International Journal of Housing Policy

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/reuj20

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Andreas Alm Fjellborg

To cite this article: Andreas Alm Fjellborg (2022) Residential mobility and spatial sorting in Stockholm 1990-2014: the changing importance of housing tenure and income, International Journal of Housing Policy, 22:2, 198-224, DOI: 10.1080/19491247.2021.1893117

To link to this article: https://doi.org/10.1080/19491247.2021.1893117

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Published online: 05 Apr 2021.

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INTERNATIONAL JOURNAL OF HOUSING POLICY
2022, VOL. 22, NO. 2, 198–224
https://doi.org/10.1080/19491247.2021.1893117

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Residential mobility and spatial sorting in Stockholm 1990-2014: the changing importance of housing tenure and income

Andreas Alm Fjellborg

Department of Social and Economic Geography, Uppsala University, Uppsala, Sweden

ABSTRACT

In this paper an analysis of residential mobility and sorting by income and housing tenure in Stockholm is carried out. The study contrasts two periods: one (1990-2001) characterised by recovery after the economic crisis in 1991-1992 and one (2002-2014) characterised by large changes to the housing stock composition. With the use of a longitudinal full population data set, it is shown that the socioeconomic composition of movers is relatively stable over time, while the economic sorting of movers increases. People with low income are increasingly likely to move into low-income neighbourhoods, whether they move into the rental or owner segments of the housing market. Those who own their housing unit and mid- to high-income earners increasingly avoid moving to low-income neighbourhoods. The paper concludes that the increasingly owner-dominated housing market in Stockholm contributes to stronger socio-spatial residential patterns through the economic sorting of movers across the whole income scale.

KEYWORDS Residential mobility; housing tenure; Stockholm; longitudinal analysis

Introduction

The critical reasons policy makers have for promoting increased shares of owner occupancy are that it supports economic security, independence and freedom of choice for individuals (Swedish examples see Koliev & Lind, 2017; Edholm, 2005). The idea that owner occupancy delivers these benefits stems from the notion that it will create private capital accumulation through increasing price levels, granting access to a broader range of housing alternatives or providing sufficient economic gains to cover other

CONTACT Andreas Alm Fjellborg andreas.alm.fjellborg@kultgeog.uu.se

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consumption needs, through refinancing for instance. However, the accumulation of wealth in the housing sector benefits households profiting from a geographically uneven capital accumulation within the housing sector. The part of the population in need of social and economic security from housing when social safety nets gradually erode may have difficulties accessing housing in favourable locations if they lack sufficient economic resources (Smith, 2015).

This paper aims to contribute to our knowledge on how residential mobility and residential sorting evolves in a housing market context that is increasingly characterised by rising rates of owner occupancy, growing geographical gaps in wealth accumulation in owned housing and a shrinking rental sector. The effects of income and housing tenure are central to the analysis of residential mobility and residential sorting in this paper, as to clarify how these two factors have changing properties on an increasingly financialised housing market.

Demographic factors and socioeconomic status have been found to influence *who* moves (Bolt & van Kempen, 2003; South & Crowder, 1998). Thus, the relation between *income*, *housing tenure* and *residential mobility* is studied in order to understand whether and how mobility changed between the periods in the study. Such background characteristics are also hypothesised to influence *where* people move (Hedman, van Ham, & Manley, 2011; Musterd, van Gent, Das, & Latten, 2016). The relation between *income*, *housing tenure* and residential *sorting* is the second central theme of the paper.

The study area, Stockholm County (Stockholm), has seen substantial compositional changes in the housing stock. A clear shift in the housing tenure structure, through housing tenure conversions, can be detected from the turn of the millennium. This is the reason for the time period division (1990–2001, 2002–2014) used in the empirical models. The first period covers a severe economic crisis and the subsequent recovery period with rising income inequality (The Gini-coefficient for earned income rose with 14.3% between 1990 and 2000 see Stockholm Statistical Bureau, 2014). The second period covers the time of large compositional changes to the housing tenure structure. The first peak of conversions of rental housing units marks the beginning of the second period, the period is further characterised by less dramatic changes in income inequality (+2.3% 2001–2014). Over time, there have been fewer options for low-income residents as the rental market has shrunk, and the poorest residents need to seek housing where rents are low, or buy into the market-based segments where they can afford it (Andersson & Magnusson Turner, 2014). With increased market-based provision of housing in Stockholm, the first hypothesis is that (i) *who moves is increasingly positively correlated with income*, and secondly, (ii)

income is a stronger determinant of what type of neighbourhood people move to. The price for owned housing naturally differs across various neighbourhoods. Therefore, in the third hypothesis I suggest that (iii) *income is more strongly correlated with the socio-economic composition of destination neighbourhood in the market-based housing sector compared to the rental sector.*[1] Owned housing could, as argued by many policy makers, bring insider advantages, as selling often renders profits, at least when prices increase, which they have done since the mid-1990s in Stockholm. These profits could be invested in a new dwelling. Consequently, it is hypothesised that (iv) *housing tenure status before a move is increasingly important for the possibility to acquire housing in attractive locations*. The insights gathered through testing these hypotheses are necessary for answering the research question: How do income and housing tenure as determinants for households' intra-urban relocation and moving destination change as the housing-market is increasingly financialised?

The relation between residential mobility, income and housing tenure

A household's demographic, socioeconomic and ethnic characteristics often match the characteristics of the residential neighbourhood that the household moves to (Hedman et al., 2011). People who are poor disproportionally enter poor areas (Bailey & Livingston, 2007; Quillian, 2003), and middle-class families (Boterman, 2012) and the affluent (Andreotti, Le Galès, Fuentes, & Javier, 2013) find housing where others from these groups live. Naturally, changes in household characteristics and in the neighbourhood composition affect decisions about whether to stay or move (Kim, Pagliara, & Preston, 2005). Income is one important aspect to consider when studying residential mobility and sorting. Generally, research has indicated that lower income levels are associated with higher likelihood of moving, while lower levels of residential mobility can be detected in the owner segments of the housing market as opposed to the rental segments (Musterd et al., 2016).

Growth of economic segregation due to growing income inequality has, in the U.S., been found to be driven by clustering of the rich rather than increased poverty concentrations (Reardon & Bischoff, 2011). Musterd, Marcińczak, van Ham, and Tammaru (2017) argue that the welfare state and housing regimes are important and could potentially weaken the link between housing outcomes and income through housing benefits or other mechanisms. Reardon and Bischoff (2011, p. 1102) write that economic segregation requires 'income-correlated residential preferences, an income-based housing market, and/or housing policies that link income to residential location'. The income-correlated preferences may refer to a desire among

some income groups to have access to certain amenities that affect housing choices or preferences for certain neighbourhood types. An income-based housing market is a housing market where housing is allocated mainly through income, the variations in house prices between neighbourhoods could then increase economic segregation (Drudy & Punch, 2002). Housing policies that link income to residential location include planning practice and the location and allocation of means-tested housing. Income levels affect not only the choice of neighbourhood but also the choice of housing type and housing tenure (Feijten & Mulder, 2005; Magnusson Turner & Hedman, 2014). Thus, there are connections between income levels, neighbourhood type and housing tenure that could affect residential mobility.

