

# Using Sequence Analysis to study Housing tenure trajectories

Ida Borg





Department of Human Geography

Stockholm University




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# Socio-spatial stratification of housing tenure trajectories in Sweden – A longitudinal cohort study

Ida Borg  , Juta Kawalerowicz , Eva K. Andersson 

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<https://doi.org/10.1016/j.alcr.2022.100467>

<https://www.sciencedirect.com/science/article/pii/S1040260822000077>

# Tenure types

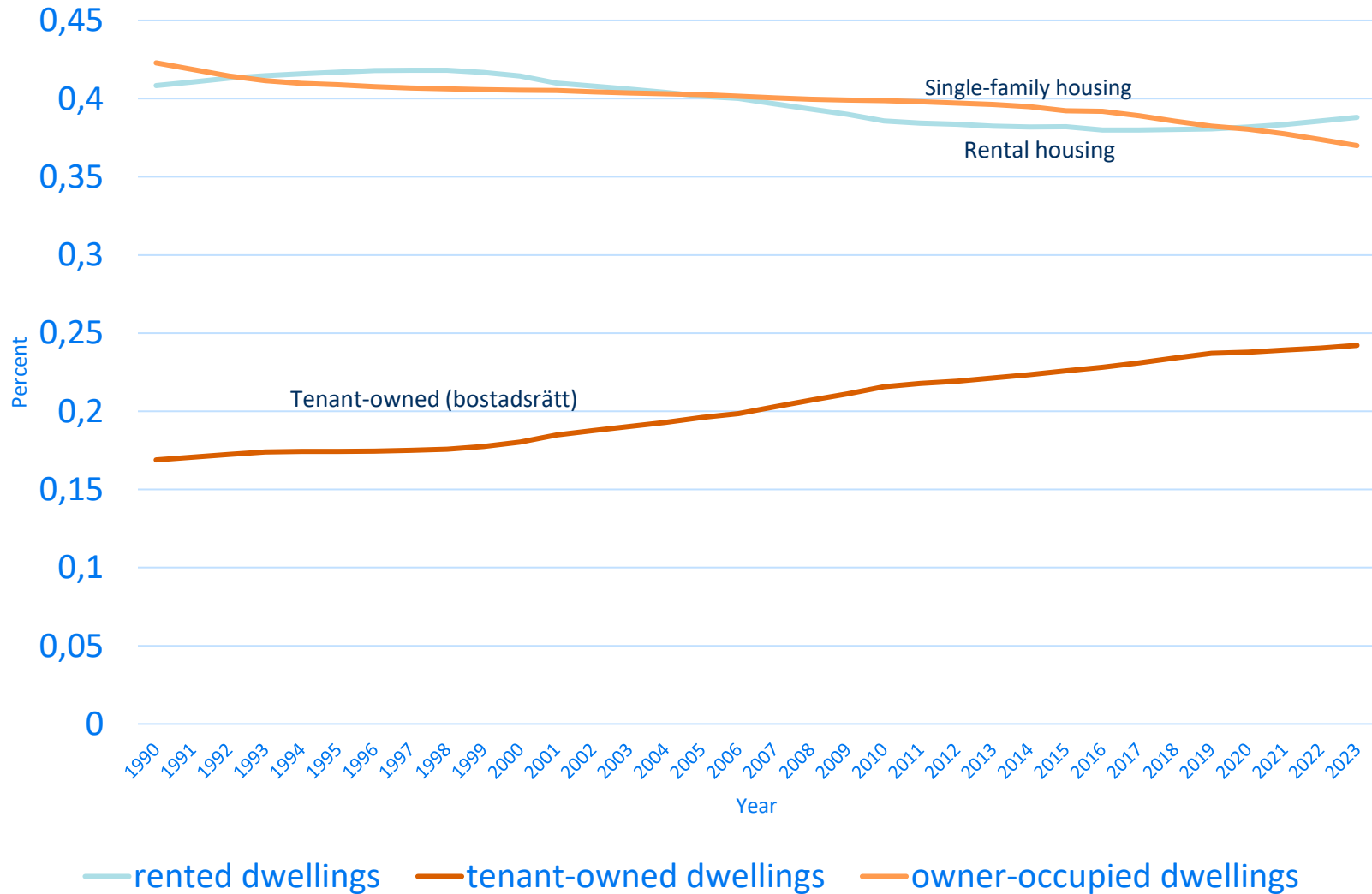


- Owner-occupied housing (single-family housing)
- Tenant-ownership/cooperative (multifamily dwelling) (*bostadsrätt*)
- Rental housing a) public rental housing  
b) Private rental housing

