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Distributional Effects of Deregulating the Stockholm Rental Housing Market

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1 Introduction

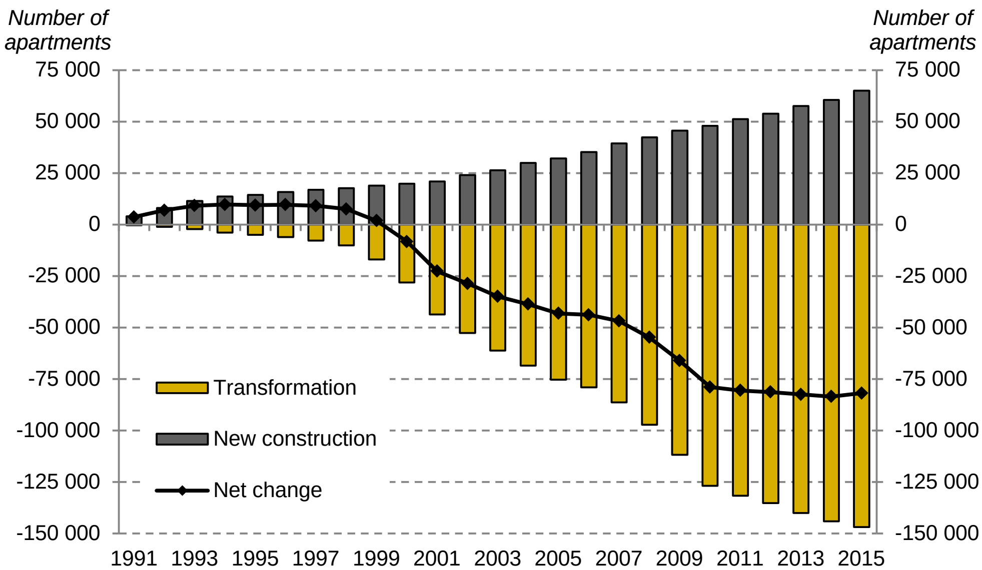
Among other wartime measures, Sweden introduced rent control in 1942. Since then, the regulation has changed shape many times, and has also shown local variations. But in large cities, like Stockholm, Göteborg and Malmö, the rent control is arguably still binding in the sense that rents are below the levels that would obtain in a free rental market.

The consequences of deregulating the market are large and multi-faceted. First, rents would of course increase for some dwellings, but they might fall for others. In Stockholm, the rent hikes would certainly outnumber the rent cuts. But the effects would depend on the time profile of the deregulation. If, for instance, deregulation is allowed to affect only new rental contracts, while incumbent tenants may keep their old, regulated rents, no tenants will lose in the short run. What groups in the next generation will then be the losers (because of higher rents) and what groups will be the winners (because they can more easily find an apartment)? This is a very relevant and difficult question which is outside the scope of the present paper.

One effect of deregulation is that the prices of rental buildings would be affected – and in most cases increase. This would in turn have a number of consequences. The price changes would affect construction of rental apartments. One might say that in central Stockholm, there is little room for new housing, and thus the supply response to deregulation will be negligible. But this is not true. First, there is always *some* space – even in the city center. And once we look at the suburbs – letting suburbs here be defined as areas located, say, seven or eight subway stops from the city center – space is not a limitation.

Second, a price rise on rental real estate would reduce the transformation of rental apartments into coops. As an example of the forces involved, consider the composition of the housing stock in the City of Stockholm over recent decades. As shown in Figure 1, between 1991 and 2015 roughly 147,000 dwellings in metropolitan Stockholm were transformed from rental to owner-occupied apartments in the form of shares in cooperative housing associations (*bostadsrätter*; coops for short). New construction of rental apartments during this period amounted to 65,000 units, and thus the total stock of rental housing fell by 82,000 apartments – which amounts to around 25 percent of the total stock. In fact, 2015 was the first year since 1996 when the rate of new construction was higher than the rate of transformation into coops – arguable a consequence of most of the attractive rental apartments having already been transformed. Whether this wave of transformation is irreversible or not is an open question.

Figure 1 The change in the stock of rental apartments in Stockholm, 1991-2015.



Note: "New construction" is a net figure, consisting of entirely new buildings minus torn down old buildings plus the net change in the number of apartments as a consequence of renovation and rebuilding. The latter two categories are numerically very small; if presented separately, they would hardly be discernible in the diagram.
Source: Boverket

With market rents, the prices of coops and owner-occupied houses would probably also change – and thus the supply of those would also be affected. It is hard to tell in what direction those changes will go. Most economists believe that the rent control, by channeling excess demand to owner-occupied housing, has contributed to the dramatic price increases of coop shares. Thus a deregulation of the rental market might cause a fall in the price level, and thus in the construction, of other types of dwellings.

Another consequence of deregulation is that, *ceteris paribus*, uncertainty will increase about future rents. This will probably boost the emergence of new types of contracts with, say, a fixed rent over the next year, or over the next five or ten years (possibly with some index clause). Such contractual arrangements, which already exist in other countries with free housing markets, may put heavy demands the ability of tenants to make rational and well informed choices. One should however not over-dramatize this aspect of a free market; after all, the choice between contracts of varying length already exists in several markets, like in the case of bank loans with flexible of fixed interest rates, or electricity contracts with flexible of fixed rates. Increasing the choice set for the consumers in the rental market is therefore not essentially different from what we face in other areas of everyday life. It provides an important role for the Swedish Tenants' Association (*Hyresgästföreningen*) as a legal advisor and negotiator on those matters.

Disentangling all these consequences of deregulation would constitute a formidable task for the researcher. In the present report, we limit the discussion to the first issue, i.e., the effect on rents for the existing stock of rental housing, and the distribution of this effect among incumbent tenants. Even with this limitation, the analysis is rather complex and involves a lot of uncertainty. Our calculations should only be regarded as a modest attempt at quantifying one aspect of the effect of deregulating rents.

The likely structure of market rents will be estimated based on transaction data for coop sales. This involves translating coop prices into monthly housing costs ("market rents") using a discount factor. This approach will be described in more detail in the next section followed by a discussion of possible biases in Section 3. Our study relies on separate data sets for coop prices, current rents, and household income, which are described in Section 4. The econometric specification, including the choice of discount factor, is discussed in Sections 5 and 6. In the following sections, results are presented. First, we look in Section 7 at predicted rents across neighborhoods which display a considerable dispersion ranging from more or less unchanged rents in the periphery of the region to increases by 50 percent or more in the city center. The propensity to rent is closely related to income. Section 8 shows that in the lower deciles roughly every second household is a renter compared to every tenth household in the top deciles. In this sense, low-income households will be disproportionately affected by a move to market rents. The following two sections look at distributional effects within the group of renter households. In section 9 we look across different neighborhoods. We find a tendency for percentage rent increases as well as increases relative to income to be higher in areas with high average income than in areas with lower income. In section 10, finally, we look at data on individual households. Sorting households by income we find, contrary to the pattern for neighborhood averages, a tendency for rent increases relative to income to be higher in lower income deciles. We suggest that a source of difference between the distributional pattern looking across income deciles versus neighborhood averages is that temporary deviations from permanent income are averaged out in neighborhood averages. This is further discussed in the concluding section of the report.

2 Our Approach to the Problem

How could one compute free-market rents when there is no free rental market in reality? One approach is that of Lindbeck (1972), who took as a departure the rent level that existed prior to the introduction of rent control in 1942. The pre-1942 rents could be regarded as equilibrium rents, and given the assumption that the price and income elasticities of demand functions had not changed much since then, and given the increase in income levels and in the housing stock between 1940 and 1971, Lindbeck could compute the rent level necessary to equate demand and supply at the latter date. He found that the new equilibrium rents would be between 20 and 40 percent higher than the regulated rents of 1971.

The disadvantage of such an approach is that income and price elasticities can only be estimated with considerable uncertainty even on a free market and are in principle impossible to infer from data on a regulated market. This probably holds even more for local demand functions, pertaining to specific neighborhoods that have gone into or out of fashion, and that in some cases did not even exist in the WWII years.

Another approach is to take today's unregulated housing markets – i.e., the markets for coop shares and one-family houses – as a point of departure. This is the approach we have chosen for our study. Since one-family houses differ in many more respects from rental apartments than do coop shares, they are weaker substitutes for rental apartments than are coop shares. Admittedly, coops and rental apartments also differ in some respects (in particular with respect to risk for short-term leases), but they are physically very similar; if you look at a multi-family building, you can hardly ever know whether it contains coops or rental apartments.

Our study is based on data for all coop shares that were sold in the metropolitan Stockholm Area (see section 4 below for a precise definition) in 2014 and 2015. The data set has information about prices, monthly fees, and the basic physical characteristics of the apartment (essentially size and location). This information allows us to estimate a demand function that gives the cost of housing the consumers pay for a particular apartment i:

$$c_i = f(X_i) + \varepsilon_i. \qquad (1)$$

Here, X_i are the physical characteristics of apartment i (size and location, to be defined more precisely later) while ε_i is a statistical error term representing aspects that are important for the price of the apartment but that are not in our data set. For instance, one apartment could have a nice lake view while another apartment (possibly in the same building) does not. Below, we will discuss exactly what variables enter into the vector of characteristics X_i, as well as the exact functional form of the so-called "hedonic" demand function $f(\cdot)$.

If we know the housing cost c_i of coop share i, we can estimate (1) using standard econometric methods. The cost for apartment i consists of, first, the monthly fee paid to the housing association (denoted A_i), mainly covering heating and maintenance and in some cases interest on loans held by the coop association. Second, it contains the cost of capital. This cost can be calculated from the purchase price of the apartment, P_i, which is in our data. Let r denote the yearly interest rate and g the expected yearly rate of price increase of the apartment; then the yearly cost of capital is $(r-g)\cdot P_i$. The total monthly housing cost of a coop is then

$$c_i = A_i + \frac{(r-g)\cdot P_i}{12}. \qquad (2)$$

If we knew $(r-g)$, we would thus have data for all terms in equation (1) and could estimate it by a suitable econometric method.

Consider now instead a rental apartment i with characteristics X_i and a regulated monthly rent $h_i^{regul.}$. In a well-functioning rental market, the equilibrium rent h_i is equal to the housing cost the tenant is willing to pay. Thus, having estimated equation (1), we can insert the characteristics X_i of any rental apartment and obtain the expected market rent for that apartment:

$$\hat{h}_i = \hat{f}(X_i). \qquad (3)$$

The expected rent increase if the market is deregulated is then $\hat{h}_i - h_i^{regul.}$. Note that $\hat{h}_i$ is only a prediction of the market rent of a rental apartment with observable characteristics X_i. Since we do not have all information about apartment i in our data we cannot do better; the "hat" over the h_i is intended to emphasize the discrepancy between our prediction and the true rent that would be realized in a well-functioning market, where tenants and landlords alike can observe the characteristics not in our data base (like the lake view, or the decrepit state of the building).

3 An Upward or a Downward Bias?

There are several problems connected with using equations (1) – (3) as a vehicle for computing market rents in Stockholm. One is the choice of a suitable functional form $f(\cdot)$, another is the choice of characteristics to enter the X_i vector, and a third is how to obtain information about the capital cost $r - g$. These issues will be dealt with below. Here we will discuss a few more general problems connected with using price data from coops to obtain estimates of free-market rent levels.

If all individuals had identical preferences concerning housing, and considered rental and owned apartments as perfect substitutes, then a procedure like the one described above would be straightforward. But one must bear in mind that preferences are not identical, that some persons have self-selected into the coop market, and that the price level of coops is to some extent driven by the rent regulation. The relation between regulated rents on the one hand, and unregulated coop prices on the other, is a complex matter that warrants some consideration.

At the heart of the matter is the allocation mechanism of rent-controlled housing. One might hypothesize that high-income households are relatively favored in this allocation, for two reasons. First, both private and to some extent public landlords may prefer high-income households among their tenants, since this means fewer problems of rent arrears. Second, high-income households are likely to be better connected, which means that they are more likely to know (private and public) landlords. As is well known (see Section 4 below), a majority of new leases in the rental sector are mediated through informal channels – which in practice means through friends and acquaintances.

One effect of this is that those who obtain cheap rental housing are likely to demand more housing (say, more spacious apartments) than they would do if they had to pay the free-market rent. Note that this would occur even if new leases were allocated in a strict fashion such that excessive space were not allowed; for instance, a family with many children would obtain a relatively spacious apartment – and after a decade or two, when the children have moved out, the parents (and later, a single widow or widower) would still live in that spacious apartment. This would be equivalent to a fall in the stock of rental housing – which in turn would drive up the prices of coop shares.

There are more mechanisms at work in the interplay between a regulated and an unregulated market; see e.g. Hubert (1993) and Häckner and Nyberg (2000) for more elaborate analysis. In particular, the existence of housing of different quality complicates matters. The main conclusion appears to be that although rent control may in principle affect unregulated coop prices in either direction, the most likely outcome is that introducing rent control will drive up coop prices. Analogously, abolishing rent control would lead to a fall in coop prices. For the purpose of the present paper, this means that using coop prices is likely to cause an upward bias in the estimates of the rent hikes following a de-regulation of the housing market.

Another aspect, which we touched upon in the introduction, is the possibility that deregulation will result in an increased supply of rental apartments. Rents cannot increase without bounds, since this would make new construction increasingly profitable – and thus rent increases will be restrained. In fact, this is one of the basic features of the concept of market equilibrium – and, as we pointed out above, space is not an issue *per se*, only central location is. It is, however, hard to say how swiftly supply will increase; to some extent, it depends on whether builders will trust the deregulation to remain politically viable during the lifespan of a new building. The feedback from new construction suggests that the short-run rent increase may be larger than the long-run increase.