In many western contexts, housing policy has generated more market-based housing at the expense of affordable, accessible rental options (Hedin, Clark, Lundholm, & Malmberg, 2012; Kadi & Ronald, 2016). One noticeable process is stock-transfer policies (in the U.K., Germany and the Netherlands, see Stephens, Elsinga, & Knorr-Siedow, 2014; for Sweden, see Andersson & Magnusson Turner, 2014). The stock-transfer in Stockholm is comparable to the process in the U.K. in many ways, and has been argued to increase segregation in Stockholm. Andersson and Kährik, (2016) show, using the dissimilarity index, that economic segregation between income quintiles increased in Stockholm. They also show that there is a reduced ethnic segregation within income brackets. The development also expanded processes of gentrification and low-income filtering (Hedin et al., 2012). Households with low income are generally renters and wealthier households are owners. However, there is also ethnic and economic mix within housing tenures, especially in the rental and co-op segments in Sweden (Bråmå, Andersson, & Solid, 2006), indicating that geographic tenure segmentation is not necessarily the only important aspect of segregation between ethnic or socio-economic groups.

Growing income inequality, as witnessed in Sweden (Björklund & Jäntti, 2011), could cause increased economic segregation (Chen, Myles, & Picot, 2012; Scarpa, 2016). And indeed, economic polarisation has increased in Stockholm (Amcoff, Östh, & Niedomysl, 2014). The segregation index for low-income groups (measured as the quintile with lowest income) mainly rose during the 1990s (Andersson & Kährik, 2016), when income inequality also rose in Stockholm (Stockholm Statistical Bureau, 2014). Stronger concentrations of the higher-income groups in Stockholm municipality are evident in the 2000s (Andersson & Kährik, 2016), when large parts of rental housing units were converted to owned forms of housing. Given the findings displaying increased residential segregation by income (e.g. Andersson & Kährik, 2016), it is anticipated that income is an increasingly important factor for residential sorting of movers. It may be expected that housing

tenure explains residential sorting increasingly over time, because of the reduced levels of affordable rental housing units in mid- and high-income neighbourhoods and with a greater dependency on assets to navigate a financialised housing market (Musterd, Marcińczak, van Ham & Tammaru, 2017). But, geographically fixed assets such as housing accumulate wealth unevenly (Smith, 2015). Some locations have stronger house price development compared to others. It is therefore not probable that the effect of housing tenure on residential sorting is geographically even.

Restructuring the Stockholm housing market

Holmqvist and Magnusson Turner (2014) argue that changed regulation of public rental housing in Sweden is one important sign of the view of housing as a commodity rather than a social right. In line with this, a large-scale stock transfer policy has restructured the Stockholm housing market and made the housing stock increasingly market-based.

Sweden has three main tenure forms: homeownership housing in single-family units (50.2 percent of the population), co-ops[2] (20 percent) and rental housing[3] (30 percent), most often in multi-family housing units. Homeownership and co-ops are the owned housing tenure forms. In Stockholm, substantial changes to the tenure structure have taken place since the 1990s, and in 2010 more people were co-op owners than renters. The trend is rather clear: rental housing has lower shares of the population at the end of the period and there is a slight increase of the population in homeownership housing and a rather large increase among co-op owners. In a Swedish context, Stockholm stands out in this regard even if other larger cities follow similar trends.

The changes to the public rental sector have had an impact on the housing market, making rental units less common in the central and attractive locations of Stockholm (Andersson & Magnusson Turner, 2014; Bergsten & Holmqvist, 2013). This development is a clear break with the Swedish welfare state model in relation to housing consumption and provision. During the 20th century, the state has provided massive subsidies to housing production aiming at a large rental sector open to all income groups throughout cities. Large-scale and accessible housing benefits have contributed to all income groups' ability to consume housing in accordance with their needs, rather than mainly according to their level of income (Grundström & Molina, 2016).

Single mothers, foreign-born and young adults suffered most from the 1990s crisis and subsequent restructuring of the welfare state (Bergmark & Fritzell, 2007). The changes around the economic crisis in 1991-92 included tax reforms in relation to capital and income, but also changed taxation of

housing. Other key changes were the rules on housing benefits, which cut the number of recipients by 50 percent in 1997/1998 (Chen & Enström Öst, 2005). The highly regulated housing sector of the 1960-1970 has gradually been replaced and, since the mid-2000s, housing policy has been geared towards market solutions (Grundström & Molina, 2016; Hedin et al., 2012), although some parts remain heavily regulated (Christophers, 2013; Lind & Lundström, 2007). The rental sector is particularly regulated. Rents in rental housing are set through negotiations between rental companies and the Swedish union of tenants (Hyresgästföreningen), and this has kept rents fairly low and has also kept rent increases rather moderate. Critics argue that this lowers the rate of construction, as profitability for builders is low. Long queues for allocation and the low rents are aspects that could hamper mobility, making it hard for new groups (young and foreign-born) to enter the housing market (Boverket, 2014; Lind & Lundström, 2007). It should be noted that rents in rental housing have increased beyond the consumer price index making it gradually more expensive to rent, meanwhile costs for owning have been reduced somewhat in relation to consumer price index (Grander, 2018). The lower real estate taxes, low mortgage rents and rather high taxes on profits[4] when selling houses have also led to high demand for owned housing but low incentives to leave the homeowner market. The annual shares of movers and stayers are nonetheless stable from 1990 to 2014, except for substantially higher shares of stayers in the co-op and homeownership segments during the economic crisis years 1991-1992.

The price development of residential units is crucial for residential mobility frequencies as the 1991/1992 crisis period shows. Low mobility frequencies in the owner segments could be explained by the dramatically lowered prices and massive increase of mortgage rent levels during the crisis years. Price development is also crucial for economic sorting and the possibility to move to certain neighbourhoods. Swedish housing prices have been rising over the past decades, mirroring trends throughout Western Europe (Eurostat, 2018). In Stockholm the price increase has been particularly dramatic. The average price per square metre in Stockholm County rose from 4,703 Swedish Kronor (SEK) in 1996 to 40,005 SEK in 2016 (Svensk mäklarstatistik[5]). There are small shifts as to which areas have attracted the wealthier parts of the population, but these areas are increasingly inaccessible for growing parts of the population, both in terms of price development and in terms of the shifting tenure composition.