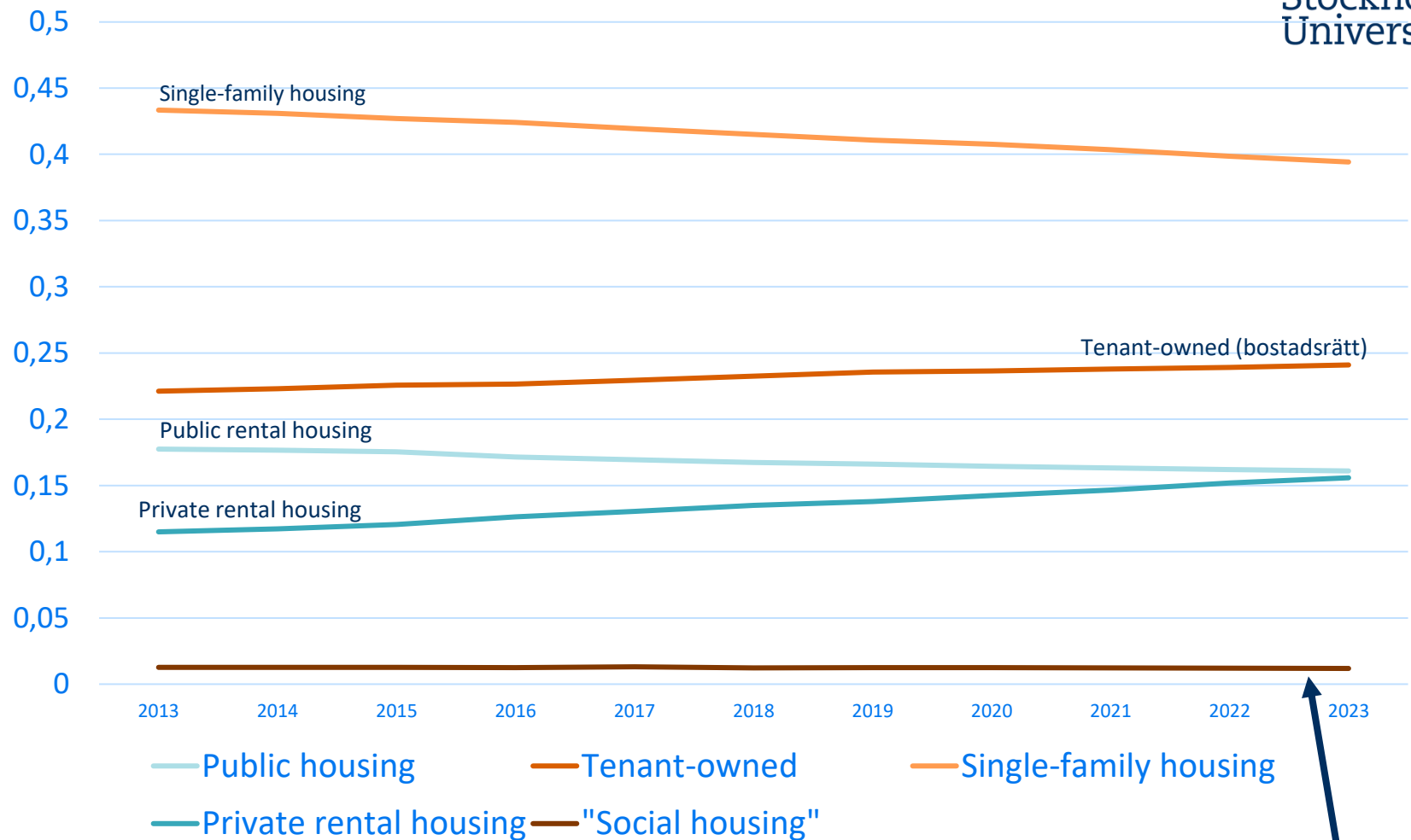


- Emerging tenure type: owner-occupied flats in multifamily dwellings (since 2009, very few)
- Sweden lacks a social housing sector