Further, there is the problem of selection. Under rent control, there are strong incentives for both landlords and tenants to transform rental apartments into coops. These incentives are strongest for the most attractive apartments, given the vector of observable characteristics X_i. This means that the coops we observe in the market tend to have more unobservable, but attractive, features ε_i than the rental apartments we observe; the most attractive rental apartments have already been transformed into coops. This mechanism will result in an upward bias in the estimated market rent, $\hat{h}_i$.

Summarizing, there are several arguments suggesting that our calculations will be biased upwards. These mechanisms have however not been subject to much empirical analysis, and we cannot therefore tell whether they are quantitatively important.

Below we will present two different sets of results, building on different assumptions about interest and growth rates (see Section 6). One of these assumptions will result in lower predicted rent increases than the other. In line with the suggestion that relying on coop sales prices will lead to an overestimation of the rent following a de-regulation, we will emphasize the set of results with the lower predicted rent increases – although presenting both sets of results in the tables.

4 The Data

We use three different data sets: one with information about the coop shares sold in the Stockholm metropolitan area in 2014 and 2015, one with information about the rental contracts mediated by the Stockholm Housing Agency (*Bostadsförmedlingen*) in 2014 and 2015, and one with register data on a stratified random sample of households in Stockholm. We use information on household structure, housing conditions, and income to analyze the redistributive effects of deregulation, i.e., the effects of the expected rent changes $\hat{h}_i - h_i^{regul.}$.

Our first data set, obtained from data company Valueguard, has information about all 67,000 coop shares sold in 2014-15. For each apartment, there is information about area (square meters and the number of rooms), the monthly fee paid to the coop association, the purchase price and the location. Location is very detailed including the exact street address of each apartment. Such a high resolution would however create problems for the statistical analysis; in order to obtain a sufficient number of observations for each location, we have therefore chosen to represent location of a given apartment with the church parish in which the apartment is located. In the following, we will interchangeably use the term "parish" or "neighborhood" for the geographical area where an apartment is located. Smaller neighborhoods than church parishes would be feasible for coops, but not for rental apartments where the number of observations is more limited.

In order to compute the expected rent increase $\hat{h}_i - h_i^{regul.}$ we also need data on rental apartments. Here, data is considerably more scant. We have data on all apartments mediated by the Stockholm Housing Agency in the metropolitan Stockholm area in 2014 and 2015. The Housing Agency is a municipal organization set up to administer a housing queue and to allocate the scarce, rent-controlled dwellings among the consumers. Apartments are essentially allocated according to queuing time. Of all households moving to a rental apartment in a given year, around 15-20 percent received the apartment via the Housing Service queue; only those are in our database. It is hard to tell how representative those apartments are; one may argue that the most attractive apartments are allocated through other, informal channels.

The Housing Agency also mediates a large number of special apartments that are less close substitutes to coops (for instance, apartments especially made for the elderly, for students, and for young persons in general, as well as a large number of short-term leases). Such special apartments, which are more numerous in the data than regular apartments, are not included in our study.

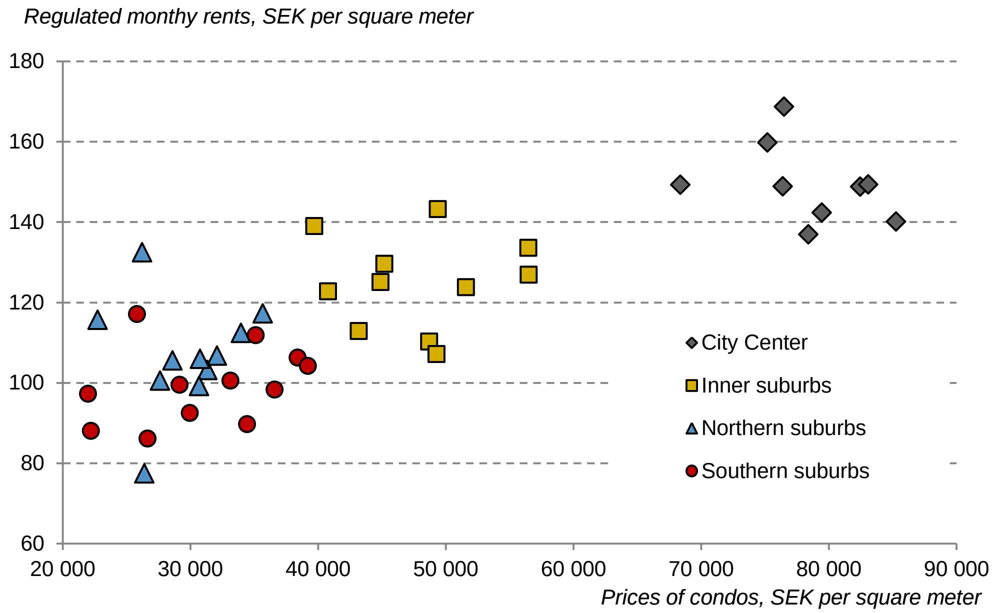
We have also chosen to delete newly constructed apartments, which are over-represented among the apartments handled by the Housing Agency. The reason we have deleted them is that the actual implementation of the rent control allows landlords to charge high rents for newly constructed dwellings – arguably close to the market-clearing level. With such apartments dominating our data on rents, while constituting only a minor fraction of the total housing stock, one would get the false impression that rents in general are in fact close to the market-clearing level.

We have therefore chosen to use only data on rental apartments in buildings constructed prior to 2014. The total number of such apartments, mediated by the Housing Agency in 2014 and 2015, is 7,530 – i.e., a mere 11 percent of the number of coops in our data set (the total number handled by the Housing Agency in those two years, including special apartments and newly constructed ones, is close to 23,000). The number of rental apartments is critical for our study since we want to estimate a hedonic price function like (1) for rental apartments, too. As a comparison, the number of newly constructed coops in Stockholm during these two years was 6,400, i.e. slightly less than a tenth of the total number of purchases. Thus the estimates of equation (1) are hardly affected by whether new coops are included in the data or not.

The third data set is the household register dataset used for the Statistics Sweden microsimulation model (FASIT). That model is regularly employed for policy simulations, using a stratified dataset with weights that allow the outcome to be representative for the population as a whole. This dataset contains rich information on individual households: age, family composition, income, housing characteristics, etc. Here, we look at the 44,000 households living in rental apartments in the Stockholm metropolitan area. However, there is no information about rents paid. In order to study how households with different characteristics are affected by rent increases, we must know what rents they paid prior to the deregulation. We will infer rents from estimates of a version of equation (1) estimated on rent data in the Housing Service data base, with $c_i = h_i^{regul.}$. Using the corresponding housing characteristics of the household data base, we impute a regulated rent $\hat{h}_i^{regul.}$ for each household in the register (where the "hat" indicates that the rent is not the true, regulated rent, but a rent imputed from (1) using data on the 7,530 apartments mediated by the Housing Agency in 2014 and 2015).

In the Appendix (Tables A1 and A2) we present the coop price data from Valueguard and the rent data from Stockholm Housing Agency. We have merged some neighborhoods (church parishes), since the number of observations would otherwise have been too small. Even after merging, there are some neighborhoods with only a few observations (Värmdö-Djurö, e.g., has only 19 coop observations). For the rental market, the problem of too few observations is particularly severe, since so few of the apartments are handled by the Rental Agency. The estimates for these neighborhoods should therefore be regarded with caution (there are five neighborhoods with fewer than 25-30 rental apartments mediated during 2014 and 2015, among them Värmdö-Djurö again). There are also five neighborhoods with between 30 and 50 observations. The very attractive locations in central Stockholm fall into this category, as do some suburban neighborhoods dominated by one-family houses. The data in Tables A1 and A2 in the Appendix are summarized in Figure 2.

Figure 2 Average coop share price per square meter in a neighborhood vs. average regulated rent per square meter in that neighborhood.



Here we see that location plays an important role; central locations command much higher coop prices, but also higher regulated rents, than do peripheral locations. Note also that the pattern in Figure 2 is clearly concave, which suggests that the most attractive, central neighborhoods are not allowed to get a regulated rent that fully reflects their attractiveness. Now, the fact that some neighborhoods have higher prices than other does not necessarily mean that a those neighborhoods are more attractive *per se*. The composition of apartments might differ across neighborhoods and some neighborhoods may have more large, or more old-fashioned, apartments than others, differences that could account for the differences in prices and rents. Differences in size will be controlled for in our statistical analysis (Section 5), but other characteristics, such as "charm", are unobservable and have to be relegated to the error term ε_i.

Note that even if the relationship in Figure 2 had been linear rather than concave, and even if all points in the diagram had been perfectly located on a straight line, this would not have implied that the rent regulation had no effect. Even if regulated rents respect the ranking of neighborhoods in the consumer preferences, the rent *levels* could be non-market-clearing. We will look closer at this question in Section 7, where we report the estimated differences $\hat{h}_i - \hat{h}_i^{regul.}$.

In particular, there is the problem of selection. While the coops in our data base probably constitute a reasonably random sample of the total stock of coops in Stockholm, one may argue that the rental apartments in the data do not. The most attractive rental apartments might change hands via informal channels, without the intermediation of the Housing Agency, and thus will not be in our database. This may be particularly relevant for the attractive neighborhoods in the center of the city.

Finally, we should discuss one variable that is missing in our dataset, namely the construction year of the building. Information about vintages, which are correlated with building quality and architectural attractiveness, is potentially important for the prices of coop shares – although the effect may not be very clear-cut (for a recent Swedish study, see Donner and Kopsch, 2017). Also when estimating (1) for rents, the construction year may play a role (as pointed out, newer buildings are usually allowed to have a higher rent than older ones). One problem is, of course, that the construction year is not a well-defined variable; later additions and renovations will affect both coop prices and controlled rents. Nevertheless, the construction year might have some explanatory power when estimating (1). But since it is missing in our database for rental apartments we are unable to include it in our empirical specification.

5 Econometric Specification

When estimating the hedonic price function (1) we have made use of the so-called Box-Cox Transformation used, e.g., by Halvorsen and Pollakowski (1981). As a first approach, we write the function as

$$\frac{{c_i}^{\theta}-1}{\theta}=$$

$$a_0+a_1\frac{{area_i}^{\lambda}-1}{\lambda}+a_2\frac{{rooms_i}^{\lambda}-1}{\lambda}+a_3\frac{(area_i\cdot rooms_i)^{\lambda}-1}{\lambda}+ \quad (4)$$

$$\alpha_i\cdot neighborhood_i+\delta_i\cdot year_i+\varepsilon_i.$$

As already noted, c_i stands for the housing cost of apartment i, which is equal to $A_i+(r-g)P_i/12$ for coops, and (monthly) rent for rental apartments. Further, $area_i$ represents the apartment's area (in square meters), $rooms_i$ is the number of rooms, and $neighborhood_i$ is a dummy variable that takes the value 1 for the church parish where the apartment is located and 0 for all other parishes. Finally, $year_i$ takes the value 0 if the data on the apartment refer to 2014, and 1 if the data refer to 2015. Note that since $neighborhood_i$ and $year_i$ only take the values 0 and 1, it is meaningless to transform them.

With the specification (4), we can interpret the coefficients α_i as location factors, showing the attractiveness of neighborhoods once we have controlled for $area_i$ and $rooms_i$. Being a dummy variable, we set $\alpha_i=0$ for the combined parishes of Hammarby and Fresta (Upplands Väsby); in Table A3 in the Appendix, we report estimates of the location factors.

Now, one may argue that equation (4) is too simplistic. Maybe the location factor is different for apartments of different sizes; a small one-room apartment might be less attractive in one neighborhood than in another. Therefore, we would prefer a specification including interaction terms $neighborhood_i \cdot area_i$ and $neighborhood_i \cdot rooms_i$:

$$\frac{c_i{}^{\theta} - 1}{\theta} =$$

$$a_0 + a_1 \frac{area_i{}^{\lambda} - 1}{\lambda} + a_2 \frac{rooms_i{}^{\lambda} - 1}{\lambda} + a_3 \frac{(area_i \cdot rooms_i)^{\lambda} - 1}{\lambda} + \tag{5}$$

$$\alpha_i \cdot neighborhood_i + \beta_i \cdot neighborhood_i \cdot area_i +$$

$$\gamma_i \cdot neighborhood_i \cdot rooms_i + \delta_i \cdot year_i + \varepsilon_i.$$

With this specification, we cannot interpret α_i as unique location factors. For this reason we use estimates of (4) to illustrate the impact of location and estimates of (5) to predict rent increases for individual dwellings, $\hat{h}_i - \hat{h}_i^{regul.}$, to be used in the distributional analysis.

6 Choosing a Suitable Value for $r - g$

Before we can proceed to estimating equations (4) and (5), one important issue remains to be discussed. To estimate the hedonic price function for coop shares, we need data on the housing cost $c_i = A_i + (r - g)P_i/12$. Our data base has information on A_i and P_i, but we have no information about the capital cost $r - g$. We have inferred it in the following way.

In practice, the Swedish rent control permits landlords to set rents relatively freely for newly produced apartments, so called presumption rents (*presumtionshyror*). Hence, one may argue that for this particular segment of the market, the rent control is not so strictly binding. Our data on rental apartments contain information about the characteristics X_i and the actual rent h_i on newly produced apartments in 2014 and 2015.