Changes to the tenure composition could change the composition of in-movers to a particular neighbourhood, due to unevenly rising price levels and an uneven development of the housing stock composition. In areas with the lowest shares of people above median income (neighbourhood

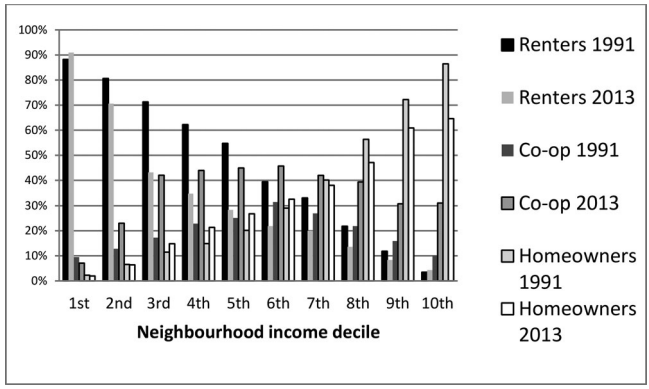

Figure 1. Distribution of tenants across neighbourhood deciles (by share of above median income earners) (1 = lowest, 10 = highest) in 1991 and 2013.
Source: PLACE database, author's calculations.

decile 1 in Figure 1), renting is most common, close to 90%. Owning is most common in areas with higher shares of the population with above median income. The largest increase of co-ops is found in mid-income areas.

Figure 1 shows that rental housing is more common in the poorest neighbourhoods (1st and 2nd deciles) both at the beginning (1991) and end (2013) of the period covered in this paper. The share of co-ops increases in decile 2 neighbourhoods and above, at the expense of rental units. In decile 7 neighbourhoods and above, there are also lower shares of home-ownership housing at the end of the period. This shows that neighbourhoods characterised by multi-family housing units also attract large parts of the wealthier population. From the data depicted above, it is reasonable to conclude that the decrease of tenure mix (i.e. fewer rental units where the wealthier part of the population is clustered) will have an effect on the possibility for residents with lower income to move there. The effect of owning in low-income neighbourhoods remains open; the rapidly diverging house price development suggests fewer possibilities for owners in low-income neighbourhoods to move to wealthier areas, despite private capital accumulation from housing.

The next section provides an outline of the methods used to study the changes of residential mobility and mobility outcomes in Stockholm over 25 years.

Methods and research design

The empirical part in this paper focuses on the development of residential sorting and mobility by analysing descriptive and inferential statistics. The

time period divisions in the statistical models are 1990-2001 and 2002-2014.

The data for this study come from the PLACE database at the Department of Social and Economic Geography at Uppsala University. The database includes every individual who has lived in Sweden between 1990 and 2014 covering individual-level information on location, 100×100 metre coordinates derived from information on housing location, yearly socioeconomic data, educational information, housing, family composition and other demographic data. The annual data allows for residential mobility, income development or demographic changes to be studied over time for each individual. Here a subset of the dataset is used which comprises all individuals that have, at some point, resided in Stockholm County between 1990 and 2014.

A generalised estimating equation with a binary dependent variable for staying or moving with the population average (PA) specification in Stata is used to assess the impact of various background characteristics on the odds of moving for the population in Stockholm. These models serve to answer the question of *how the impact from income and housing tenure influence residential mobility changed over time*. The coefficients estimated are to be interpreted as the average outcome, for instance the estimation for low income on staying or moving is to be interpreted as representing the *odds of an average low-income person moving compared with the odds of an average person at the mid-income (reference category) level moving* (see Stata, 2013). This paper focuses on the development over time of residential mobility in the Stockholm region and therefore the choice of using average models is reasonable, as it is the difference across the time periods of the average impact of income and housing tenure that is of interest when discussing the processes of residential mobility. Since the data set contains multiple observations of the same individual over time, standard errors are clustered at the individual level to avoid breaking the standard assumption of independence of observations.

After the PA models, the movers within Stockholm County are used in the multinomial logit models (MNL) to shed light on the association between a set of individual and contextual characteristics and mobility outcomes. This is done with the same stratification of periods, obtained through a time period dummy interaction with all the explanatory variables, to be able to assess the temporal changes of the association between mobility outcomes and individual characteristics. When interacting all explanatory variables with the time period dummy variable we obtain a model equivalent to stratifying the dataset and running one model each for the two periods. However, with one exception; through specifying joint models with a period dummy (both in the PA and MNL model below) the slopes of the coefficients are estimated with varying intercepts through the

period dummy variable.[6] This provides an estimation of the difference in the intercept between the two periods.

The main question to be answered by these last models is *to what extent income and housing tenure influence sorting and how it changes over time*. The explanatory variables in the MNL models are presented as odds ratios, representing the odds of an individual moving to a low-income neighbourhood in relation to moving to a mid-income neighbourhood when having a trait (e.g. high income) versus the same individual not having that trait. In the MNL models, the outcome variables are three different neighbourhood types based on the share of the closest 400 neighbours above median disposable income among the population aged 20-64 (computed with the Equipop software, see Östh, 2014).

The scale of suitable geographical size, as well as what number of neighbours to include in a population-based measure of *neighbourhood,* has been debated (Östh, Malmberg, & Andersson, 2014). Here the choice landed on quite small units of the 400 closest neighbours. This is chosen due to indications that individuals' conceptualisation of their *neighbourhood* normally spans up to about 500 neighbours, probably due to micro shifts in housing types and tenure structure but also due to natural barriers in the built environment (Haynes, Daras, Reading, & Jones, 2007). Low-income neighbourhoods are defined as having one standard deviation below, and high-income neighbourhoods have one standard deviation above, the mean share of residents with above median disposable income. These threshold values correspond to cut-off values just below decile 2 and above decile 8 in Figure 1. Areas between these threshold values are categorised as mid-income areas and are used as the reference outcome in the models.

Variables

A move is defined as changing coordinates from one year to the next between two years. Due to minor measurement errors of the coordinates between the years, a move has to be at least 200 metres in order to be included. The dependent variable of the logistic (PA) models display the odds for whether a person moves, while the dependent variable of the MNL model analysing residential sorting is the share of the population among the closest neighbours with above median income, divided into three categories for the year after the move. A continuous outcome variable could have been used instead, however, here the aim is to study and contrast types of neighbourhoods, therefore a categorical outcome is chosen.

The variables used in the regressions are displayed in Table 1. A categorical variable separates the three main tenure forms: rental housing, co-ops and homeownership. Disposable income makes up the income variable and is calculated as deciles, on the county level, for each year and grouped in

Table 1. Variables in the regression models. Displayed for 1991 and 2013. Total population age 20-64.

