases also be owned by the state, which is why I have elected to use the term public housing firms, rather than municipal housing firms. The market concentration is simply the percentage of the total local supply that is owned by the public sector. For rent data I chose the yearly median rent per square meter for all municipalities during the years 2016-2021. It is due to this data only being available from 2016 that the total data set is so limited in the number of observations. I also collected the data for the business cycle of the construction sector, but since it should impact public and private firms roughly equally and since all regressions use averaged data for the given period, I will assume that the business cycle's effect in this analysis is minimized during the course of data processing. The population data is the entire registered population in each municipality.

To show how quantity changes relatively between public and private firms in aggregate, I calculated the percentage change in public and private ownership of rental apartments for each year measured: $\Delta Q = \frac{Q_{Year+1} - Q_{Year}}{Q_{Year}}$, resulting in five data points, and then found the difference between these two: $\Delta Q^{Net} = \Delta Q^{Public} - \Delta Q^{Private}$. Doing it this way means that data points with negative y-values correspond to a net decrease, and positive y-values a net increase, in public ownership. Finally, I averaged out the percentage changes over the measured period. This is the variable called relative quantity growth.

Table 1. *Descriptive statistics for main regression variables*

	Mean	Standard deviation	Min	Max
Median rent (SEK)	994.7	116.2	754.3	1539
Relative quantity growth (%)	-2.539	4.160	-22.50	14.26
Concentration (%)	43.63	19.29	0	90.74
Population (thousands)	36.04	75.06	2.395	978.8

The Swedish Association of Local Authorities and Regions (2017), has a categorization of the Swedish municipalities that I will use to distinguish how the results may vary between different kinds of municipalities. These groupings should also act as approximations of municipal micro- and macroeconomic traits, as well as other factors that allows the locals housing markets to be roughly comparable within the groups. I considered adding median income as a separate control variable to approximate purchasing power, thinking that higher purchasing power enables extraction of higher rents. However, since there is no data on cost of living or purchasing power down to the level of individual municipalities, I have decided that the groups will have to serve as approximations of this as well. Note that the rural municipal group is very broadly defined so any approximations will likely be least accurate for this group. The municipality groups are these:

A: The three largest cities and municipalities within commuting distance of these cities, divided into subcategory A1 and A2 respectively. This group will from here on out be referred to as metropolitan municipalities.

B: Medium and small sized cities as well as municipalities within daily commuting distance, with subcategories for the cities, municipalities with high rate of commuting and municipalities

with low rate of commuting as B3, B4 and B5 respectively. Group B is hereafter referred to as urban municipalities.

C: Towns and rural areas, with subcategories for municipalities with a large town, municipalities with commuting distance of such towns, rural municipalities, and rural municipalities with a significant tourism industry as C6, C7, C8 and C9 respectively. Hereafter group C is called rural municipalities.

6. Data processing and analysis

6.1 Data processing and results

Both regressions use the same x-variables and only differ in what y-values they are modelling using OLS. The first regression looks at how median annual rent per square meter in SEK changes as a function of percentage points of public sector market concentration, and the municipal population. In order to distinguish how the markets varies between different kinds of municipalities, a set of dummies are added. The intercept dummy shows how the expected rent at zero percent public housing differs between municipal groups, the concentration dummy shows how rent changes differently between groups as a function of concentration, and the population dummy shows how population size impacts rents differently between the municipal groups. For the second regression the only difference is that median rent is switched out with relative growth in percent as the y-variable.

The rural municipalities are the baseline in both regressions, so the variables called concentration and population show the effects in rural municipalities, and the dummies are to be read as the rural value plus the respective dummy value to get the effect in metropolitan and urban municipalities. Intercept refers to the expected value of rents or relative quantity growth at zero percent public ownership, depending on the regression. Columns one and two are pooled regressions with no distinction between municipalities. Columns three and four are those that separate effects between municipal groups using dummies, the latter of which serves as the foundations for further analysis.