# Tenure types 1990-2023



# Tenure types 2013-2023



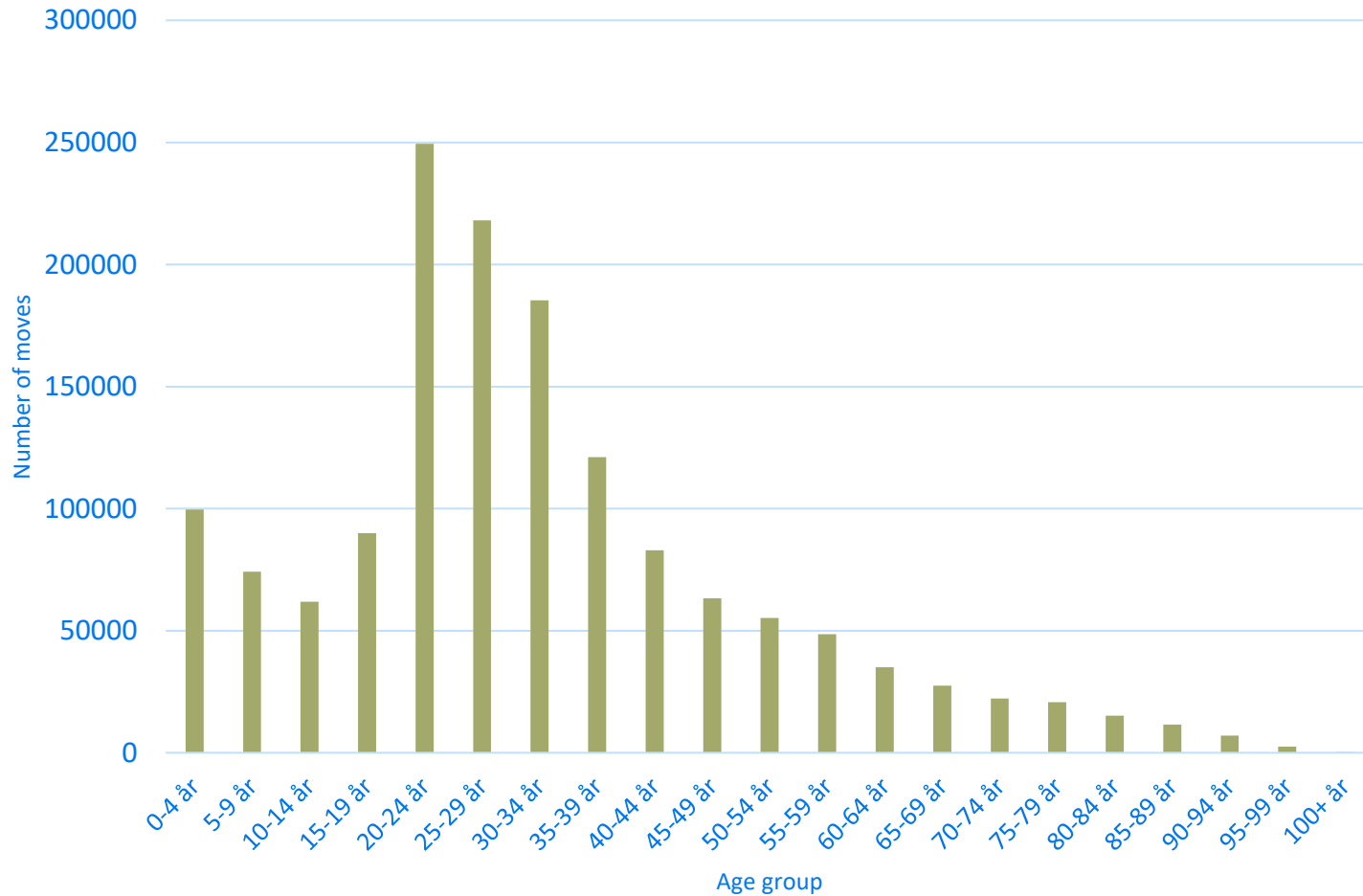
"Social housing" in Sweden  
(means-tested housing owned  
by the local authorities  
(the municipal))

# Short short background to our study



Stockholm  
University

Number of moves in Sweden according to age group, 2023



# Aim and questions

- Aim:

To describe and understand individuals' tenure trajectories over the life course.