		1991		2013	
		N	%	N	%
Population	Total population	1 007 175	100	1 304 043	100
	Female	504 742	50.1	648 931	49.8
Housing tenure	Rental	439 106	43.6	419 847	32.2
	Co-op	184 048	18.3	437 081	33.5
	Homeownership	328 886	32.7	397 773	30.5
Mobility	Movers	118 604	11.8	158 384	12.1
Ethnic background	Foreign background	222 969	22.1	441 418	33.8
	Non-western immigrants	65 662	6.5	218 837	16.8
Education	High education	230 439	22.9	611 419	46.9
	Mid education	519 384	51.6	509 299	39.1
	Low education	213 307	21.2	149 170	11.4
Family type	Single	358 538	35.6	473 511	36.4
	Single with child(ren)	98 099	9.7	150 098	11.5
	Couple	143 894	14.3	132 222	10.1
	Couple with child(ren)	406 644	40.4	544 257	41.7
	Change family type	92 664	9.2	123 593	9.5
Income	Student allowance (yes)	67 979	6.7	109 966	8.4
	Social benefits (yes)	72 881	7.2	43 393	3.3
	High income (Disposable income decile 8-10)	301 652	30.0	390 949	30.0
	Mid income (Decile 4-7)	402 963	40.0	521 591	40.0
	Low income (Declie 1-3)	302 560	30.0	391 503	30.0
	Employed	875 862	87.0	1 082 269	83.0
	Decreasing income	242 941	24.1	256 762	19.7
	Increasing income	293 393	29.1	354 133	27.2
		Mean	Std dev.	Mean	Std dev.
Neighbourhood	Distance to 400 neighbours	377.54	790.57	336.61	682.37
	Ratio Above median income earners *k*-400	.4955	.1055	0.491	0.170
	Ratio Above median income earners *k*-3200	.4931	.0800	0.486	0.142
Disposable income by tenure	Mean income decile - Homeownership	6.243	3.389	6.453	3.372
	Mean income decile - Co-op	5.718	3.013	5.872	3.217
	Mean income decile - Renter	4.939	2.579	4.319	2.457

Source: PLACE database, author's calculations.

the categories high income (deciles 8-10), mid income (deciles 4-7 used as reference category) and low income (deciles 1-3). It would be preferable to use household-level data, as households are the prime level of decision making regarding moving or staying. Constraints make it difficult to aggregate individual data to the household level for large parts of the population. The family type variables separate different forms of households that each individual belongs to. There is no straightforward way to distinguish between single people and couples that are not married and do not have children. When a couple has a child or gets married, their partnership shows up in the database; otherwise these individuals are listed as singles.

Other control variables include dummies for social benefits, student allowances and any change of family type, as well as variables controlling for education and ethnic background (definitions in Table 1). The not-employed dummy variable separates those who have a job from those who do not. Those who do not have a job are not necessarily unemployed, but could be on sick leave or parental leave, or they may be students or have other reasons not to be in the workforce.

Table 1 displays descriptive statistics of the data used in the regression models. Here only the years 1991 and 2013 are shown in order to contrast both ends of the period studied, effectively displaying the long-term development in Stockholm. The descriptive data from the variables show a large increase in Stockholm's population over the period studied. They also show the increase of foreign-born in Stockholm. Other changes include an overall increase in educational level, an increase of co-op owners and a decrease of renters as a share of the total population. Also notable is the increased mean income decile among co-op owners and homeowners and the decrease of mean income among renters. The next section will lay out the descriptive findings of residential mobility.

Residential mobility and residential sorting

The average share of movers is stable over time, 12.1 percent in the period 1990–2001 and 12 percent in 2002–2014. There are some changes in mobility within and between tenure forms. More people move from rental to co-op housing and there is a decrease in the reversed type of move. This implies that renters have difficulties relocating within the rental sector and therefore move into co-ops to a higher degree.

Table 2 summarises key trends of the relation between income, housing tenure and residential mobility. In the first section of the table it shows that the share of low, mid and high-income earners increases in low-, mid-, and high-income neighbourhoods respectively. It is also notable that even if the mid-income neighbourhood category captures the lion's share of neighbourhoods in Stockholm, high-income earners are more often found in high-income neighbourhoods in the end of the period (44% rising to 49% of high-income earners live in high-income neighbourhoods, 47% decreasing to 45% live in mid-income neighbourhoods). In all income groups the share living in co-ops increases (section 2), this is most notable in the mid-income category, both in terms of the share of mid-income earners in co-op housing as well as the absolute increase (from 71.767 to 181.932 individuals aged 20-65). In the third section, the concentration of rental housing to low-income neighbourhoods is evident. As well as the increasing number of co-op-housing units found in high-income neighbourhoods –

Table 2. Key trends of share and N of groups by income, tenure and residential mobility by neighbourhood type, selected years 1990-2014 Stockholm County.

		1990	1996	2002	2007	2013
Section 1	Total population (N)	1 013 130	1 081 475	1 164 488	1 210 543	1 326 779
	High-income earners in low-income nhood	9% (29 232)	8% (27 677)	7% (25 138)	6% (20 592)	5% (19 667)
	High-income earners in mid-income nhood	47% (140 619)	47% (150 833)	47% (163 956)	46% (166 743)	46% (180 995)
	High-income earners in high-income nhood	44% (131 567)	45% (144 902)	46% (158 824)	48% (175 806)	49% (196 471)
	Mid-income earners in low-income nhood	22% (90 288)	21% (91 518)	21% (99 130)	20% (97 818)	21% (110 268)
	Mid-income earners in mid-income nhood	53% (212 836)	54% (231 141)	54% (248 850)	55% (266 701)	55% (293 445)
	Mid-income earners in high-income nhood	25% (100 525)	25% (108 777)	25% (116 844)	25% (118 359)	24% (125 881)
	Low-income earners in low-income nhood	27% (82 540)	30% (96 570)	31% (108 068)	34% (121 951)	34% (134 000)
	Low-income earners in mid-income nhood	50% (152 437)	48% (157 458)	48% (168 224)	47% (170 663)	47% (188 349)
	Low–income earners in high-income nhood	23% (70 468)	22% (70 615)	21% (73 846)	19% (69 681)	19% (75 245)
Section 2	High-income renters	31% (89 978)	29% (92 099)	24% (80 162)	18% (63 126)	14% (54 772)
	High-income co-op	19% (55 578)	24% (73 243)	30% (103 119)	35% (122 884)	39% (153 278)
	High-income homeowners	50% (143 747)	47% (148 386)	46% (154 913)	47% (168 109)	47% (181 119)
	Mid-income renters	53% (203 334)	50% (206 533)	44% (195 099)	40% (185 568)	36% (186 403)
	Mid-income co-op	19% (71 767)	21% (87 661)	25% (113 060)	29% (136 654)	36% (181 932)
	Mid-income homeowners	28% (105 937)	29% (119 370)	31% (136 658)	31% (142 415)	28% (142 141)
	Low-income renters	56% (157 688)	57% (174 158)	54% (176 485)	53% (182 402)	49% (184 414)
	Low-income co-op	16% (44 967)	18% (55 737)	22% (73 602)	24% (82 970)	29% (109 816)
	Low-income homeowners	28% (79 893)	25% (76 610)	24% (79 782)	23% (77 597)	22% (82 712)
Section 3	Rentals in low-income nhood	36% (159 937)	37% (174 532)	41% (186 484)	44% (191 176)	47% (201 067)
	Rentals in mid-income nhoods	57% (256 808)	55% (261 806)	51% (229 476)	48% (204 759)	45% (189 655)

(*continued*)

Table 2. Continued.