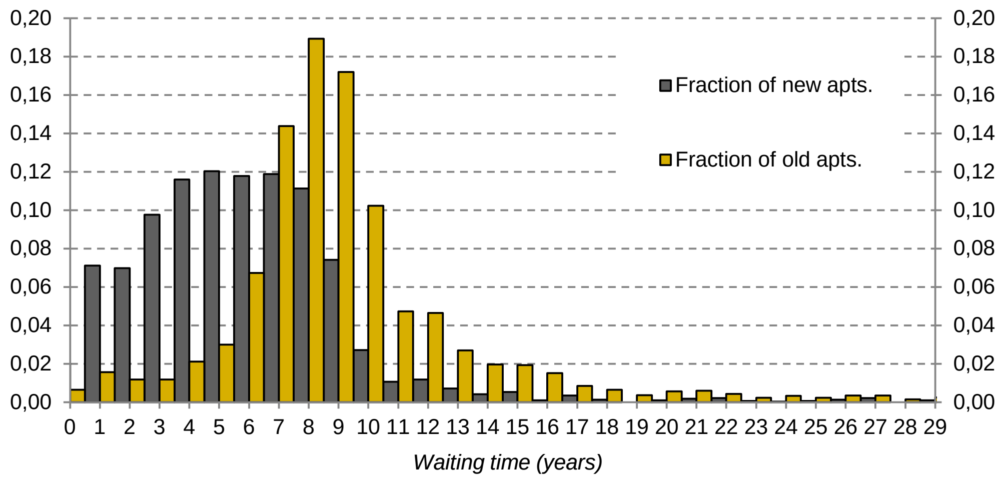
Estimating (5) on coop data for any arbitrary value of $r - g$ would give us an estimate of the housing cost $\hat{c}_i$ for any vector of characteristics – area, rooms, and neighborhood – given that particular value of $r - g$. If apartment i had been a newly produced rental apartment, the estimated housing cost $\hat{c}_i$ could be regarded as a prediction of the actual rent h_i for that apartment. For any given value of capital cost $r - g$, we would thus obtain a forecast error $h_i - \hat{c}_i$. This allows us to choose the value of the capital cost that minimizes the forecast error according to some statistical criterion. We employ two such criteria, namely (a) the root mean square error, and (b) the median absolute forecast error. It turns out that the root mean square error is minimized for $r - g = 0.027$, while the median forecast error is minimized for $r - g = 0.0315$.

We can now estimate equation (4) using our two possible values of $r - g$. The results for the location factors α_i are reported in the Appendix, Table A3. It gives roughly the same information as the prices and rents per square meter illustrated in Figure 2. In particular, the correlation between the mean square-meter price of coops (Table A1) and the location factors α_i is 0.999, for both discount rates. Similarly, the correlation between the mean regulated rents (Table A2) and the location factors is 0.990.

Finally, one should bear in mind that queuing matters even for new apartments. People who move into newly produced rental dwellings in Stockholm have been waiting for 5 years on average. Thus, for at least some new apartments, the rent control seems to be binding anyway. But not all households enter the queue because they need an apartment immediately; some may choose to register for a place in the queue just in case they would need a dwelling in the future (registering is costless). Standing in the queue is equivalent to having a zero-price option.

Figure 3 shows the distributions of waiting times for new (constructed in 2014 or 2015) and existing (constructed in 2013 and earlier) apartments. The distribution for new apartments is located distinctly to the left of the distribution for old apartments. Although the average waiting time for a new apartment is as high as five years, 9 percent of those who moved into new apartments in 2014 and 2015 had been waiting for one year or less.

Figure 3 The distribution of waiting times (years) for those who obtained a rental apartment in metropolitan Stockholm in 2014 and 2015.



Source: https://bostad.stockholm.se/statistik/statistiktjansten/

Summing up, rents in newly built apartments are clearly closer to the market-clearing level than rents in existing apartments rent, but they are probably on the low side of the market level. Thus our estimates of $r - g$ might be somewhat biased downwards. On the other hand, since we do not have any reliable information about the reason why the tenants of those dwellings chose to register in the queue, or about the waiting time for the marginal household, we choose to report both estimates of $r - g$, namely 0.027 and 0.0315, and assume that the true value is somewhere in between.

7 Predicted Rent Increases

The estimates of the parameters in equation (5) are given in the Tables A4 (coops) and A5 (rental apartments). With these estimates, we can calculate the expected rent changes $\hat{h}_i - \hat{h}_i^{regul.}$ for all rental apartments in our database.

Now, neighborhoods differ in the size composition of their rental apartments. To make the neighborhoods comparable, we report in this section the expected rent change for a "standard" rental apartment of 3 rooms and 76 square meters (the average area of 3-room apartments in the database). In Table 1 we report the effects for such an apartment of lifting the rent control, for each of the 43 neighborhoods.

We see that rents increase in almost all neighborhoods. The average increase across all parishes is 33 percent based on $r - g = 0.027$ and 48 percent for $r - g = 0.0315$. The increase is largest in the attractive central-city neighborhoods, as one would expect. For the most expensive neighborhood (Hedvig Eleonora and Oscar) the absolute increase is 7,528 crowns (9,934 with the higher discount rate) corresponding to74.0 (97.6) percent. Although these magnitudes do not seem altogether unrealistic, the number of rental apartments in our data in this neighborhood is on the low side (34) to yield a very reliable estimate. There are also a few suburban neighborhoods with rather modest rent increases in absolute terms – but with rather low rent levels to begin with, and thus rather large increases in relative terms (for instance, Skarpnäck with 247 rental apartments in the database and an average rent increase of 61.6 percent).

Generally speaking, the numbers for individual neighborhoods should be interpreted with caution. There are in fact a couple of neighborhoods where rents are predicted to fall. These are Husby-Ärlinghundra + Valsta (around Märsta) and Vallentuna. This may seem surprising – how could lifting the rent control result in *lower* rents? While these negative numbers might be an artifact, due to few observations, there is no *economic* reason why lifting rent control must lead to higher rents everywhere. Keeping rents artificially low in attractive areas might squeeze tenants, who would otherwise not have any housing at all, to accept dwellings in unattractive areas. Thus the rent control may make it possible for landlords in less attractive areas to get tenants at rent levels that are in fact above what they would have been in a free market. This should of course not be taken as a statement of the attractiveness of these particular parishes, but just refers to general effects of price regulation.

The numbers in Table 1 refer to a standard apartment of 76 square meters. Since some neighborhoods have mostly larger and others mostly smaller apartments, it is also instructive to compute the expected rent change for an average apartment in each neighborhood. The results of such an exercise are reported in Table A5 in the Appendix. Now the average rent increase is somewhat lower (26 percent for $r - g = 0.027$), but the general geographical pattern is quite similar with rent reductions in Husby-Ärlinghundra + Valsta and in Vallentuna (and also in Täby-Danderyd) and the highest rent increases in Hedvig Eleonora + Oscar. The correlation between the absolute rent increases for the standard apartment and for the actual apartments is 0.96 while the correlation between the percentage rent increases is 0.91 (for $r - g = 0.027$).

Having thus established neighborhood-wise predictions of rent increases, we now turn to the question of distributional effects. In other words, who live in those attractive apartments in Hedvig Eleonora + Oscar that are so underpriced by the rent control? And who live in the overpriced apartments in Husby-Ärlinghundra (if we may put any faith in the estimate given the low number of observations)?

8 A First Look at Redistribution: Renters vs. Owners

Redistribution is a multi-faceted concept. Considering redistribution across neighborhoods, one may forget that although a particular neighborhood has a high average income, there will also be a fair number of low-income earners living there, too. It may therefore be preferable to study redistribution across income brackets (say, deciles) rather than across neighborhoods.

Considering instead redistribution across deciles of yearly income, it should be kept in mind that the lowest decile includes, e.g., students who may have a low current income but are not poor in a life-cycle perspective and elderly people who may have a low pension but perhaps a substantial wealth. Because of these measurement problems, studying distribution across neighborhoods may add information beyond looking only at income deciles, in particular if wealthy retirees and potentially wealthy students tend to concentrate in posh high-income neighborhoods. Furthermore, the value of household income depends on the size of the household: a single person might live well from an income that would be regarded as insufficient for a household with three children.

To capture all these aspects, one should study redistribution along (at least) four dimensions: neighborhoods, income, household structure, and age – and, in particular for young people, also the income of parents. In this report we will focus on redistribution by neighborhoods and by income deciles, taking into account differences in household compositions.

Deregulation of the rental market entails, in a *ceteris paribus* perspective, a redistribution from renters to landlords, while owners will be unaffected in the short run. This has a first-order distributional impact since renters in general have lower incomes than owners. In the longer run, owner-occupiers are likely to be affected as property prices change, landlords may be hit by increased taxes, and future renters may benefit by getting better access to rental apartments.

In a neighborhood perspective, the difference between owners and renters is evident from the first two columns of Table 2 below (for the moment, we disregard columns 3 and 4; which will be discussed in Section 9 below).

Table 1 Monthly rents and rent changes for a standard (3-rooms, 76 sq. meters) apartment

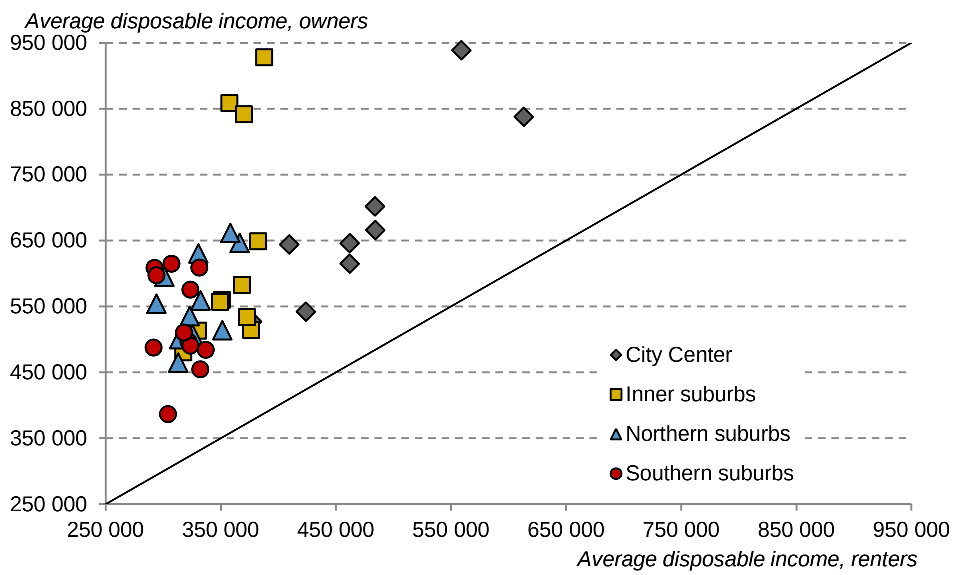
Neighborhood (church parish)	Regulated monthly rent, $\hat{h}_i^{reg}$	$r-g=0.027$ Absolute change, $\hat{h}_i-\hat{h}_i^{reg}$	$r-g=0.027$ Relative change, percent	$r-g=0.0315$ Absolute change, $\hat{h}_i-\hat{h}_i^{reg}$	$r-g=0.0315$ Relative change, percent
City Center					
Domkyrko. + Joh:es + Adolf Fredrik	10,525	6,768	64.3	9,146	86.9
Engelbrekt	12,765	3,720	29.1	5,856	45.9
Gustav Vasa + Matteus	11,735	5,679	48.4	8,093	69.0
Hedvig Eleonora + Oscar	10,180	7,528	74.0	9,934	97.6
Högalid	9,501	6,870	72.3	9,019	95.0
Katarina	10,130	6,416	63.3	8,641	85.3
Kungsholm + Västerm. + Essinge	12,096	4,244	35.1	6,362	52.6
Maria Magdalena	10,459	6,476	61.9	8,268	79.0
Sofia	11,137	4,918	44.2	6,880	61.8
Inner suburbs					
Lidingö	9,013	2,448	27.2	3,714	41.2
Solna	7,937	3,550	42.2	5,564	70.1
Sundbyberg	10,027	2,213	22.1	3,565	35.6
Täby + Danderyd	10,261	452	4.4	1,564	15.2
Bromma	9,331	2,459	26.4	3,682	39.5
Västerled	10,366	3,498	33.7	5,130	49.5
Hägersten	9,719	3,767	40.0	5,324	54.8
Enskede-Årsta	8,282	4,095	49.4	5,468	66.0
Nacka + Boo	8,500	3,237	38.1	4,449	52.3
Skarpnäck	7,524	4,636	61.6	5,905	78.5
Brännkyrka	9,012	2,051	22.8	3,172	35.2
Northern suburbs					
Hammarby + Fresta	7,497	1,405	18.7	2,190	29.2
Husby-Ärlinghundra+Valsta	8,562	-307	-3.6	296	3.5
Sigtuna	7,831	1,653	21.1	2,593	34.4
Sollentuna	8,788	1,069	12.2	1,721	19.6
Vallentuna	9,307	-193	-2.1	250	2.7
Österåker-Östra Ryd+ Vaxholm	7,533	1,631	21.7	2,412	32.0
Bro	6,020	2,148	35.7	2,851	47.4
Hässelby	7,080	2,636	37.2	3,495	49.4
Järfälla	7,875	1,476	18.7	2,312	29.5
Spånga-Kista	7,297	2,191	30.0	3,020	41.4
Vällingby	8,440	1,549	18.4	2,499	29.6
Southern suburbs					
Botkyrka + Grödinge	6,383	2,595	40.7	3,333	52.2
Flemingsberg	6,493	2,702	41.6	3,284	50.6
Farsta	7,745	2,778	35.9	3,812	49.2
Huddinge	7,471	2,449	32.8	3,422	45.8
Gustavsberg-Ingarö	7,897	2,411	30.5	3,352	42.4
Skärholmen	6,667	3,067	46.0	3,966	59.5
Södertälje + Östertälje	7,314	722	9.9	1,318	18.0
S:t Mikael	6,892	3,234	46.9	4,056	58.8
Trångsund-Skogås	7,606	1,036	13.6	1,826	24.0
Vantör	7,499	2,732	36.4	3,699	49.3
Värmdö-Djurö	7,924	1,690	21.3	2,639	33.3
Österhaninge	8,679	284	3.3	1,008	11.6