Table 2. *Regression statistics for regressions 1 (rent) and 2 (quantity growth)*

	Rent regression	Quantity growth regression	Rent regression	Quantity growth regression
Intercept	1079***	-2.844***	929.5***	-0.7099
(SEK, %)	(15)	(0.657)	(21.3)	(1.214)

Concentration	-2.365***	-0.007756	-0.5960*	-0.02424
(%)	(0.302)	(0.013067)	(0.3457)	(0.01969)
Population	0.4968***	-0.0009057	2.229***	-0.01368
(thousands)	(0.0777)	(0.0033583)	(0.391)	(0.02227)
Intercept,			347.8***	-2.701
metropolitan			(31.49)	(1.794)
Intercept,			51.73*	-3.021*
urban			(30.92)	(1.761)
Concentration,			-3.516***	0.00002824
metropolitan			(0.705)	(0.04016)
Concentration,			-0.09272	0.05785*
urban			(0.5453)	(0.03105)
Population,			-2.101***	0.01685
metropolitan			(0.397)	(0.02239)
Population,			-1.185***	0.008032
urban			(0.424)	(0.024162)
Observations	290	290	290	290
Adjusted R²	31.0%	-0.5%	61.1%	1.6%
	*Sig. at 90%	**Sig. at 95%	***Significant at 99%	

The first regression has a clear and significant relationship between rent levels, public sector market concentration, and population. The effects also clearly varies between municipal groups. Per percentage point of concentration, the median rent in rural municipalities expected to decrease slightly, and per additional thousand population it is expected to increase slightly. The metropolitan municipalities have, unsurprisingly, much higher expected initial median rent. Urban municipalities are also expected to initially be more expensive than rural municipalities. The results are to be interpreted as the concentration or population coefficient plus the dummy coefficient, so per unit of concentration in a metropolitan municipality the rent is expected to drop significantly more compared to a rural municipality. The effect per percentage point of concentration in urban municipalities, however, is statistically insignificant. The expected rent increase per additional thousand population is much lower in urban and metropolitan municipalities than in rural ones.

The relative quantity growth regression does not return a conclusive or significant result for a relationship with public sector concentration on the local market. The only somewhat significant results are that quantity growth in urban municipalities initially favors private firms but favors public firms slightly more per percentage point of public concentration, compared to rural municipalities. Besides that, this analysis cannot make any reliable statements about how relative growth between public and private housing firms is affected by the relative size of the public housing firm on the local market. To aid in visualizing the data for both regressions, graphs 1 and 2 are plots of rent and relative growth respectively plotted over public sector market concentration in percentage points. The municipality groups are color coded as rural municipalities being green, urban as red, and metropolitan as blue.