		1990	1996	2002	2007	2013
	Rentals in high-income nhoods	7% (33 412)	8% (36 292)	8% (35 127)	8% (34 249)	8% (33 918)
	Co-ops in low-income nhood	9% (15 893)	10% (22 434)	8% (23 265)	8% (26 479)	8% (37 235)
	Co-ops in mid-income nhoods	66% (113 514)	63% (135 237)	62% (178 722)	61% (210 099)	62% (276 335)
	Co-ops in high-income nhoods	25% (42 221)	27% (58 323)	30% (87 268)	31% (105 209)	30% (130 934)
	Homeownership in low-income nhood	2% (6 757)	2% (8 531)	2% (9 065)	2% (9 095)	3% (10 305)
	Homeownership in mid-income nhoods	32% (105 294)	34% (115 502)	39% (144 557)	42% (163 105)	42% (169 844)
	Homeownership in high-income nhoods	66% (216 921)	64% (219 665)	59% (217 352)	56% (215 346)	55% (224 880)
Section 4	Share of population moving	13% (132 541)	13% (140 525)	12% (145 677)	12% (147 572)	12% (159 263)
	High-income renters	14% (12 599)	14% (13 203)	14% (11 433)	14% (8 735)	13% (7 069)
	High-income co-op	14% (7 524)	12% (8 964)	13% (12 976)	12% (15 331)	13% (19 720)
	High-income homeowners	6% (8 110)	5% (7 813)	5% (8 417)	5% (8 399)	5% (8 679)
	Mid-income renters	16% (31 589)	16% (32 201)	14% (27 483)	15% (27 022)	14% (26 715)
	Mid-income co-op	14% (9 848)	13% (11 535)	13% (15 093)	13% (18 297)	14% (25 421)
	Mid-income homeowners	8% (8 787)	7% (7 789)	7% (9 044)	6% (8 777)	7% (10 382)
	Low-income renters	17% (27 153)	19% (32 327)	16% (28 022)	17% (30 527)	15% (27 899)
	Low-income co-op	17% (7 501)	17% (9 351)	16% (11 848)	16% (13 104)	15% (16 241)
	Low-income homeowners	12% (9 712)	13% (9 706)	12% (9 575)	12% (9 245)	12% (9 834)

Source: PLACE database, author's calculations.

signalling the growing concentration of high-income earners in centrally located areas of Stockholm. Finally, in section 4, it is notable that mobility is stable in terms of the share of movers in the different income groups across housing tenures. There is reduced mobility among low-income renters. The stability of the share of co-op movers is interesting even if the number of residents in this tenure increases substantially across all income groups and particularly among mid-income residents.

When socioeconomic sorting is analysed by tenure and neighbourhood deciles (Table 3), low-income earners make up a growing part of in-movers to co-op and homeownership housing in low-income neighbourhoods. Low-income individuals do not buy into neighbourhoods above decile 1, which makes this group rather concentrated in low-income neighbourhoods. It is only in the rental sector that low-income households, over time, make up a larger proportion of in-movers to neighbourhoods above decile 2. Mid- and high-income earners make up larger parts of the in-movers to mid- and high-income neighbourhoods respectively. The main conclusion from Table 3 is that, within the market-based part of the housing stock, sorting by income has become gradually stronger.

Preliminary conclusions from the descriptive data, first, do not support the notion that increased owning among low-income earners could reduce economic segregation; rather it enforces the concentration of low-income residents to low-income neighbourhoods. Second, the results suggest that the owner segments in low-income neighbourhoods attract low-income earners rather than the middle-class in-movers. Third, only small changes in the share of movers are detected.

Who stays and who moves?

A population average model with a binary outcome variable (stay or move) is fitted to the data set containing all individuals aged 20-64 in Stockholm County for the periods 1990-2001 and 2002-2014. The model serves to analyse whether there are differences between who moves and who stays and whether this changed across the period studied. The models, run with a time period dummy interaction with the explanatory variables, are displayed in two columns. The first column for the first period and a second column displaying the interaction effects, i.e. the effects of the variables in the second period. Thus for high-income earners in the first period the estimates show a constant of 0.078 and estimated odds for moving of $-0.016 = 0.066$. For period two we add the period dummy estimates (-0.012) to the constant and the term for high income for the second period (-0.020) adding up to 0.046. Hence, the odds for moving for an average high-income earner is reduced.

Table 3. Change of the proportion (%) in-movers by tenure and income group to neighbourhood deciles (1st = lowest, 10th = highest) by share of above median income earners between 1990-1991 and 2012–2013.

Neighbourhood deciles	1st	2nd	3d	4th	5th	6th	7th	8th	9th	10th
High-income renters	−4.2	−6.9	−6.6	−5.4	−4.8	−5.6	−4.2	−4.8	−3.1	−3.8
Mid-income renters	−4.6	−2.5	0.5	2.9	3.6	5.2	3.1	3.1	1.2	2.5
Low-income renters	8.8	9.5	6.1	2.4	1.2	0.4	1.0	1.7	1.9	1.2
High-income co-op owners	−2.5	−3.5	−3.1	−1.6	1.5	1.0	6.2	4.2	5.3	5.9
Mid-income co-op owners	−2.0	2.1	5.8	7.6	6.7	6.3	3.0	4.5	2.3	0.7
Low-income co-op owners	4.6	1.4	−2.6	−6.0	−8.2	−7.3	−9.2	−8.7	−7.6	−6.6
High-income homeowners	−5.7	−3.2	−2.1	1.2	2.6	2.5	3.5	3.7	6.5	9.8
Mid-income homeowners	−4.1	5.7	9.1	9.5	6.2	5.1	1.2	3.0	2.6	−2.0
Low-income homeowners	9.9	−2.5	−7.0	−10.7	−8.9	−7.6	−4.8	−6.7	−9.2	−7.8

Source: PLACE database author's calculations.

When running the model (Table 4) only with income and housing tenure, it suggests that differences in the odds of moving between the income groups is stable, with a marginal increase. In the different tenures, we can see that residential mobility is more common in the rental segment followed by co-ops and homeownership. Interestingly, over time, only marginal changes in the likelihood of moving across the different housing tenures may be detected. There are very small changes with regard to who moves. This mirrors descriptive findings from Table 2.