- Questions:

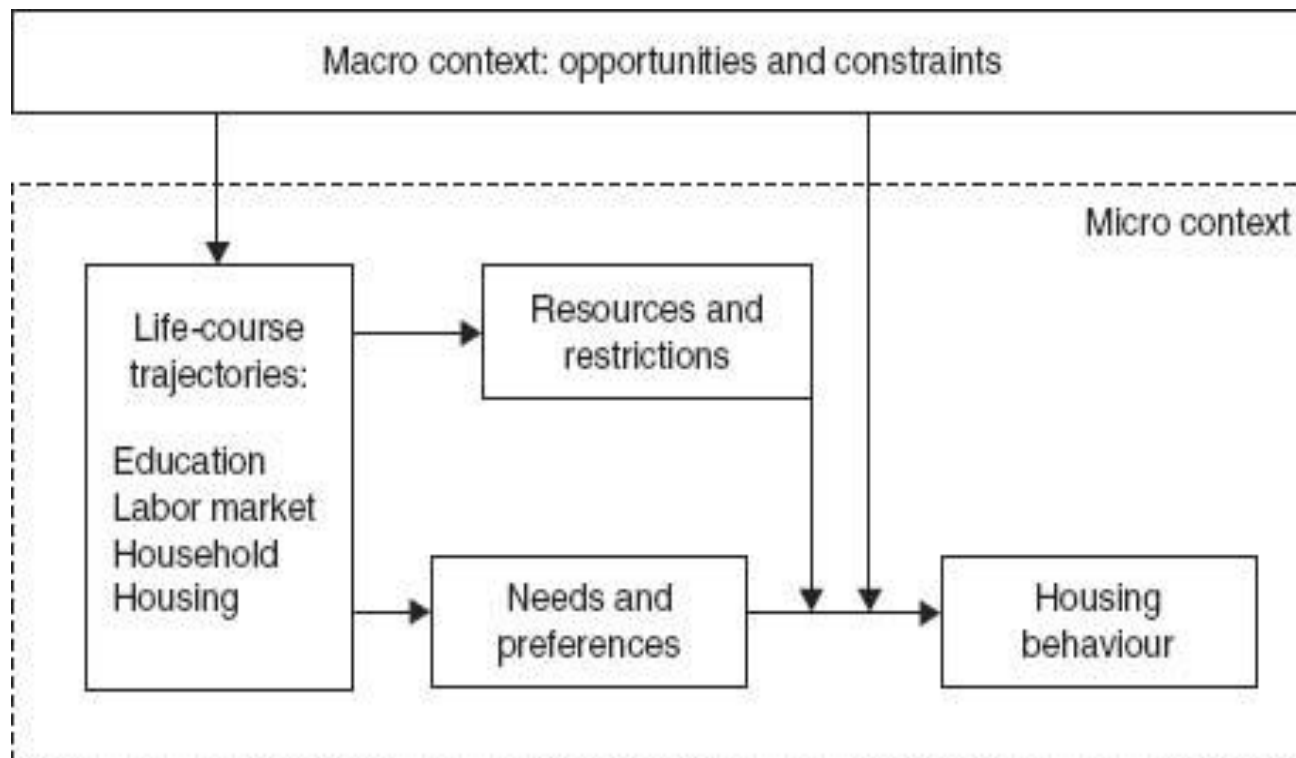
1. Which tenure trajectories do individuals tend to follow in Sweden during their most mobile years?
2. How can we understand and explain these trajectories?

## Previous research

- We know a lot about mobility, but this mobility tends to be focused on **one move**/single event. For instance, there is a large literature on entering the home-owning sector for various groups. Or the move out of the parental home.
- There is a need to understand tenure trajectories over the life course **in Sweden in particular**. A great deal of research on housing tenure trajectories has this longitudinal view, but this research is mainly done in countries such as the UK, USA and Australia. These countries have the same type of housing system, with a great reliance on home ownership. Adding Sweden here is needed to broaden how tenure trajectories might look in countries with other systems.