Table 2 Estimated Distributional Effects Across Neighborhoods

	Average disposable household income		Change in rents, percent of disposable income, renters	
	Renters	Owners	$r-g\ =0.027$	$r-g\ =0.0315$
City Center				
Domkyrko. + Joh:es + Adolf Fredrik	484,063	701,843	11.11	15.77
Engelbrekt	613,360	837,551	6.47	11.10
Gustav Vasa + Matteus	484,529	665,687	9.74	14.30
Hedvig Eleonora + Oscar	559,105	938,712	16.23	20.88
Högalid	377,524	526,955	12.58	17.08
Katarina	424,288	542,037	12.12	16.61
Kungsholm + Västerm. + Essinge	409,657	643,978	6.44	10.53
Maria Magdalena	462,343	614,801	11.15	15.31
Sofia	462,112	645,905	7.75	11.37
Inner suburbs				
Lidingö	357,653	858,334	5.15	8.50
Solna	376,631	514,288	9.05	12.42
Sundbyberg	372,965	533,980	3.77	7.10
Täby + Danderyd	370,121	841,476	-0.66	2.09
Bromma	368,596	582,994	4.46	7.33
Västerled	388,088	927,731	6.51	9.95
Hägersten	351,000	559,878	7.62	11.23
Enskede-Årsta	330,555	513,158	8.67	12.09
Nacka + Boo	382,796	649,015	7.03	9.96
Skarpnäck	317,827	480,276	11.52	15.04
Brännkyrka	349,797	556,978	4.15	7.02
Northern suburbs				
Hammarby + Fresta	323,243	535,011	2.31	4.57
Husby-Ärlinghundra + Valsta	313,128	465,048	-2.48	-0.06
Sigtuna	366,500	646,166	3.45	5.99
Sollentuna	358,472	661,466	1.90	4.34
Vallentuna	294,237	554,096	-4.01	-1.72
Österåker-Östra Ryd + Vaxholm	330,847	630,126	3.10	5.26
Bro	314,146	500,310	5.53	7.66
Hässelby	301,346	594,749	6.33	8.86
Järfälla	351,730	513,923	3.55	5.88
Spånga-Kista	325,852	507,422	5.16	7.61
Vällingby	332,818	558,941	2.81	5.41
Southern suburbs				
Botkyrka + Grödinge	322,177	496,887	6.85	9.08
Flemingsberg	304,255	386,684	7.60	9.31
Farsta	323,846	490,756	6.52	7.33
Huddinge	331,536	608,961	4.58	7.25
Gustavsberg-Ingarö	292,706	608,623	7.48	10.20
Skärholmen	332,335	454,778	6.71	9.27
Södertälje + Östertälje	291,784	487,468	0.73	2.65
S:t Mikael	294,225	597,508	8.75	11.33
Trångsund-Skogås	323,936	575,432	1.88	4.20
Vantör	318,349	510,550	6.61	9.42
Värmdö-Djurö	307,303	614,763	4.15	6.92
Österhaninge	337,039	484,217	0.39	2.43

We see that the choice of owning vs. renting is highly income-dependent. The average income of owners is 70 percent higher than that of renters. We can illustrate this by plotting the average income among renters against the average income among owners (Figure 4). We see that the average owner always earns more than the average renter (all observations are located above a 45-degree line through the origin). This discrepancy is most pronounced in Hedvig Eleonora + Oscar and in Västerled, with disposable incomes for owners well above 900,000 crowns. There is also a clear positive correlation between owner and renter income. The highest renter incomes are found in Hedvig Eleonora and Engelbrekt, where renters earn more than 550,000 crowns.

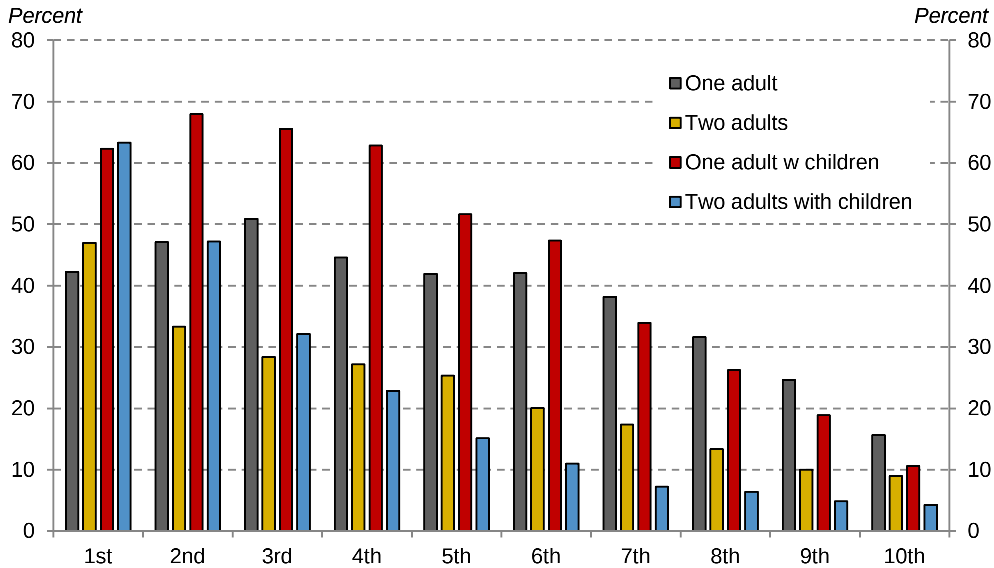
Figure 4 Disposable yearly income among renters and owners, neighborhood averages.



One immediate conclusion to be drawn from Figure 4 is that a de-regulation of the rental market, resulting in rent hikes, will harm the relatively poorer part of Stockholm's population: rents will rise, while owners will not de directly affected (disregarding possible property price changes). As an aside, it is interesting to note that many of today's owners were renters before the great transformation of rental apartments into coops in recent decades. Some of these ex-renters have earned a handsome sum due to this transformation. These capital gains are a consequence of the rent control, and form an interesting area for future research on income distribution.

Another way of looking at the distribution of renters vs. owners is to look at income deciles. In Figure 5 we have first divided the households into four different categories according to household structure and then, within each category, ordered the households according to disposable yearly household income.

Figure 5 Percent of households renting their apartment, across income deciles and household structures.



Note: The households are first classified by household types and the ordered in deciles for each type. Hence, decile limits are different for the four household types. The average disposable yearly income for each decile is:
One adult: **1**: 75,158; **2**: 132,072; **3**: 148,964; **4**: 167,965; **5**: 199,525; **6**: 235,190; **7**: 272,590; **8**: 316,372; **9**: 380,116; **10**: 733,597.
Two adults: **1**: 196,323; **2**: 296,894; **3**: 356,573; **4**: 418,126; **5**: 476,501; **6**: 536,749; **7**: 609,292; **8**: 702,389; **9**: 840,754; **10**: 1,876,154.
One adult with children: **1**: 115,649; **2**: 188,467; **3**: 226,191; **4**: 258,828; **5**: 289,237; **6**: 322,997; **7**: 361,664; **8**: 408,545; **9**: 483,918; **10**: 890,267.
Two adults with children: **1**: 265,430; **2**: 406,526; **3**: 491,305; **4**: 562,391; **5**: 625,824; **6**: 694,823; **7**: 774,497; **8**: 873,374; **9**: 1,056,401; **10**: 1, 987,494.

Disregarding the first, and to some extent the second, decile, the fraction of renters is decreasing in income – and this holds regardless of household type. Thus, a reform leading to higher rents will mainly affect low-income earners – at least if we only consider the short-run impact effect. In the top decile, fewer than 20 percent of the households rent their apartment; among households with two adults, fewer than 10 percent. Data for the first decile are generally hard to interpret since this decile contain many households with temporarily low income, including students, retirees, unemployed and households with large capital losses.

The conclusion from this section is that a deregulation of the rental market that is not accompanied by some kind of tax/transfer measure will – at least in the short run – have a negative redistributional profile. But what will the distributional profile look like within the group of renters?

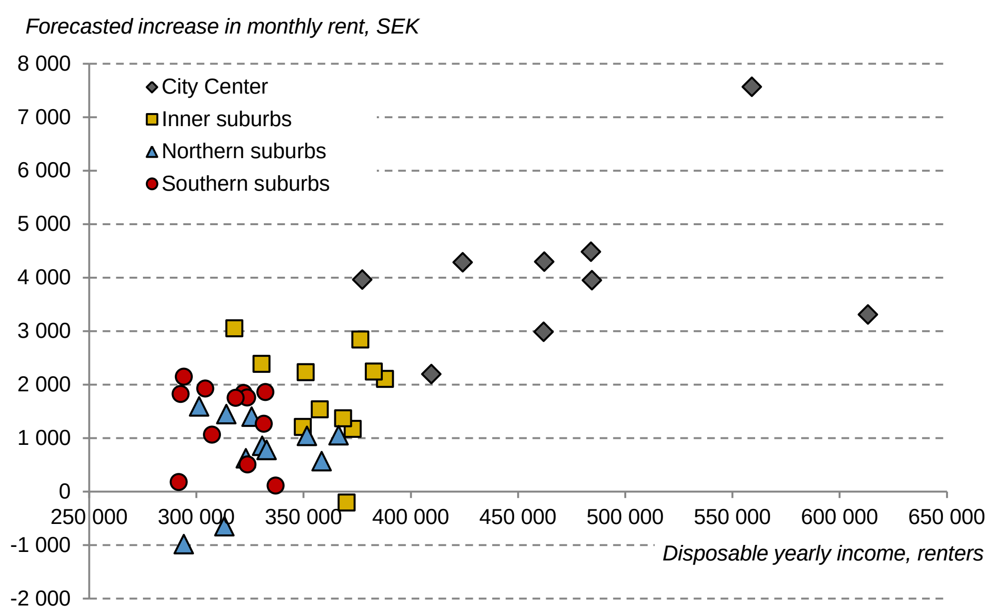
9 Distributional Effects Across Neighborhoods

In this section we use our household data to compute predicted regulated rent $\hat{h}_i^{regul.}$ and predicted market rent $\hat{h}_i$ for each of the 135,000 households in the FASIT database. The rent increases are, hence, based on the actual dwelling of each household. In the appendix, Table A6, we report estimated rent and rent increases for the actual dwellings (in the same fashion as rents were reported in table 1 for the "standard" apartment). In the third and fourth columns of Table 2 we report estimated rent increases (from Table A6) in percent of disposable income for each neighborhood.

The correlation between income and rent change is illustrated in Figure 6, which shows the disposable incomes of renters (first column of Table 2) against the absolute rent increases of Table A6. For brevity, we only plot the rent increases for $r - g = 0.027$.

We see that deregulating the housing market has a clear distributional profile: the largest absolute rent increases will take place in the high-income neighborhoods of the city center. The two outliers are Hedvig Eleonora (highest rent increase) and Engelbrekt (highest disposable income.

Figure 6 Disposable incomes vs, expected rent increases



Running a linear regression on the data in Figure 6 of the form

$$Rent\ increase = \alpha + \beta \cdot Disp.income \qquad (6)$$

one obtains

$$\hat{\beta} = 0.016 \quad t = 6.515 \quad R^2 = 0.509,$$

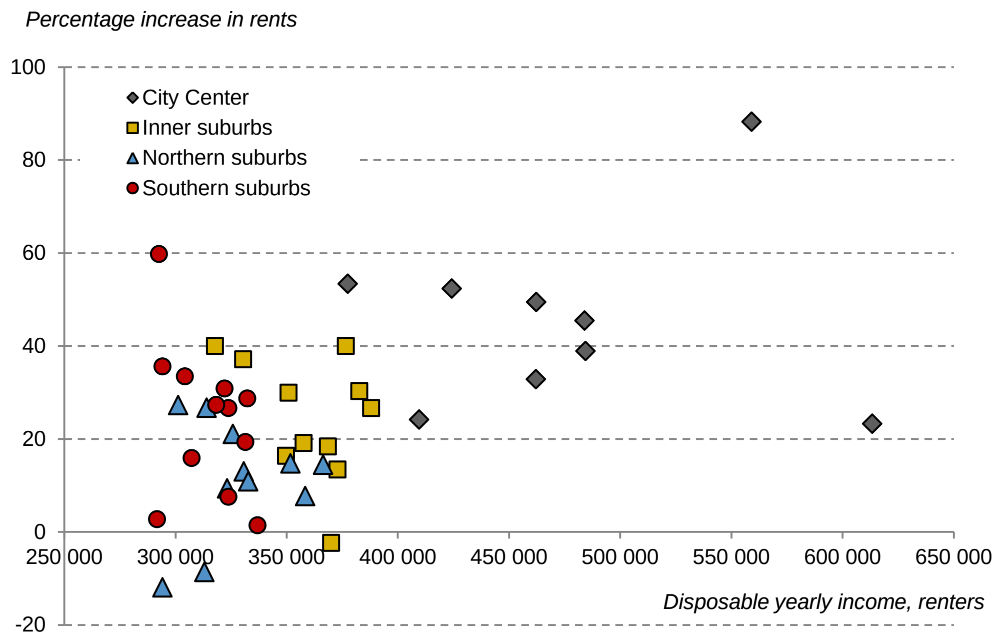
i.e., $\hat{\beta}$ is significantly different from zero at the 1-percent level. Comparing a high-income neighborhood with renter disposable income of 600,000 with a 300,000 income neighborhood, the predicted difference in rent increase is 4,800 crowns. This regression is, however, primarily driven by the difference between the city center and all other neighborhoods. Deleting the city-center parishes from the sample, one instead obtains

$$\hat{\beta} = 0.006 \quad t = 1.013 \quad R^2 = 0.032.$$

For this restricted sample, $\hat{\beta}$ is no longer significantly different from zero. Thus, outside the city center, deregulation has no clear distributional profile.