In Table 4, other explanatory control variables show, as expected, a higher mobility among singles compared to other family types. Changing family status triggers mobility, however, the effect is less strong over time. Furthermore, the model shows lower odds of moving with higher age. The foreign background group seems to be similar to the Swedish background group in terms of the odds of moving, while the non-western foreign-born group has higher odds of moving and the effect of education level is similar over time. All estimates display stability over time.

Changes of residential mobility destinations

The next step in the analysis is to scrutinise the relation between housing tenure, income and residential sorting. Table 5 shows results from the MNL models with intra-urban movers. The primary aim here was to study the economic- and tenure-based sorting of movers and how this sorting has changed over time. In the descriptive data section, it was found that *high-income earners increasingly avoid low-income neighbourhoods* and that *low-income earners increasingly move to low-income areas*. The models confirm these findings.

The three main, and overarching, findings from these models depicting the development of residential sorting of Stockholm's movers are that (i) avoidance of low-income neighbourhoods is stronger among co-op owners relative to other tenures in the second period. The changing odds for co-op owners relative to renters is rather large. Co-op housing and homeownership is, relative to rental housing, more important for explaining moves to high-income neighbourhoods in the second period. Second (ii), growing gaps between income groups are detected. The avoidance among high-income earners of low-income neighbourhoods is strengthened across the time periods (odds reduced from −0.743 to −1.080), relative to low-income earners. There are also stronger relations between higher income levels and entering high-income neighbourhoods in the second period, even if these changes are much smaller. The difference between low- and medium-income levels displays the sorting across the income scale, and the difference increases between the time periods. Thirdly (iii), the neighbourhood

Table 4. Results from GEE, population average model. Estimating moving (1) or staying (0). Stockholm total population age 20-64. Two time periods 1990-2002 and 2002-2014.

		Stay/Move 1990–2002						Stay/Move 2002–2014					
		Model 1			Model 2			Model 1			Model 2		
		Coef.	S.E.	Sig.	Coef.	S.E.	Sig.	Coef.	S.E.	Sig.	Coef.	S.E.	Sig.
Income	High income (yes = 1)	−0.016	0.000	***	0.003	0.000	***	−0.020	0.000	***	0.000	0.000	
	Low income (yes = 1)	0.032	0.000	***	0.006	0.000	***	0.029	0.000	***	0.005	0.000	***
Housing	Co − op housing (Homeownership = ref.)	0.062	0.000	***	0.026	0.000	***	0.068	0.000	***	0.030	0.000	***
	Rental housing (Homeownership = ref.)	0.086	0.000	***	0.042	0.000	***	0.083	0.000	***	0.043	0.000	***
Neighbourhood type	Low-income neighbourhood (ref.)												
	Mid-income neighbourhood				−0.009	0.000	***				0.000	0.000	***
	High-income neighbourhood				−0.009	0.000	***				−0.007	0.000	***
Background	Non-western foreign-born (yes = 1)				0.005	0.000	***				0.007	0.000	***
	Foreign background (yes = 1)				−0.001	0.000	**				−0.002	0.000	***
Demographic variables	Gender (male = ref.)				0.006	0.000	***				0.002	0.000	***
	Age				−0.015	0.000	***				−0.012	0.000	***
	Age (sqr)				0.000	0.000	***				0.000	0.000	***
	High education (yes = 1)				0.005	0.000	***				0.005	0.000	***
	Low education (yes = 1)				−0.005	0.000	***				−0.004	0.000	***
	Single with child(ren) (single = ref.)				−0.035	0.000	***				−0.034	0.000	***
	Couple (single = ref.)				−0.027	0.000	***				−0.024	0.000	***
	Couple with child(ren) (single = ref.)				−0.035	0.000	***				−0.028	0.000	***
	Change family (yes = 1)				0.305	0.000	***				0.280	0.000	***
	Student allowance (yes = 1)				0.005	0.000	***				0.000	0.000	
	Social benefits (yes = 1)				0.025	0.000	***				0.023	0.000	***
	Not employed (yes = 1)				−0.011	0.000	***				−0.016	0.000	***
Time in neigbourhood	Year in neighbourhood				−0.002	0.000	***				−0.002	0.000	***
	Time period dummy							−0.012	0.000	***	−0.058	0.002	***
	Constant	0.078	0.000	***	0.482	0.001	***						
	N	2 162 596			2 162 596								
	Scale parameter	0.1044			0.0927								
	Wald chi2	372901			3550423								

Source: PLACE database author's calculation.

Table 5. Results from Multinomial logit model estimating mover's outcome. Mid-income neighbourohods (ref.), low-income neighbourhoods (1), high-income neighbourhoods (2). Intra-urban mobility only Stockholm total population age 20–64. Two time periods 1990–2002 and 2002–2014.

		1990–2002			2002–2014			1990–2002			2002–2014		
		Move to low-income neighbourhoods			Move to low-income neighbourhoods			Move to high-income neighbourhoods			Move to high-income neighbourhoods		
	Variables	Coef	S.E	Sig	Coef	S.E	Sig	Coef	S.E	Sig	Coef	S.E	Sig
Housing tenure	Co-op owner (rental housing = ref.)	−0.126	0.007	***	−0.360	0.006	***	0.415	0.007	***	0.449	0.006	***
	Homeownership housing (rental housing = ref.)	0.038	0.009	***	−0.014	0.008		0.011	0.009		0.162	0.008	***
Income	Mid income (low income = ref.)	−0.190	0.006	***	−0.366	0.006	***	0.072	0.008	***	0.126	0.007	***
	High income (low income = ref.)	−0.743	0.009	***	−1.080	0.009	***	0.606	0.009	***	0.689	0.008	***
Neighbourhood before move	Mid income n:hood before move (low income n:hood = ref.)	−0.957	0.006	***	−0.950	0.006	***	0.292	0.010	***	0.380	0.009	***
	High income n:hood before move (low income n:hood = ref.)	−1.260	0.012	***	−1.292	0.012	***	0.890	0.013	***	0.993	0.011	***
Ethnic background	Foreign background (yes = 1)	0.521	0.007	***	0.697	0.006	***	−0.176	0.009	***	−0.190	0.008	***
	Non-western immigrant (yes = 1)	0.712	0.009	***	0.572	0.007	***	−0.126	0.016	***	−0.088	0.011	***
Demographic variables	Gender (male = ref.)	0.152	0.005	***	0.182	0.005	***	−0.145	0.006	***	−0.116	0.005	***
	Age	−0.033	0.002	***	−0.042	0.002	***	0.130	0.002	***	0.105	0.002	***
	Age (sqr)	0.000	0.000	***	0.001	0.000	***	−0.002	0.000	***	−0.001	0.000	***
	Single with child(ren) (single = ref.)	0.064	0.009	***	0.131	0.008	***	−0.071	0.011	***	−0.034	0.009	***
	Couple (single = ref.)	−0.137	0.011	***	−0.055	0.010	***	0.438	0.011	***	0.374	0.010	***
	Couple with child(ren) (single = ref.)	−0.079	0.006	***	−0.036	0.006	***	0.437	0.007	***	0.419	0.006	***
	Change family (yes = 1)	0.158	0.006	***	0.175	0.005	***	−0.192	0.007	***	−0.214	0.006	***
Soico-economic characteristics	High education (yes = 1)	−0.280	0.007	***	−0.312	0.005	***	0.385	0.006	***	0.359	0.005	***

(*continued*)

Table 5. Continued.