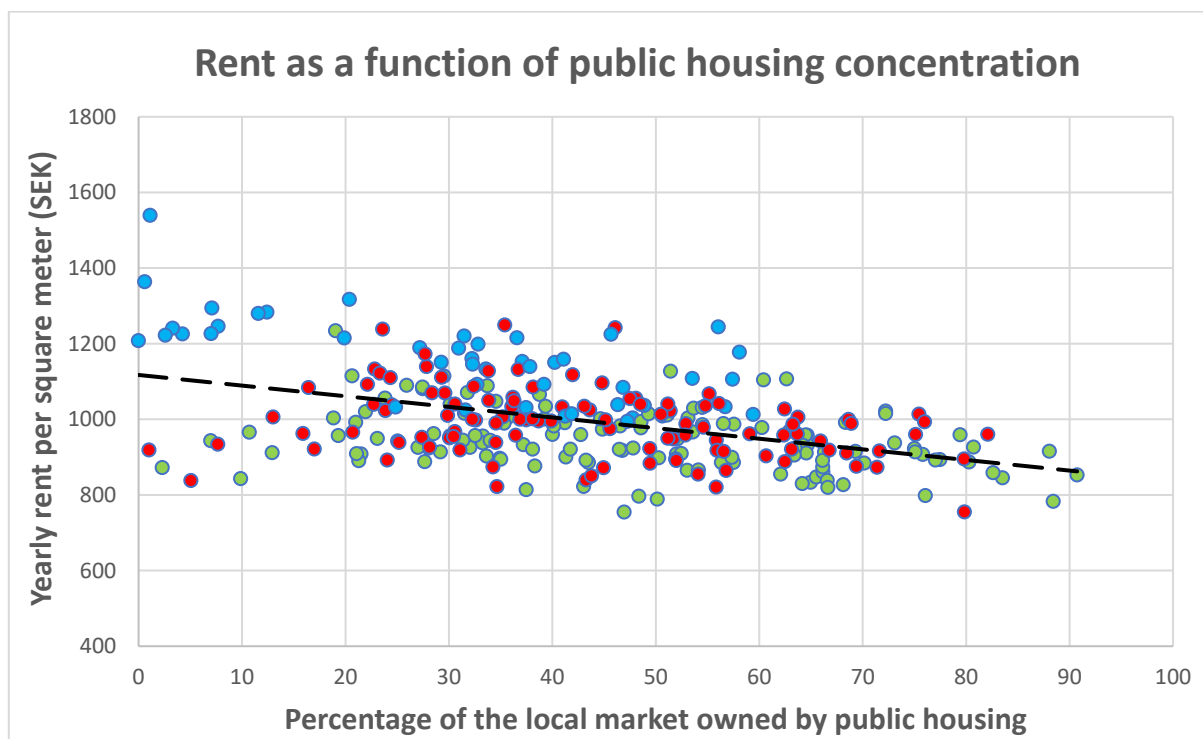


Figure 3. *Rent as a function of public housing’s market concentration.*

By coloring the groups, it can clearly be seen that local markets display different traits depending on what the groups the municipality belongs to. The metropolitan municipalities tend to have low-to-medium concentration and the highest rent no matter concentration, likely due to population density and economic prosperity, resulting in high housing demand. The other urban municipalities are represented all over the distribution yet are mostly positioned in the middle in terms of both concentration and rent. The diverse but mostly rural municipalities tend to have lower rents and have the greatest concentration spread of all groups.

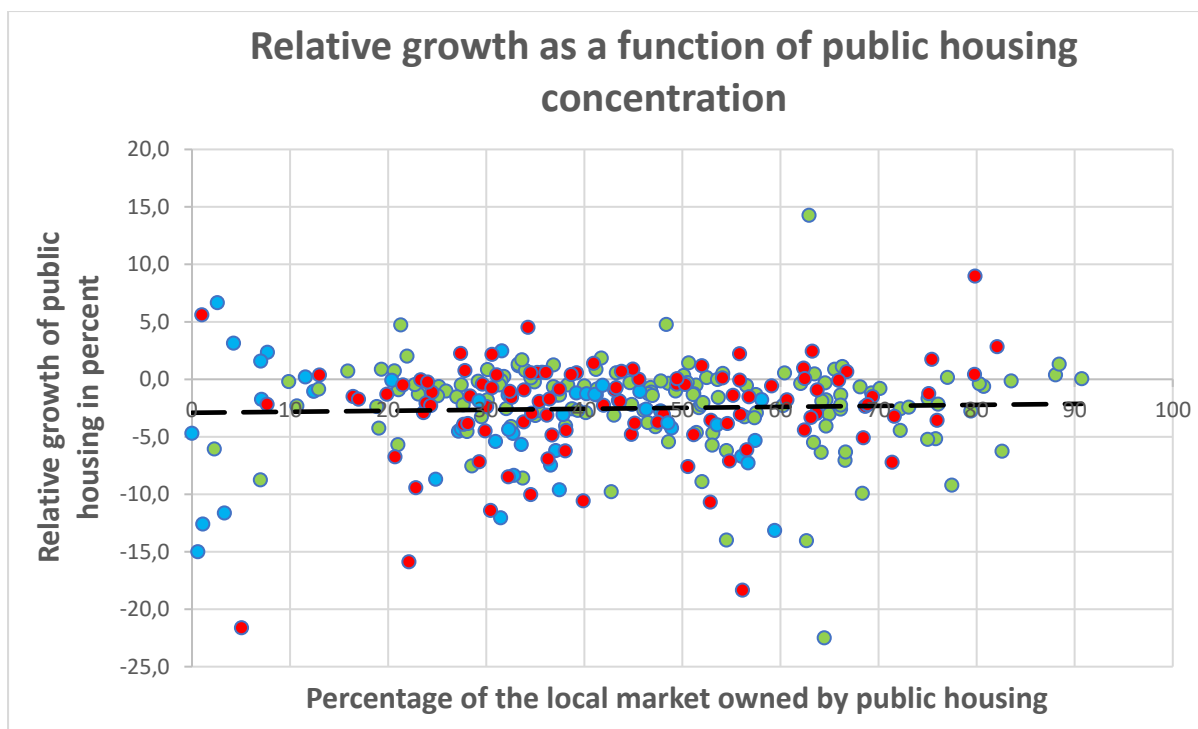


Figure 4. *Relative growth as a function of public housing's market concentration.*