It may be more interesting to look at percentage rather than absolute rent increases. These are illustrated in Figure 7, which shows the disposable incomes of renters (first column of Table 2) against percentage rent increases (third column of Table A6). Also in percentage terms deregulation has an egalitarian bias.

Figure 7 Disposable income vs. percentage rent increases.



Here, the effect is entirely driven by the difference between the wealthy central neighborhoods and the suburbs. Running the regression (6) on all data points in Figure 7, we obtain

$$\hat{\beta} = 0.000121 \quad t = 3.257 \quad R^2 = 0.206,$$

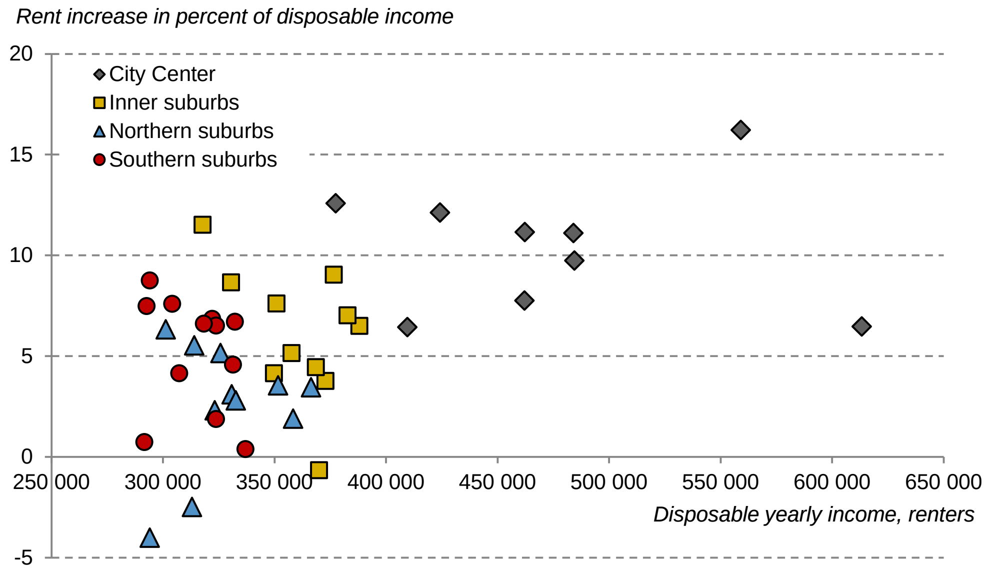
i.e., $\hat{\beta}$ is significantly positive at the one-percent level. This corresponds to a difference of 36 percentage points between a 300,000 and 600,000 crowns neighborhood. Deleting the city-center neighborhoods yields

$$\hat{\beta} = -0.000029 \quad t = -0.294 \quad R^2 = 0.0027,$$

i.e., $\hat{\beta}$ is negative but insignificant.

Finally, one may be interested in the rent increase as a percentage of disposable income (third column of Table 2). This is illustrated in Figure 8.

Figure 8 Disposable income vs. rent increase as a percentage of disposable income



Here, too, the deregulation profile is egalitarian in the sense that the richest neighborhoods experience the highest rent increases relative to income. Running a linear regression yields the estimates

$$\hat{\beta} = 0.000028 \quad t = 3.51 \quad R^2 = 0.240,$$

with the coefficient being significantly positive at the one-percent level. The difference in the rent increase relative to income is 8.4 percentage points between a 300,000 and a 600,000 neighborhood. Again the positive relation disappears if we delete the central-city neighborhoods from the sample. Then the regression line becomes

$$\hat{\beta} = -0.0000017 \quad t = -0.08 \quad R^2 = 0.0001,$$

which indicates that in the suburbs, there is no relationship between rent increase (as a fraction of income) and income.

10 Distributional Effects Across Individuals

In the previous section, we looked at distributional effects across neighborhood averages. In this section we will first sort households by their disposable income and then compute average effects within each income decile. Which measure gives the most relevant picture of the reform's distributional effects – neighborhood averages or income decile averages? Both approaches have pros and cons. Yearly income is influenced by temporary factors, and may therefore be a poor measure of lifetime or permanent income. When we sort households by yearly income, households with a temporarily low or high income will be overrepresented in the extreme deciles. In particular, the lowest decile will contain students, potentially with a high lifetime income, retirees with considerable wealth, and households with large capital losses. Similarly, the highest decile will contain households with occasionally high capital gains. Using neighborhood averages, some of these effects may be averaged out. But the drawback of neighborhood averages is the mixture of people with high and low permanent incomes. With these caveats in mind, we may look at the distributional pattern based on income deciles, as illustrated in Figure 9.

We see that the regulated rents (the black parts of the columns) are increasing in income, as one would expect: housing is a normal good. This holds for all household types. But we also see that the income elasticity of rental housing is much less than unity (at least when looking at yearly income); although the average income in the 10th decile is almost ten times higher than the average income in the 1st decile for each household category, the regulated rent is only around twice as high.

We also see that the egalitarian profile of deregulation found across neighborhoods (Figure 6) remains when we study income deciles: the richest renter households get the highest rent increases in absolute terms. But what about rent increases in percentage terms? This is illustrated in Figure 10, where the columns show the ratio of the white areas to the black areas in Figure 9.

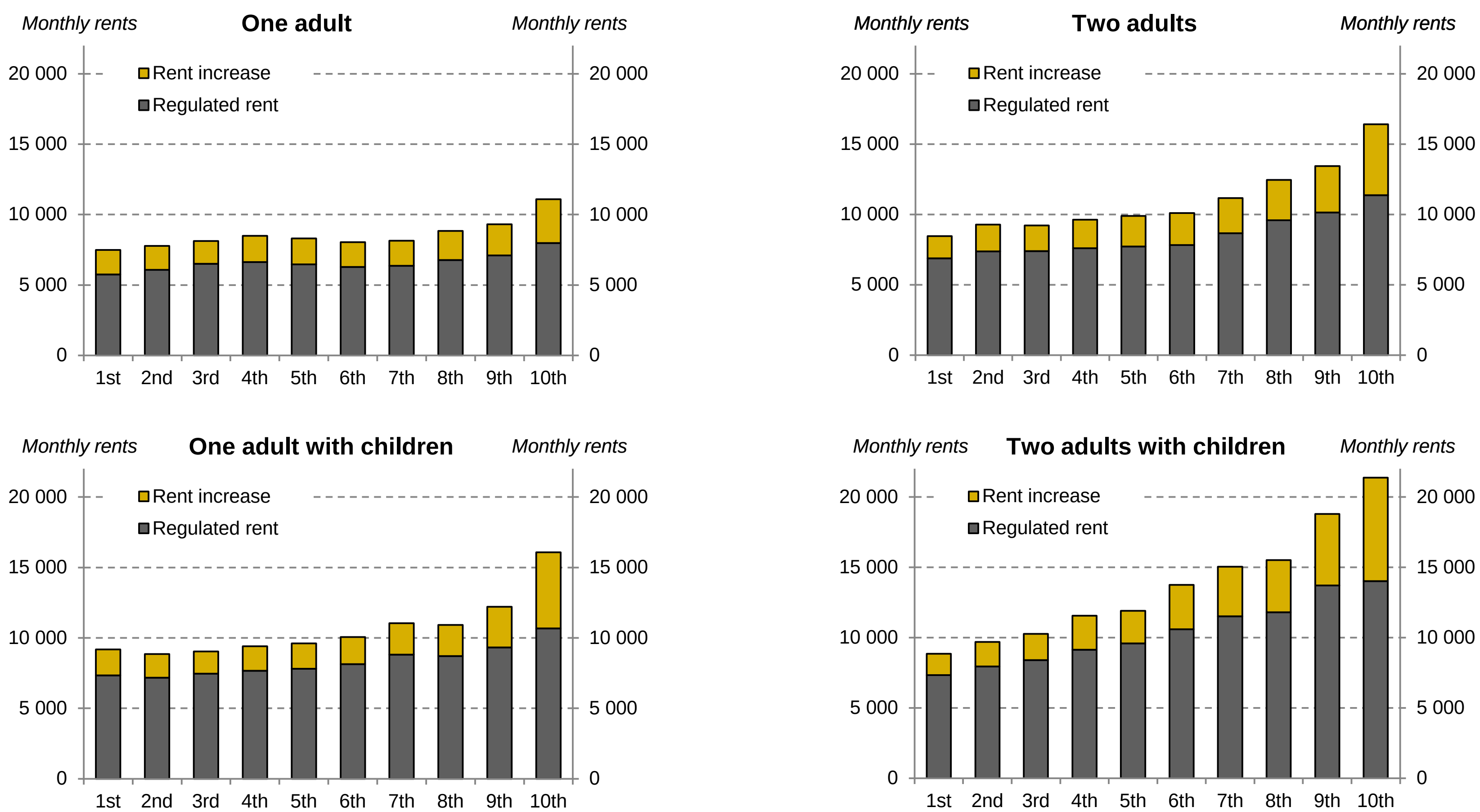
Again, the pattern is largely preserved when we shift from neighborhoods (Figure 7) to income deciles: the high-income earners tend to get higher rent increases, also in percentage terms. In particular, the top income decile gets a much higher percentage rent increase than all other income groups. Between deciles 1-9, the distributional profile is relatively flat, especially for households of one adult with our without children. In these categories of households there is a slight non-monotonicity: the first two deciles get a higher percentage increase than does the third decile. This could be the result of an age effect, with some retirees living in relatively cheap but attractive apartments in the city center. Investigating the nature of this non-monotonicity seems like an interesting topic for future research.

Finally, we investigate the rent increases as percentages of disposable income. This is illustrated in Figure 11. Here we see a pattern that is neither present in the corresponding neighborhood data (Figure 8) nor in the analysis of absolute and relative rent change across deciles in Figures 9 and 10. Here the reform has a different distributional profile. For households with children, the rent increase as a percentage of disposable income is more or less the same for all deciles except the first decile. For households without children the percentage rent increase is monotonously falling with income across all deciles.

Why do we see a different pattern when we look across household income brackets? One explanation is that in the neighborhood analysis, the differences between neighborhood averages is not so large: the average income in the richest neighborhood (Engelbrekt) is only twice as high as that in the poorest neighborhood (Södertälje + Östertälje); cf. Table 2. In the analysis of income deciles, however, the differences are much larger, even if we disregard the first decile: the average income in the 10th decile is between four and six times as large as that of the 2nd decile (cf. the note in Figure 5). Even if we also choose to disregard the 10th decile, and only compare the 9th decile to the 2nd, incomes differ by a factor of almost 3. In other words, the individuals in the highest decile have such high income and spend such a small portion on housing that even a quite substantial rent increase is small in comparison with their income.