		1990–2002			2002–2014			1990–2002			2002–2014		
		Move to low-income neighbourhoods			Move to low-income neighbourhoods			Move to high-income neighbourhoods			Move to high-income neighbourhoods		
	Variables	Coef	S.E	Sig	Coef	S.E	Sig	Coef	S.E	Sig	Coef	S.E	Sig
	Low education (yes = 1)	0.251	0.007	***	0.239	0.007	***	−0.290	0.010	***	−0.227	0.011	***
	Student allowance (yes = 1)	0.031	0.007	***	0.136	0.007	***	−0.092	0.010	***	−0.163	0.009	***
	Social benefits (yes = 1)	0.529	0.007	***	0.586	0.009	***	−0.702	0.016	***	−0.602	0.022	***
	Not employed (yes = 1)	0.085	0.007	***	0.039	0.007	***	0.122	0.010	***	0.081	0.009	***
Years in neighbourhood	Year in neighbourhood	−0.007	0.001	***	−0.020	0.001	***	0.025	0.001	***	−0.008	0.001	***
Metropolitan level controls	Share rental housing (Year)	−5.019	0.197	***	−7.097	0.099	***	−2.963	0.222	***	−7.253	0.102	***
Period	Period dummy (2002 − 2014 = 1)				0.714	0.100	***				1.515	0.114	***
	Constant	1.850	0.089	***				−3.547	0.103	***			
	N	2 934 228											
	Wald chi2	524 582.58											
	Pseudo R2	0.1454											

Notes: Sig
< .001 = ***, <.01 = **, <.05 = *.
Source: PLACE database, author's calculation.

type individuals move from only changes low-income neighbourhood avoidance marginally. However, living in high- and mid-income neighbourhoods is an increasingly strong predictor of entering high-income neighbourhoods.

The demographic variables show expected results. Singles (and singles with children) are more likely than other family types to move towards low-income neighbourhoods, as are younger people and those with changing family status. It is worth noting that singles with children are more likely to move to low-income neighbourhoods in the latter period compared to singles. The difference between family types is generally reduced between the periods. Higher age is less strong a predictor for mobility to high-income areas in the latter period. Socioeconomic controls variables including employment status, education level and social benefits show expected results, with some changes to the magnitude of the coefficients. As a final note to the findings of changes in sorting of movers in Stockholm, the relation between non-western migrants and sorting into low-income neighbourhoods declines between the time periods when controlling for socioeconomic factors.

The main and overarching conclusion from the models presented in Table 5 is that the Stockholm housing market contributes to the process of economic segregation through the geographical, socioeconomic and tenure based stratification of residential mobility outcomes.

Robustness checks

The multinomial logit model used for analysing mobility outcomes has also been run with a relaxed criterion for the neighbourhood definition. This is to see if results are robust even if the operationalisation of neighbourhood is altered somewhat.[7] Here, 1/2 standard deviation (instead of 1 S.D.) above the mean share of people among the closest 400 neighbours with above median disposable income are categorised as high-income neighbourhoods. Respectively, 1/2 S.D. below the mean share are categorised as low-income neighbourhoods. There are differences and nuances adding to the picture of residential sorting by income and tenure but, generally, the models show stability of the increased economic sorting. For instance, the model shows that low-income earners are likely to enter a low-income neighbourhood after a move while they are less likely to enter higher-income areas. However, the coefficients are generally lower across all income levels and housing tenures, indicating a weaker sorting when high- and low-income neighbourhood are less strictly defined. The relaxed neighbourhood model still shows the increased avoidance of low-income areas by co-op owners and by movers leaving mid- and high-income

neighbourhoods. A less strong differentiation in the upper part of the neighbourhood scale is detected when compared to the models in the empirical section.

The robustness check shows that even when defining larger parts of Stockholm as low- or high-income neighbourhoods, the economic sorting is growing. This indicates that sorting goes beyond housing tenure segmentation, displaying the stronger large-scale economic sorting in Stockholm over time.

Discussion and conclusions

This paper has explored the relationship between housing tenure, income and residential mobility on the one hand, and mobility outcomes on the other. The paper covers the periods 1990–2001 and 2002–2014, between which Stockholm has seen increasing income inequality (mainly during the first period), dramatic changes to the tenure composition of the housing stock (mainly during the second period) and growing economic segregation (Andersson & Kährik, 2016; Scarpa, 2016). In the introduction, the first of four hypotheses stated that *who moves is increasingly positively correlated with income*. The findings include little support for any larger socioeconomically based shifts in *who* moves. The share of movers across tenures and income groups are stable. The findings indicate a marginally closing housing tenure gap between renters' and co-op owners' odds of moving. This shows that people need to move, and do move within the city regardless of housing policy context.

When turning to the analysis of residential sorting of movers, findings include that low-income earners make up an increasing share of Stockholm's renters. The low-income group also makes up a larger share of those who buy into the co-op and homeownership segments of the housing market in low-income neighbourhoods. Mid- and high-income earners end up in mid- and high-income areas respectively. The second hypothesis stated that *income is a stronger determinant of what type of neighbourhood people move to*. The findings in the paper support the second hypothesis. The paper further confirms that income and demographic factors are important determinants for mobility outcomes (see also Hedman et al., 2011). The groups shown to be most severely affected by the 1990s crisis and economic restructuring – single parents, younger people and those with foreign background (Bergmark & Fritzell, 2007) – are increasingly likely to move towards or within low-income neighbourhoods. The development displayed in the empirical section shows that, in the second period, these groups are even further away from being able to enter neighbourhoods other than the poorest ones.

The findings confirm the arguments put forward by Andersson and Magnusson Turner (2014) that, when the rental markets shrink, low-income people need to seek rental housing where rents are fairly low or buy into the owner segments where it is affordable. Low-cost rental housing may be found across the city, as the rent-negotiation scheme applies to the whole rental sector in Sweden, while low-cost co-ops or homeownership housing are more concentrated in low-income neighbourhoods. The third hypothesis stating the expectation that *income is more strongly correlated with the socio-economic composition of destination neighbourhood in the market-based housing sector compared to the rental sector*, is confirmed.