Concerning relative quantity growth, the groups have less distinct trends. Notably, most municipalities are around or just below the zero relative growth line, meaning that either there is little to no net growth at all, or that public and private housing firms grow at roughly the same pace, with the private firms having a slight upper hand on average. The only group that distinguishes itself is that metropolitan municipalities have a higher tendency towards private firm growth. It is also worth noting that some rural municipalities are very small in terms of rental market size, which makes it sensitive to relative percentage growth, which likely explains why it has extreme values in both directions. The most negative data point is Malung-Sälen whose public units went from 869 to 915 and private units from 298 to 729 during the period. Torsås is the most positive data point and went from 445 to 587 public units and from 293 to 170 private units. In short, this regression suffers from a weakness where some small absolute changes causing large percentual results, which affects the fit of the data.

6.2 Result analysis

The results give a picture of competition on the Swedish housing market, at least between public and private housing firms, being conducted by means of price, not quantity. The implication of this is that varying costs between the two types of firms and overall differences in structural economics and demand between municipalities are the determinant factors. It is

clear that the structural cost vary between municipalities, causing different trends on their local rental markets depending on the kind of municipality. It is also clear that there must be some variation in costs, or at the very least aims and actions, between public and private firms since higher concentration of public housing implies lower rent. In hindsight it is not peculiar that there is no significant quantity competition, since the market is in an overall deficit and as such any additional unit made available to the market, regardless of ownership, will be consumed, or in this case rented out. There could still be a structural advantage or disadvantage for either side in the effort to match supply with demand, but this analysis cannot make any such claims.

The reason why median rents get lower with concentration of public housing ownership can partially be related to structurally lower costs, but it must also be considered that the municipalities with highest public sector concentration are also very rural, and therefore the concentration is largely due to a small rental market overall, usually below 1000 units in total, rather than a substantial public ownership. In such municipalities demand for rental housing should be generally low compared to more urbanized areas, resulting in lower rents. That is one possible explanation for the high end of the trend, but the municipalities on the low end lack single commonality. One group seem to be the metropolitan municipalities within commuting distance from one of the three major cities, that make use of the proximity to people, capital, and metropolitan public services to keep their own public sectors small, at least in terms of housing. It is fair to say that it is common for middle-high income households in Sweden to buy houses near, yet not in the middle of, population centers, which can explain the low public ownership of rental apartments in municipalities neighboring large cities. The urban and rural municipalities are harder to explain as a group, but could perhaps be explained by previous political majorities, low inflow of people, unusually accommodating private landlords, or any other such circumstance that can affect individual local markets and their structures. My conclusion is that both urbanization and structural costs are significant factors, but this analysis cannot clearly distinguish the individual magnitude of either, nor determine if or how the magnitude varies between municipalities.

Since rent levels decrease as public housing concentration increases it seems to not be the case that wealth extraction from tenants to municipal coffers is caused by the strength or size of the public housing firm. Rather, like with varying rents at the same level of concentration, the prevalence of such extraction could instead be caused by factors impacting costs for the entire municipal organization, which would be caused by factors such as urbanization and geography.

However, that conclusion assumes that wealth extraction is founded in a municipal need for financing beyond ordinary taxes, not excess profit extraction initiated by the public housing firm itself. Historical political rule, private investment tendencies and geographical factors can again be major causes behind such variations throughout Sweden.

Regarding monopoly power and the Lerner Index we clearly see a variation in price across local markets, but monopoly power also requires a variation in costs such that a monopoly margin is present and can be used to suppress smaller actors on the market. As stated, it is likely that the municipalities with the highest concentration are such due to low demand for rental units rather their firms acting aggressively, and the municipalities with low concentration are obviously not close to monopoly power. Referring to my hypothesis, the firms on both ends of the concentration range seem to be the closest to what I defined as supplementary firms. It is rather in markets of medium concentration we could expect to find public housing firms such as those I defined as competitive. My conclusion is that such firms surely can be present in some municipalities, but this analysis cannot support that it is a widespread phenomenon. The differences in cost, price and concentration between equivalent municipalities are likely better explained by differences in scale economies from urbanization, historical political rule, behavior of the local private firms, geography induced construction costs, and other structural factors that define the markets, rather than market composition and the traits of the local firm alone. This thesis neither exclude or encourage the conclusion that there exists local public housing monopoly behavior in Sweden, but it does indicate that it is theoretically possible and empirically plausible under certain circumstances.