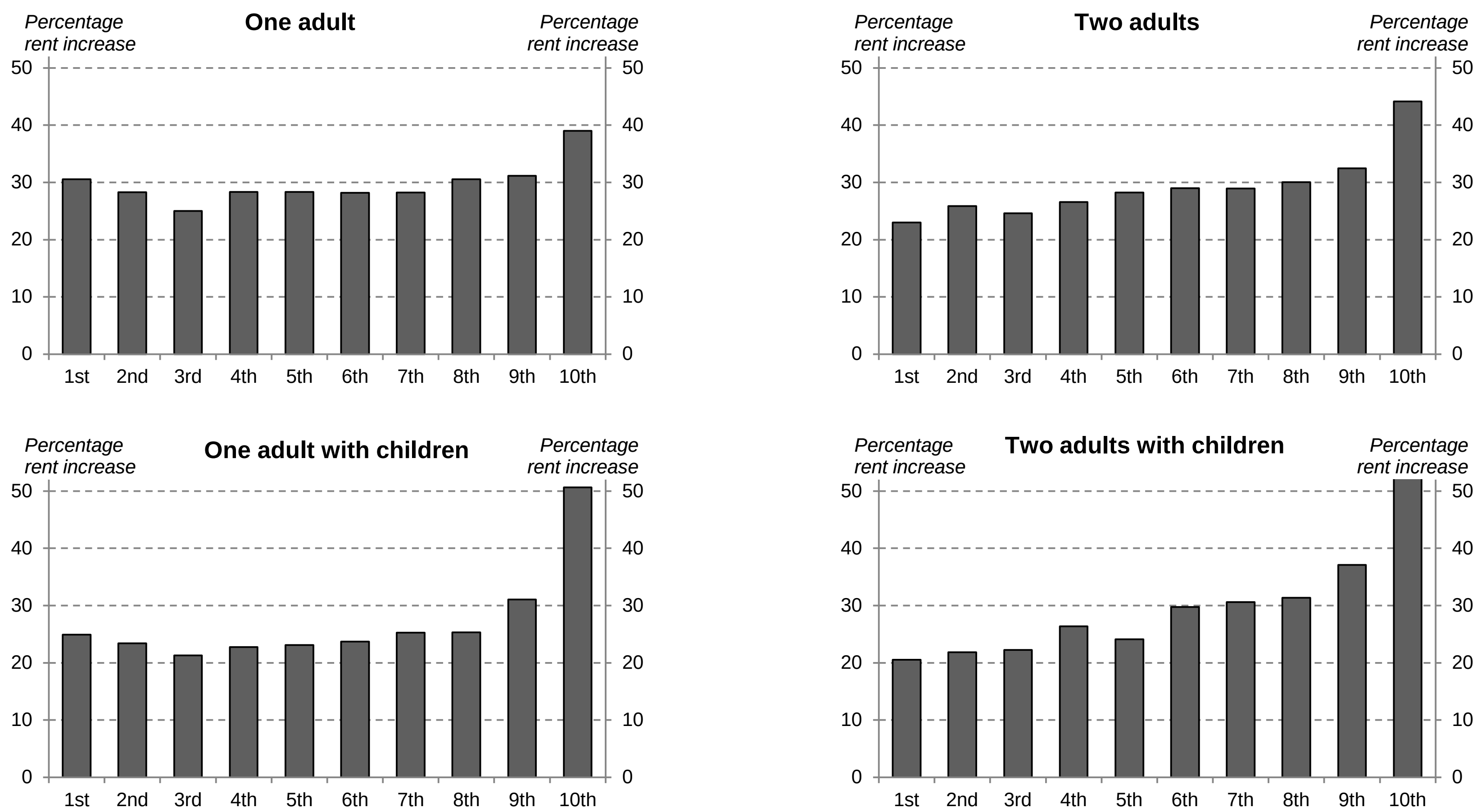
One should note that the ratios in Figure 11 are computed by summing all rent changes in a decile, and dividing the sum by the sum of all disposable incomes in that decile. The resulting number might be sensitive to the numerator, for instance if there are many households with zero income in the 1st decile, or many households with very large incomes in the 10th decile. An alternative is to compute the ratio of rent increase to income for each household, and then study the median of those ratios for each decile. The result of such an exercise is reported in the Appendix (Figure A1). As can be seen, it does not differ much from the pattern of Figure 11 above, but displays a somewhat clearer regressive profile in particular among households with one adult and children.

Figure 9 Regulated monthly rents and rent increases, across income deciles, for different types of renter households.



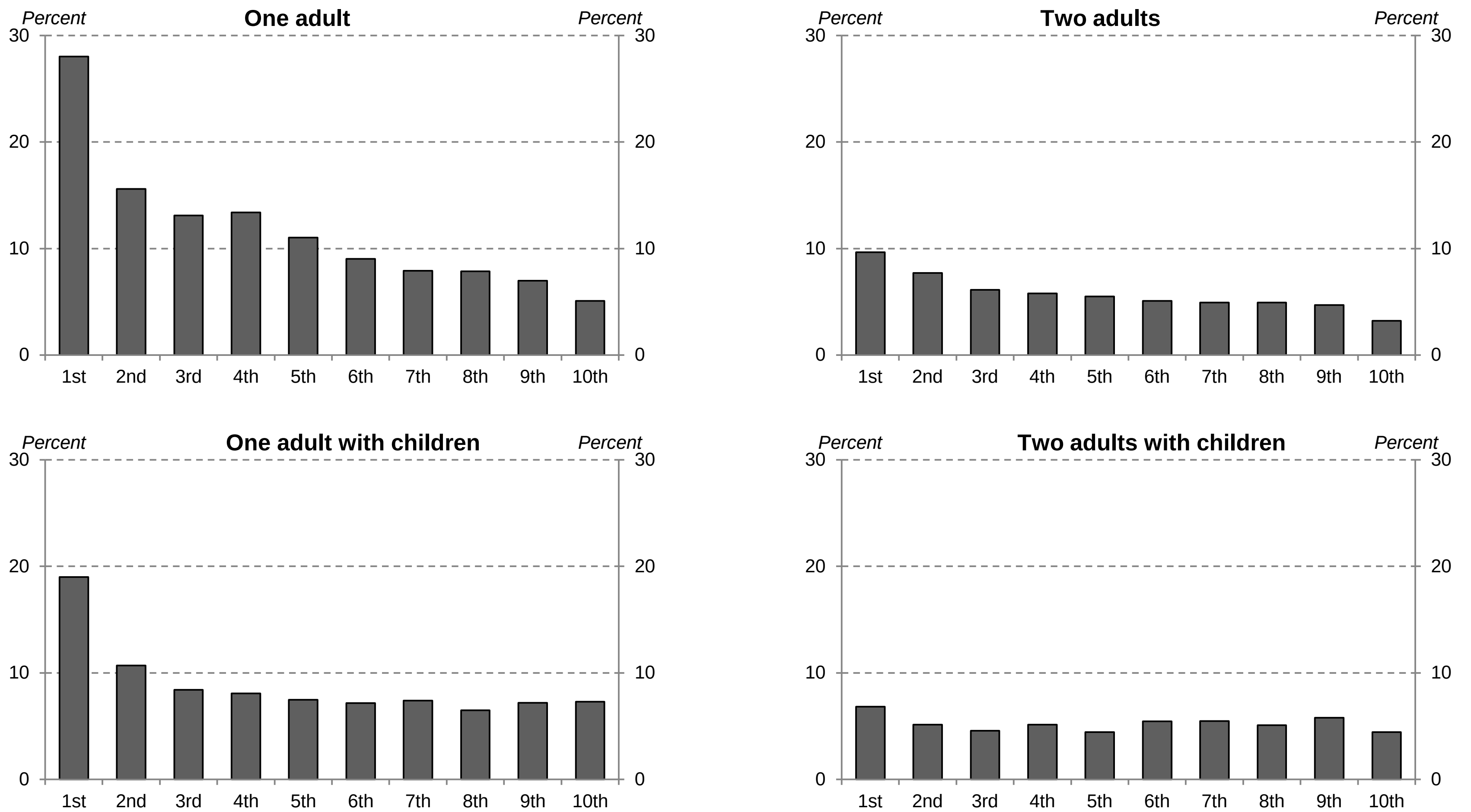
Note that the deciles are different for the four household types, cf. comment on Figure 5 above.

Figure 10 Rent increase in percent of the pre-reform regulated rent: averages for different income deciles and household types.



Note that the deciles are different for the four household types, cf. comment on Figure 5 above.

Figure 11 Rent increases in percent of disposable income: averages for renter households, different income deciles and household types.



Note that the deciles are different for the four household types, cf. comment on Figure 5 above.

11 Concluding comments

In the present report, we have used data from the unregulated market for cooperative apartments to study how rents would change if the rent control were to be lifted in metropolitan Stockholm. Although this method of inferring market rents has some well-known problems (it is likely to overestimate the level of market rents), it probably at least yields a reliable picture of the *structure* of market rents – i.e., it will tell us what neighborhoods, or what income deciles, are likely to face the highest rent increases. Our results indicate that the rent increases in the wealthy central-city neighborhoods would be around 30-70 percent. By contrast most suburban neighborhoods would have rent increases of 20-40 percent – and some neighborhoods may even experience rent decreases.

The distributional profile of a deregulation is multi-faceted. There are three groups that will be affected by the reform: tenants, owner-occupiers, and landlords. A basic difference between the first two groups is that owner-occupiers in general have higher income than renters. Consequently, since lifting rent control will only have a direct impact on renters such a reform has a basic regressive distributional profile. Owner-occupiers may also be affected indirectly by changed property values. We abstract from this effect, however.

Now turning to the redistribution between tenants and landlords, there are two groups of owners of rental properties: private individuals and corporations (with 80 percent of the rental housing stock in the city center, and 50 percent of the stock in the suburbs), and municipal companies – i.e., indirectly, the taxpayers. The property owners will make gains in the form of perpetually higher flows of rental income. The gains made by the municipal companies accrue directly to the taxpayers, and the gains made by private landlords will be subject to the normal income tax. Furthermore, the landlords will also make a windfall gain in the form of a once-and-for-all price increase of their housing stock, a gain that could in principle be taxed away by a temporary "deregulation tax". The technical design of such a tax is beyond the scope of our report, but properly designed it should not have any major allocational effects since it to a large extent has the character of a lump-sum tax. The public sector would thus be able to compensate those who lose from the reform.

The form of compensation is an intricate matter. It seems natural to use the tax proceeds to increase housing allowances for low-income earners. In such a case, the distributional profile of the reform could be made clearly egalitarian. A problem with that method of compensation is that it is targeted only to the poorest part of the population, while other groups will be uncompensated. If other groups should receive some compensation, this would entail changes in the eligibility rules for housing allowances.

Another way to shield broader groups of tenants is to implement the reform only gradually, by exempting incumbent renters. Thus the new market rents would affect only new contracts. This of course has the drawback that some of the attractive distributional profile of the reforms would be lost – namely, that the highest rent increases will fall on incumbent high-income earners. But it would certainly make the reform more palatable to the incumbent voters.

Finally, there is the issue of distribution within the group of tenants. We have shown that the reform has an egalitarian profile in the sense that percentage rent increases tend to be higher for high-income renters – and this holds regardless of whether we look at neighborhood average incomes or decile averages. But when we look at rent increases as a fraction of income, we get conflicting evidence. On the one hand, looking across neighborhoods we see a tendency for rents to increase more in relation to income in high-income neighborhoods. On the other hand, looking across deciles of yearly household income, we see a tendency for rents to increase more in relation to income in low-income deciles. Hence, from a neighborhood perspective, a move to market rents has a "progressive" distributional profile, but from an income perspective it appears to have a "regressive" profile. How can we understand these seemingly different patterns?

What really matters for the analysis of income distribution is permanent income rather than yearly income. In general, of course, yearly income is a good indicator of permanent income; for a middle-aged employee facing little unemployment risk permanent income is well approximated by yearly income. But for a sizeable fraction of households – students, the unemployed, retirees with high wealth, entrepreneurs with temporary profits or losses, etc. – the income in a particular year may deviate strongly from permanent income. Sorting households according to current income may therefore be misleading. In contrast, looking at aggregates of households (such as neighborhoods), even in a single year, will smoothen the impact of temporary deviations of current from permanent income, since any neighborhood will be a mixture of households in different phases of life. The drawback of looking at neighborhoods, on the other hand, is that they even out not just deviations of current from permanent income but also differences between households with high permanent and low permanent income. Hence, neither the neighborhood-based analysis in section 8 nor the household-based analysis in section 9 gives an entirely accurate picture of the distributional profile. The best we can do with the data at hand is to present both perspectives.

In our study, we have abstracted from several important consequences of deregulation. One is that we have not taken into account any behavioral adjustments. But it is exactly those behavioral adjustments that may be regarded as the main reason for deregulation. Insiders (for instance, retirees whose children have moved out) would more easily be able to downsize their housing consumption. And outsiders (like young couples who are establishing a household, or immigrants who try to become integrated into the labor market) would, because of deregulation, be able to find rental housing that was not accessible to them before. Although increasing the choice space for both outsiders and insiders is clearly welfare-enhancing, the calculation of those welfare gains requires strong knowledge or assumptions about the shape of individual demand functions. Studies by Glaeser and Luttmer (2003), Lyytikäinen (2008) and Andersson and Söderberg (2013) suggest that the welfare gains may be sizeable.

Finally, there is one issue that also should be considered, and that also would require careful investigation, namely that of segregation. Everybody knows that unregulated housing markets often tend to be segregated, i.e., to an outcome where certain groups – socioeconomic or ethnic – tend to wind up together; see e.g. Glaeser (2008) for a discussion with further references. But so is today's housing market. The question is not so much whether a deregulated market would be segregated, because we already know that it will. The question is rather whether that segregation is more severe than the segregation already present in today's regulated housing market. Enström Öst, Söderberg and Wilhelmsson (2014) compare the degree of segregation on the current regulated market with the unregulated coop market The results appear to be mixed, and this seems to be an important field for future research.

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Appendix

Table A1: Descriptive statistics for coop shares in 2014-2015. Prices in Swedish crowns.