The most striking finding regarding sorting of movers related to the neighbourhood type that households leave is that movers leaving mid- and high-income neighbourhoods are increasingly likely over time to end up in higher income neighbourhoods. Hence, this is in line with findings showing that high-income clustering is an important process, and in this paper, it is shown that the neighbourhood a household leaves is important for this process.

The data shown in this paper confirm the fourth and last hypothesis: *housing tenure status before a move is increasingly important for the possibility to acquire housing in attractive locations,* even if the move towards low-income neighbourhoods are more affected by where the housing unit is located before the move. The renter-owner gap increases for neighbourhood attainment but income and location of the dwelling before the move are important. Co-ops and homeownership housing in low-income suburbia do not attract mid- and high-income earners. Instead, in-movers to these segments of the housing stock are, over time, more often low-income earners.

Privatisation of the housing market does not produce lower levels of segregation; rather, it enforces the process of economic sorting through the link between income levels and housing outcomes, as the comparison between the periods show. This seems to be a process driven mainly by avoidance of low-income neighbourhoods by those who have higher income levels, or those who have housing assets that enable them to move into more desirable neighbourhoods. In conclusion, I argue that an expected outcome in housing markets experiencing a loss of affordable rental options is that residential mobility frequencies can be rather stable, however, the economic sorting of movers becomes stronger. This sorting of movers is not as strong in the rental segment of the housing stock, but the likelihood of renters entering higher income neighbourhoods is reduced by the shrinking shares of rental housing in these types of neighbourhoods.

For the purposes of achieving mixed neighbourhood populations, at least, three insights warrant a policy response if economic segregation is on

the agenda. First, owned housing in low-income neighbourhoods does not attract the middle class. This runs contrary to many political suggestions on policies to reduce economic segregation (e.g. Edholm 2005). There is limited possibility for tenure mix to reduce economic segregation if it is implemented only in rental-dominated neighbourhoods.

Secondly, since the 1990s, there has been an almost constant rise in prices for dwellings. Under such circumstances, owning a co-op is beneficial for the possibility to move towards more economically favoured neighbourhoods. The benefits of owning are progressively skewed towards those with higher income and for those who have managed to secure housing assets in locations gaining from the geographically uneven distribution of price increase and private capital accumulation in housing. Thus, increased shares of low-income earners in owned housing do not necessarily have the potential to reduce segregation. Entrance to co-ops depends on income, or other monetary resources; consequently, choice is restricted for those groups lacking these resources. The co-op sector is most likely to be hit when prices fall, and hit hardest in the least attractive locations. This could severely affect the possibility for low-income co-op owners to relocate if they need to when prices fall. As a third policy relevant observation, though there are mediating factors, it can be argued that income is a primary determinant for residential mobility outcomes and that marketisation of the housing stock enforces the link between income levels and mobility outcomes. Therefore does the lower effect of income on mobility destinations within the rental segment suggest that (rent-controlled) rental housing, dispersed across the city, is fruitful as a policy tool to tackle economic segregation. This could effectively extend the choice of where to live to those with lower income levels and those lacking accumulated housing wealth.

Notes

1. Sweden has no unregulated rental sector; all rents are subjected to collective negotiations between the Swedish union of tenants and housing companies, and there are no other rules for allocation of rental housing except queuing time – at least not in municipality-owned rental housing. Alterations to the collective negotiations of rent levels were introduced in 2010, limited to new construction. This rent setting was introduced to increase the production and profitability of new rental homes. In Stockholm, about 30 percent (3000 units) of newly constructed rental housing was subjected to these *presumtionshyror* since 2010. Also, since 2010, large-scale renovations started of the rental housing stock, mostly built in the 1960s and 1970s, after many years of underinvestment. In many cases this has led to dramatically increased rents pushing low-income households out from these areas of renovation.
2. Tenant-owned cooperative (co-op) housing is a tenure that shares similarities with other types of owned dwellings in multi-family housing. However, in a co-op, the association of tenants owns the building(s) and often the land it sits on. Access to the association of tenants is based on a decision by the elected board, but after the purchase of one of the cooperative's apartments. The tenant does not own the actual apartment but rather the right to live in it; this right can be traded on the open market. Further, the tenants are responsible for indoor maintenance, and the association together is responsible for

outdoor maintenance and the property as a whole. (Further reading: Co-operative Housing International (http://www.housinginternational.coop/co-ops/sweden.)

3. In the empirical part of this paper, no distinction is made between private rental housing companies and publicly owned rental companies. However, public rental companies are owned by municipalities and have been used to make sure that enough housing is available in the municipality. Furthermore, the rent levels negotiated between the Swedish union of tenants and public rental housing companies have been the norm and also apply to private property owners. The latter are now also part of the negotiations with the union of tenants. Many of the most deprived areas of Sweden's cities have a substantial share of housing within the public rental sector.
4. Transaction cost (i.e. cost associated with residential relocation) includes notary fees, taxation and moving costs. Calculations by the Swedish Board of Housing and Planning show that these costs amount to 17 percent for homeownership and 10 percent for co-ops, which is much higher than the OECD average of 6 percent. (See Boverket 2014 and Sánchez & Andrews, 2011.)
5. Svensk mäklarstatistik [Swedish real estate statistics, https://www.maklarstatistik.se] gathers information from real estate agents on property sales monthly. The data are gathered and produced by Statistics Sweden.
6. The logistic population average model:

   $Pr(y_{ij} = 1\ x_{ij}) = a + \quad \beta 1_{ij} * period + \ \beta 2_{ij} * period + ,,, \beta n_{ij} * period + period$

   Where the probability of y (=1 to move) for the group x (e.g. co-op owners) is a function of the intercept (a) and coefficents for explanatory variables, the coefficent slopes for the two periods are obtained through the time period dummy interaction with each explanatory variable.

   And the multinomial logistic regression-model:

   $ln\frac{Pr(Y_i=1)}{Pr(Y_i=K)} = \ \beta_0 + \beta_1 \beta x_1 * period + ,,,, \quad \beta_k \beta x_k * period + period$

   $ln\frac{Pr(Y_i=2)}{Pr(Y_i=K)} = \ \beta_0 + \beta_1 \beta x_1 * period + ,,,, \quad \beta_k \beta x_k * period + period$

   The probability that Y = 1 rather than the reference outcome (K) is a function of the intercept (represented by β_0) and the interaction of all other variables($\beta_k * period$) provides slopes for e.g. low-income in both time periods and the period dummy variables provides an estimation of the intercept difference between the time periods. Outputs from model runs may be provided upon request to the author.
7. Model tables are available upon request to the author.

Acknowledgements

I am grateful for comments and suggestions on earlier drafts of this paper from the anonymous referees and from colleagues at the Department of Social and Economic Geography at Uppsala University.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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