7. Reflections and summary

This thesis has shown that competition can occur in different ways, that different models for competition can be exemplified using empirics, that monopoly power can be observed and given certain data even measured, and that one example market, the Swedish housing market, has its competitive behavior conducted by means of price. The analysis could have been improved from a larger data set, but such limitations are an unfortunate reality of empirical studies. I would also have liked to be able to compare public and private credit ratings empirically to enforce the idea that costs can indeed be different for public and private firms. I also wished to find the cause behind why private and public housing firms experience quantity growth at different rates, but it proved to be that market concentration was not the best explanation. With more time I perhaps could had look further into that subject and find which

factors that dictates quantity growth on the Swedish housing market beyond regular demand. Furthermore, this analysis shows that rental apartments clearly are substitution goods for which price is the main discerning factor, rather than quality or preference. That, as well the fact that private firms actually are several smaller ones rather than one aggregated firm as modeled in this thesis, although the number and size in any given local market can vary quite a lot, and that consumer can distinguish between landlords yet are more interested in the apartment itself, implies that the Swedish rental market is a monopolistic one.

When looking for previous research ahead of writing I mostly found data surveys and reports and a lack of investigations into European housing markets, at least which is to some extent available in English. For further research into this field, I foresee two important paths. The first being an empirical analysis of how elasticities and local demand varies depending on the relative municipal composition of houses, rental, and tenant-owned apartments, regardless of public or private ownership. By looking at local prices for each housing option as a function of the local housing options as well as municipal population changes, perhaps a rough idea of demand elasticity and consumer preferences can be discerned. The European Commission (2013) and the Swedish Board of Housing, Building and Planning (2020) both have extensive reports on the subject, but neither provides a deeper analysis that can support municipal planning committees in achieving an optimally accessible and preferential composition of housing options given their local population demographics, median wealth, and cost factors.

The other path of potential investigation is into the utility and externality of different housing options. As stated in section 2.2 Swedish rents are set according to a negotiated utility value rather than supply, demand, and individual willingness to pay. If such a system is to be used to set rents it would be prudent to define and explore the actual utility of housing options. Some research has taken steps in this direction, but not enough to actually hold weight in an argument of monetary equivalence. Firstly, one ought to consider the individually perceived utilities of living in a rental apartment, which Gustafsson and Wernerheim (2007) wrote their thesis on. Their result was summarized as people preferring rental apartments due to the ease of moving out in the future, landlord responsibility over maintenance, and the lack of initial investment. This together with Rossi-Hansberg and Sarte's article (2012) which looks at housing externalities in the United States of America, and Klien and Streicher's report (2021) that analyses the secondary economics effects of cheaper housing on, for example, private consumption and GDP in Austria, ought to serve as a foundation for a more formal idea of what utility a certain rent entail. The utility of housing as an essential good must be understood

in the highly individual perception of it, as Lerner implied, and the secondary economics effects must also be considered when negotiating a utility-based value of rental apartments.

In summary, this thesis has given theoretical implications that monopoly power can express itself in divergence in either price, quantity, or both, and be measured using the Lerner Index. This theory was then applied on the Swedish rental housing market where the publicly owned rental firms are assumed to be in a dominant position and compared against an aggregate of the privately owned units. The result showed that rents go down as public ownership on the local rental market increases, and that the magnitude of the effect public ownership and population has on median rents depends on the type of municipality. No significant correlation was found between the relative quantity growth between public and private firms and the local market composition. The harshness of price competition clearly varies between local markets and is to some extent dependent on structural factors and how they shape the local markets. In conclusion, Swedish public housing firms do not necessarily take a dominant position against their private competition neither nationally nor locally, yet this analysis cannot exclude that public sector dominance can occur in individual municipal rental markets.

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