Neighborhood (church parish)	No. of condos	Average area (sq. meters)	Average price per sq. met.	Max. price per sq. met.	Min. price per sq. met.	90th percentile-price	10th percentile-price
City Center							
Domk.+ Joh:es + Ad. Fr.	1,495	63.31	82,456	146,774	20,000	101,562	65,057
Engelbrekt	1,231	70.00	76,499	136,875	31,319	100,000	55,556
Gustav Vasa + Matteus	3,241	61.18	83,077	143,415	10,526	100,932	66,279
Hedvig Eleon. + Oscar	2,816	65.02	85,255	199,830	10,278	107,143	65,000
Högalid	1,885	52.42	78,402	156,000	5,147	97,200	61,111
Katarina	1,580	55.17	79,453	151,685	41,878	98,022	62,132
Kungsh.+Västerm.+Essi.	5,440	55.17	75,199	162,857	28,992	93,309	58,955
Maria Magdalena	809	65.93	76,404	130,000	20,833	97,297	57,500
Sofia	1,950	65.73	68,378	140,000	12,581	89,544	51,760
Central suburbs							
Lidingö	972	67.79	44,899	92,000	4,943	60,924	31,967
Solna	5,085	66.12	48,712	111,765	4,889	64,244	35,625
Sundbyberg	2,297	62.97	49,371	100,000	7,463	64,607	34,783
Täby + Danderyd	2,823	71.17	39,698	94,444	10,843	55,454	27,160
Bromma	3,120	60.23	45,190	100,000	13,812	58,571	32,540
Västerled	1,089	63.06	56,496	115,526	22,727	70,857	42,453
Hägersten	3,455	58.15	56,465	115,625	1,000	72,000	42,500
Enskede-Årsta	2,153	57.69	51,588	156,818	19,643	65,789	38,091
Nacka + Boo	2,724	68.79	43,179	170,454	35,455	60,635	26,441
Skarpnäck	2,084	58.38	49,278	96,250	14,906	64,222	32,407
Brännkyrka	1,806	66.65	40,782	94,000	3,261	55,172	26,842
Northern suburbs							
Hammarby+Fresta	578	68.93	28,616	70,000	10,516	40,278	19,620
Husb.-Ärlingh.+Valsta	788	65.22	22,740	42,424	7,937	32,629	15,217
Sigtuna	86	73.28	32,091	51,852	22,936	41,667	25,000
Sollentuna	1,339	67.96	33,979	83,000	3,000	47,273	23,437
Vallentuna	522	69.66	26,221	56,896	11,765	35,542	18,831
Österåk.-Ö. Ryd+Vaxh.	735	68.36	27,622	73,269	9,085	37,037	18,472
Bro	82	67.85	26,397	42,857	7,812	34,684	16,620
Hässelby	513	66.58	31,336	58,219	14,185	41,667	21,918
Järfälla	2,411	66.21	30,764	65,385	13,262	42,308	21,400
Spånga-Kista	1,487	68.04	30,692	76,111	10,256	44,681	20,132
Vällingby	735	66.19	35,672	83,043	16,489	49,062	25,000
Southern suburbs							
Botkyrka + Grödinge	1,327	66.97	26,661	60,000	5,681	36,077	18,857
Flemingsberg	211	68.85	22,217	58,333	6,682	40,540	11,194
Farsta	1,407	64.56	38,406	102,778	5,047	50,000	27,500
Huddinge	612	64.69	35,132	79,130	16,923	47,368	25,439
Gustavsberg-Ingarö	389	69.05	33,141	65,278	16,369	45,263	22,031
Skärholmen	632	60.77	34,450	65,833	3,093	47,500	23,636
Södertälje + Östertälje	1,491	68.48	21,994	48,965	4,980	31,707	13,557
S:t Mikael	273	65.90	29,960	59,655	11,046	41,791	18,780
Trångsun-Skogås	402	66.50	29,155	55,000	11,029	40,394	20,645
Vantör	1,406	59.61	39,200	98,333	13,051	56,757	24,662
Värmdö-Djurö	19	81.42	36,602	87,302	19,345	68,000	23,553
Österhaninge	1,503	71.82	25,814	78,696	7,202	36,333	16,667

Table A2: Descriptive statistics for rental apartments. Monthly rents in SEK

Neighborhood (church parish)	No. of apart-ments	Average area (sq. meters)	Average rent per sq. met.	Max. rent per sq. met.	Min. rent per sq. met.	90th percentile rent	10th percentile rent
City Center							
Domk.+Joh:es+Ad.Fr.	39	63.79	148.82	234.00	81.95	196.77	93.42
Engelbrekt	63	71.02	168.73	224.58	87.46	204.20	114.37
Gustav Vasa + Matteus	50	58.00	149.35	200.05	82.92	194.18	104.60
Hedvig Eleon. + Oscar	34	51.85	140.11	186.00	98.10	182.21	112.57
Högalid	81	59.04	136.97	213.41	91.11	186.34	97.71
Katarina	55	55.07	142.38	196.10	87.13	184.93	109.92
Kungsh.+Västerm.+Essi.	170	55.05	159.83	228.05	90.38	190.05	117.03
Maria Magdalena	32	52.41	148.94	250.36	100.51	194.52	109.33
Sofia	221	62.68	149.30	197.48	95.30	170.91	121.00
Central suburbs							
Lidingö	117	63.32	125.12	199.16	80.76	156.27	89.79
Solna	229	66.35	110.31	182.06	73.43	137.71	83.09
Sundbyberg	29	58.93	143.25	224.00	84.33	171.03	96.36
Täby + Danderyd	29	64.69	139.03	183	96.48	162.19	99.38
Bromma	351	60.27	129.63	193.94	78.88	166.69	97.10
Västerled	46	54.28	126.90	156.29	82.00	148.67	97.28
Hägersten	262	60.37	133.60	216.25	77.92	156.89	102.88
Enskede-Årsta	129	54.81	123.82	184.42	76.70	152.20	93.47
Nacka + Boo	398	66.35	112.95	182.68	85.30	145.62	91.21
Skarpnäck	247	60.20	107.21	166.74	73.58	139.18	85.57
Brännkyrka	218	61.97	122.83	173.85	85.77	154.81	91.40
Northern suburbs							
Hammarby + Fresta	98	62.91	105.60	158.40	73.23	115.50	84.92
Husb.-Ärlingh.+Valsta	60	70.60	115.70	155.73	71.79	151.33	74.49
Sigtuna	89	68.38	106.78	150.22	73.06	127.22	75.91
Sollentuna	26	59.27	112.41	153.85	79.86	141.83	82.19
Vallentuna	25	61.74	132.48	180.95	97.64	170.49	100.98
Österåk.-Ö. Ryd +Vaxh.	37	66.57	100.54	141.16	88.00	106.94	91.32
Bro	37	73.13	77.46	93.94	70.26	81.62	71.79
Hässelby	378	55.58	103.22	155.74	78.43	122.93	87.34
Järfälla	256	70.97	105.98	171.69	72.02	152.25	77.82
Spånga-Kista	469	67.41	99.20	145.17	68.87	126.19	79.57
Vällingby	594	60.69	117.27	190.43	81.13	152.75	91.60
Southern suburbs							
Botkyrka + Grödinge	339	67.36	86.19	127.52	57.94	107.52	73.10
Flemingsberg	104	61.24	88.05	121.67	66.68	108.46	77.60
Farsta	593	64.54	106.33	170.59	74.98	131.57	85.86
Huddinge	154	58.06	111.90	183.33	82.84	136.39	86.91
Gustavsberg-Ingarö	57	58.68	100.54	156.24	81.99	134.68	85.35
Skärholmen	208	71.96	89.75	134.63	70.85	117.22	75.73
Södertälje + Östertälje	160	69.375	97.29	136.76	71.98	112.54	82.88
S:t Mikael	96	62.06	92.52	136.40	76.52	109.88	79.17
Trångsund-Skogås	54	52.87	99.54	134.97	76.06	116.64	82.52
Vantör	568	63.66	104.22	194.05	77.52	124.86	87.13
Värmdö-Djurö	30	63.83	98.36	120.98	80.59	114.38	83.21
Österhaninge	298	63.54	117.11	173.42	76.89	154.32	85.69

Table A3: Estimates of the location factor α_i in equation (4)

Neighborhood (church parish)	Coops, $r-g=0.027$	Coops, $r-g=0.0315$	Rental apartments
City Center			
Domkyrko. + Joh:es + Adolf Fredrik	0.0291	0.0283	0.0677
Engelbrekt	0.0276	0.0267	0.0975
Gustav Vasa + Matteus	0.0291	0.0283	0.0669
Hedvig Eleonora + Oscar	0.0299	0.0289	0.0515
Högalid	0.0273	0.0264	0.0486
Katarina	0.0275	0.0267	0.0561
Kungsholm + Västerm + Essinge	0.0264	0.0255	0.0770
Maria Magdalena	0.0280	0.0271	0.0598
Sofia	0.0264	0.0254	0.0757
Central suburbs			
Lidingö	0.0117	0.0116	0.0351
Solna	0.0150	0.0147	0.0132
Sundbyberg	0.0152	0.0148	0.0572
Täby + Danderyd	0.0092	0.0090	0.0606
Bromma	0.0135	0.0130	0.0383
Västerled	0.0193	0.0187	0.0326
Hägersten	0.0192	0.0186	0.0465
Enskede-Årsta	0.0166	0.0160	0.0263
Nacka + Boo	0.0131	0.0125	0.0209
Skarpnäck	0.0162	0.0155	0.0002
Brännkyrka	0.0112	0.0108	0.0307
Northern suburbs			
Hammarby + Fresta	0	0	0
Husby-Ärlinghundra+Valsta	-0.0036	-0.0039	0.0193
Sigtuna	0.0023	0.0026	0.0072
Vallentuna	0.0024	0.0019	0.0517
Österåker-Östra Ryd+ Vaxholm	0.0014	0.0011	-0.0041
Bro	-0.0044	-0.0042	-0.0514
Hässelby	0.0047	0.0043	-0.0110
Järfälla	0.0028	0.0026	0.0025
Spånga-Kista	0.0036	0.0033	-0.0080
Vällingby	0.0060	0.0058	0.0191
Southern suburbs			
Botkyrka + Grödinge	0.0007	0.0004	-0.0387
Flemingsberg	0.0023	0.0010	-0.0399
Farsta	0.0088	0.0085	0.0032
Huddinge	0.0057	0.0056	0.0083
Gustavsberg-Ingarö	0.0072	0.0067	-0.0145
Skärholmen	0.0056	0.0053	-0.0250
Södertälje + Östertälje	-0.0050	-0.0053	-0.0083
S:t Mikael	0.0063	0.0055	-0.0264
Trångsund-Skogås	-0.0005	-0.0003	-0.0211
Vantör	0.0081	0.0078	-0.0026
Värmdö-Djurö	0.0038	0.0040	-0.0102
Österhaninge	0.0006	0.0002	0.0211

Note: Since these factors are dummy variables in the estimation, we have set the location factor of Hammarby + Fresta (Northern suburbs) equal to zero.

Table A4: Estimated coefficients of equation (5) for coop shares

	$r-g=0.027$ $\theta=-0.2267^{***}$, $\lambda=-0.1441^{***}$ $a_0=3.4507, a_1=0.2818$, $a_2=0.1130, a_3=-0.1696$ $\delta=0.0143$ **Test statistics for various H_0:** $\theta=\lambda=-1, Pr<0.01$ $\theta=\lambda=0, Pr<0.01$ $\theta=\lambda=1, Pr<0.01$			$r-g=0.0315$ $\theta=-0.2312^{***}$, $\lambda=-0.1407^{***}$ $a_0=3.4420, a_1=0.2680$, $a_2=0.1112, a_3=-0.1663$ $\delta=0.0146$ **Test statistics for various H_0:** $\theta=\lambda=-1, Pr<0.01$ $\theta=\lambda=0, Pr<0.01$ $\theta=\lambda=1, Pr<0.01$		
Neighborhood (church parish)	$\boldsymbol{\alpha_i}$	$\boldsymbol{\beta_i}$	$\boldsymbol{\gamma_i}$	$\boldsymbol{\alpha_i}$	$\boldsymbol{\beta_i}$	$\boldsymbol{\gamma_i}$
City Center						
Domk.+Joh:es+Ad. Fr.	0.0698	0.0001	-0.0006	0.0698	0.0001	-0.0003
Engelbrekt	0.0640	0.0004	-0.0062	0.0637	0.0003	-0.0060
Gustav Vasa + Matteus	0.0675	0.0001	0.0002	0.0676	0.0001	0.0004
Hedv. Eleon. + Oscar	0.0669	0.0003	-0.0026	0.0669	0.0003	-0.0023
Högalid	0.0608	0.0002	-0.0032	0.0653	0.0003	-0.0023
Katarina	0.0657	0.0002	-0.0032	0.0652	0.0002	-0.0030
Kungsh.+Västerm.+Essi.	0.0586	0.0003	-0.0033	0.0583	-0.0031	0.0003
Maria Magdalena	0.0704	0.0002	-0.0041	0.0702	0.0002	-0.0039
Sofia	0.0615	0.0002	-0.0016	0.0628	0.0001	-0.0013
Central suburbs						
Lidingö	0.0171	0.0005	-0.0071	0.0179	0.0004	-0.0066
Solna	0.0420	0.0000	-0.0022	0.0421	0.0000	-0.0019
Sundbyberg	0.0403	0.0000	-0.0005	0.0403	-0.0000	-0.0004
Täby + Danderyd	0.0230	0.0002	-0.0052	0.0229	0.0002	-0.0048
Bromma	0.0338	0.0000	-0.0007	0.0336	0.0000	-0.0003
Västerled	0.0340	0.0003	-0.0009	0.0340	0.0003	-0.0003
Hägersten	0.0461	0.0002	-0.0050	0.0453	0.0002	-0.0048
Enskede-Årsta	0.0477	-0.0002	0.0029	0.0469	-0.0002	0.0028
Nacka + Boo	0.0267	0.0003	-0.0048	0.0262	0.0003	-0.0043
Skarpnäck	0.0501	-0.0003	0.0037	0.0491	-0.0003	0.0041
Brännkyrka	0.0398	-0.0001	-0.0011	0.03915	-0.0001	-0.0008
Northern suburbs						
Hammarby + Fresta	0	0	0	0	0	0
Husb.-Ärlingh.+Valsta	-0.0154	0.0004	-0.0084	-0.0140	0.0003	-0.0070
Sigtuna	-0.0093	0.0011	-0.0213	-0.0077	0.0009	-0.0186
Sollentuna	0.0157	-0.0000	0.0004	0.0159	-0.0001	0.0007
Vallentuna	0.0122	0.0003	-0.0118	0.0101	0.0003	-0.0110
Österåk.-Ö. Ryd+Vaxh.	0.0017	0.0001	-0.0024	-0.0004	0.0001	-0.0022
Bro	-0.0198	0.0003	-0.0043	-0.0186	0.0002	-0.0034
Hässelby	0.0119	0.0003	-0.0069	0.0115	0.0002	-0.0061
Järfälla	0.0058	0.0002	-0.0058	0.0058	0.0002	-0.0054
Spånga-Kista	0.0161	-0.0001	-0.0001	0.0158	-0.0001	0.0000
Vällingby	0.0187	-0.0001	0.0017	0.0190	-0.0001	0.0019
Southern suburbs						
Botkyrka + Grödinge	-0.0013	0.0003	-0.0067	-0.0012	0.0002	-0.0056
Flemingsberg	0.0189	-0.0001	-0.0025	0.0168	-0.0002	-0.0010
Farsta	0.0301	-0.0001	0.0004	0.0306	-0.0002	0.0010

Huddinge	0.0114	0.0003	-0.0081	0.0123	0.0003	-0.0065
Gustavsberg-Ingarö	0.0251	-0.0002	0.0017	0.0236	-0.0001	0.0018
Skärholmen	0.0308	-0.0007	0.0106	0.0302	-0.0007	0.0107
Södertälje + Östertälje	-0.0171	0.0002	-0.0043	-0.0179	0.0002	-0.0039
S:t Mikael	0.0225	-0.0004	0.0085	0.0207	-0.0004	0.0080
Trångsund-Skogås	0.0180	-0.0004	0.0036	0.0181	-0.0004	0.0038
Vantör	0.0303	-0.0000	-0.0034	0.0305	-0.0001	-0.0028
Värmdö-Djurö	0.0044	0.0000	0.0017	0.0028	0.0000	0.0021
Österhaninge	0.0100	-0.0001	-0.0000	0.0089	-0.0001	0.0006

Table A5: Estimated coefficients of equation (5) for rental apartments

$\theta = -0.0841^{***}, \lambda = 0.0697$

$a_0 = 4.7073, a_1 = 0.7781,$

$a_2 = 0.5705, a_3 = -0.4596$

$\delta = 0.0160$

Test statistics for various H_0:

$\theta = 0, Pr < 0.01$

$\theta = \lambda = -1, Pr < 0.01$

$\theta = \lambda = 0, Pr < 0.01$

$\theta = \lambda = 1, Pr < 0.01$

Neighborhood (church parish)	α_i	β_i	γ_i
City Center			
Domkyrko. + Joh:es + Ad. Fredr.	0.0690	0.0015	-0.0081
Engelbrekt	0.0962	-0.0001	0.0532
Gustav Vasa + Matteus	0.0392	-0.0006	0.0719
Hedvig Eleonora + Oscar	0.0948	-0.0029	0.0894
Högalid	0.0881	0.0007	-0.0097
Katarina	0.1032	-0.0017	0.0565
Kungsholm + Västerm. + Essinge	0.0354	0.0024	0.0019
Maria Magdalena	0.0974	-0.0012	0.0502
Sofia	0.1487	-0.0015	0.0502
Central suburbs			
Lidingö	0.1364	-0.0043	0.0936
Solna	0.0170	-0.0000	0.0033
Sundbyberg	0.1178	-0.0023	0.0635
Täby + Danderyd	0.0922	0.0000	0.0169
Bromma	0.0488	-0.0016	0.0587
Västerled	-0.1436	0.0042	-0.0077
Hägersten	0.0363	0.0012	-0.0028
Enskede-Årsta	0.0829	-0.0011	0.0153
Nacka + Boo	0.0935	-0.0035	0.0779
Skarpnäck	0.0251	-0.0025	0.0563
Brännkyrka	0.0205	-0.0010	0.0474
Northern suburbs			
Hammarby + Fresta	0	0	0
Husby-Ärlinghundra+Valsta	0.0366	-0.0034	0.0961
Sigtuna	0.0366	-0.0022	0.0419
Sollentuna	-0.2284	-0.0001	0.1047

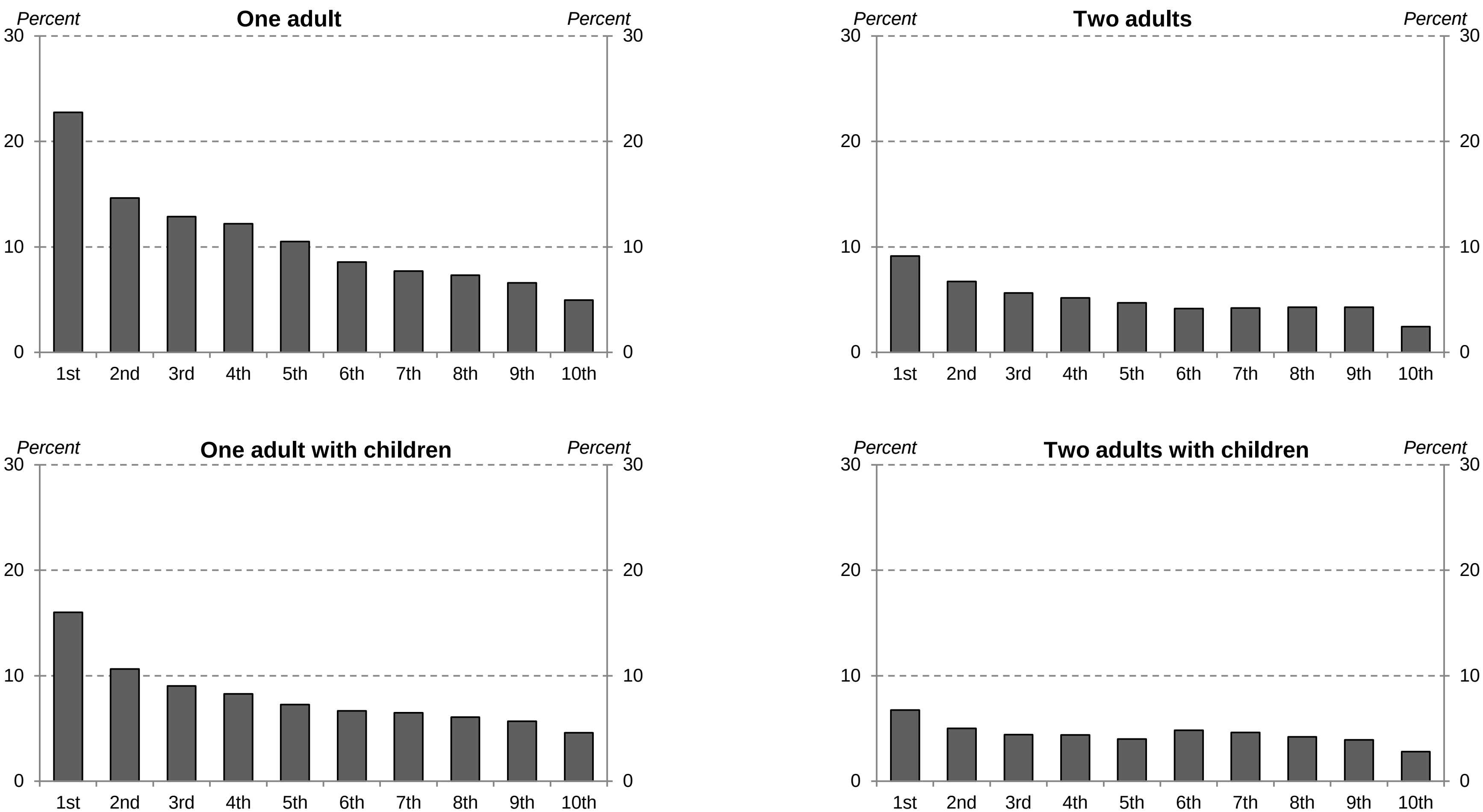
Vallentuna	-0.0637	0.0050	-0.0761
Österåker-Östra Ryd+ Vaxholm	-0.0712	-0.0001	0.0262
Bro	-0.1254	-0.0012	0.0371
Hässelby	-0.0112	-0.0015	0.0337
Järfälla	0.0860	-0.0067	0.1495
Spånga-Kista	0.0476	-0.0032	0.0622
Vällingby	0.0478	-0.0035	0.0904
Southern suburbs			
Botkyrka + Grödinge	-0.0984	-0.0013	0.0400
Flemingsberg	-0.1124	-0.0017	0.0588
Farsta	-0.0218	-0.0002	0.0174
Huddinge	0.1125	-0.0044	0.0730
Gustavsberg-Ingarö	-0.1282	-0.0028	0.1211
Skärholmen	-0.0679	-0.0004	0.0133
Södertälje + Östertälje	-0.0371	-0.0009	0.0315
S:t Mikael	-0.1256	0.0000	0.0278
Trångsund-Skogås	-0.1395	-0.0007	0.0678
Vantör	-0.0017	-0.0017	0.0435
Värmdö-Djurö	-0.0859	-0.0026	0.1039
Österhaninge	0.1034	-0.0063	0.1473

Note that since (5) is estimated on actually paid yearly rents, it is not necessary to make any assumption about $r - g$ for rental apartments.

Table A6: Estimated monthly rents and rent changes for actual apartments in each neighborhood

		$r - g = 0.027$		$r - g = 0.0315$	
Neighborhood (church parish)	**Regulated monthly rent,** $\hat{h}_i^{reg}$	**Average absolute change,** $\hat{h}_i - \hat{h}_i^{reg}$	**Average relative change, percent**	**Average absolute change,** $\hat{h}_i - \hat{h}_i^{reg}$	**Average relative change, percent**
City Center					
Domkyrko. + Joh:es + Adolf Fredrik	9,856	4,482	45.47	6,362	64.55
Engelbrekt	14,373	3,307	23.30	5,676	39.49
Gustav Vasa + Matteus	10,093	3,952	38.95	5,773	57.19
Hedvig Eleonora + Oscar	8,570	7,563	88.26	9,728	113.52
Högalid	7,424	3,961	53.36	5,373	72.37
Katarina	8,183	4,284	52.36	5,874	71.78
Kungsholm + Västerm + Essinge	9,096	2,198	24.16	3,594	39.51
Maria Magdalena	8,680	4,295	49.48	5,899	67.96
Sofia	9,091	2,985	32.84	4,380	48.18
Inner suburbs					
Lidingö	8,029	1,536	19.13	2,533	31.55
Solna	7,096	2,842	40.05	3,899	54.94
Sundbyberg	8,708	1,172	13.45	2,206	25.33
Täby + Danderyd	8,703	-203	-2.33	644	7.40
Bromma	7,454	1,371	18.40	2,251	30.20
Västerled	7,901	2,106	26.65	3,218	40.73
Hägersten	7,438	2,229	29.97	3,286	44.18
Enskede-Årsta	6,438	2,390	37.12	3,329	51.72
Nacka + Boo	7,389	2,241	30.33	3,177	43.00
Skarpnäck	6,221	3,051	40.05	3,983	64.03
Brännkyrka	7,380	1,208	16.37	2,045	27.71
Northern suburbs					
Hammarby + Fresta	6,624	622	9.39	1,232	18.60
Husby-Ärlinghundra+Valsta	7,503	-647	-8.63	-169	-2.25
Sigtuna	7,272	1,054	14.49	1,828	25.14
Sollentuna	7,341	568	7.74	1,296	17.65
Vallentuna	8,236	-984	-11.95	-421	-5.11
Österåker-Östra Ryd+ Vaxholm	6,558	853	13.02	1,322	22.12
Bro	5,417	1,449	26.74	2,006	37.03
Hässelby	5,839	1,591	27.25	2,226	38.12
Järfälla	7,069	1,039	14.71	1,722	24.36
Spånga-Kista	6,645	1,400	21.08	2,065	31.08
Vällingby	7,143	779	10.91	1,501	21.01
Southern suburbs					
Botkyrka + Grödinge	5,957	1,840	30.89	2,438	40.92
Flemingsberg	5,760	1,927	33.45	2,359	40.96
Farsta	6,602	1,758	26.63	2,550	38.62
Huddinge	6,533	1,267	19.39	2,002	30.64
Gustavsberg-Ingarö	5,724	1,825	59.79	2,525	43.45
Skärholmen	6,478	1,859	28.70	2,566	39.61
Södertälje + Östertälje	6,409	178	2.78	644	10.05
S:t Mikael	6,027	2,146	35.61	2,778	46.09
Trångsund-Skogås	6,675	507	7.60	1,134	16.98
Vantör	6,408	1,753	27.36	2,499	39.00
Värmdö-Djurö	6,686	1,064	15.91	1,773	26.51
Österhaninge	7,531	110	1.46	682	9.06

Figure A1: Rent increases as a percentage of disposable income, across income deciles and household types, medians.



Note that the deciles are different for the four household types; cf. comment on Figure 8 above