# Theoretical framework – socio-spatial life course



Source: based on (Mulder & Hooimeijer, 1999). Figure from:  
van Ham, M. (2012). Housing Behaviour. In The SAGE Handbook of Housing Studies (pp. 47–65).  
<https://doi.org/10.4135/9781446247570>

# Data and method I

Our sample from register data:

- We followed individuals born between 1970-1977 in Sweden between the years 1995-2016, individuals were between 18-25 in 1995 and we followed them up until they were between 39-46 years (in 2016).
- They were in our sample if they moved from parental home between the years 1995-1996 (i.e. changed position in variable familjeställning from child in household to something else, we also double-checked with the change of coordinates)
- 1. They were 105,237
- 2. They should have complete housing data between 1996-2016:  
45,785

# Data and method II

- Sequence analysis (using TraMineR)
- Multinomial regression analysis
  
- Tenure types we follow:
  1. Home-ownership (single family home)
  2. Tenant-ownership (BRF)
  3. Public rental
  4. Private rental
  5. Other rental

Rank	Sequence pattern
1	11111111111111111111
2	22222222222222222222
3	33333333333333333333
4	44444444444444444444
5	44111111111111111111
6	44411111111111111111
7	21111111111111111111
8	41111111111111111111
9	44441111111111111111
10	22111111111111111111

# Multinomial regression analysis

Variable	Description	Proportion/descriptive
<i>Socio-economic factors</i> <del>Parental post sec. education: None (ref), One, Two</del>	If parents in 1994 had education higher than gymnasium	One parent: 23% Both parents: 13.8%
Foreign background	Being born abroad or born in Sweden to two foreign born parents.	Native 92.2% Foreign: 7.9%
<del>Income tercile (Ref=Low): Middle or High</del>	Based on individual's disposable income in 1995	Low income: 31.7%
<i>Demographic factors</i> <del>Sex (ref=female)</del>	Whether individual is male or female	Male: 50.5% Female: 49.5%
Sibling count	Based on who were the parents in 1994, full siblings count for 1, half siblings for 0.5	Mean: 1.6, Std: 1.06
Children	Whether individual was a parent in 1995	Children: 3.2 %
Family type: Married (ref), Cohabiting, Single	Type of union: married, cohabiting or single, year 1995. (note: Cohabiting includes couples with children only, other cohabiters are not registered)	Married: 1.8% Cohabiting: 2.4% Single: 95.8%
<i>Spatial factors</i> <del>Tenure majority: Home owner (ref), Tenant-owner, Public rent, Private rent</del>	Overrepresented tenure type in individuals' municipality in 1995 (note: Other rent is not dominant or characteristic type for any municipality)	HO: 32.6 % TO: 17.3 % PuR: 29.7% PrR: 20.4%
House prices	Price for houses in 1995 in the individual's municipality, thousand SEK	Mean: 758 Std: 299
Municipality: Large cities, Metropolitan areas, Suburbs to metropolitan areas, Middle-sized towns, Other large, Other small, Rural, Sparsely populated, Industrial.	Classification of municipality where individual was resident in 1995. Classification of municipalities from Swedish Association of Local Authorities and Regions. We used the classification from year 1993, as this was the closest in time to 1994/1995, and classifications are not done yearly.	Large cities: 35% Metropolitan areas: 22.6% Suburbs to metropolitan: 10% Middle-sized towns: 12.2% Other large: 5.5% Other small: 2.9% Rural: 2.9% Sparsely populated: 2.7% Industrial: 6.2%

# Sequence analysis I

- To find the most typical trajectories
- Matrix of pairwise dissimilarity that describe to what extent each sequence resembles all other sequences in the dataset.

ID	Year 1	Year 2	Year 3	Year 4
1	Home-owner	Home-owner	Home-owner	Home-owner
2	Tenant-owner	Tenant-owner	Home-owner	Home-owner
3	Public rental	Public rental	Public rental	Public rental

# Sequence analysis II- optimal matching

- Several methods to analyse the matrix, we use optimal matching (OM)
- OM is a method that calculates the least costly way to transform one sequence into another
- Two types of “costs” are used to calculate whether some transitions to specific tenure types are more costly than others (not in a monetary way).
- We use the default option, but could be discussed whether there is a bigger transition from public rental to home-ownership for example, than between tenant-ownership and home-ownership.

ID	Year 1	Year 2	Year 3	Year 4
1 (seq 1)	Home-owner	Home-owner	Home-owner	Home-owner
2 (seq 2)	Tenant-owner	Tenant-owner	Home-owner	Home-owner
3 (seq 3)	Public rental	Public rental	Public rental	Public rental
4 (seq 4)	Public rental	Public rental	Tenant-owner	Tenant-owner
5 (seq 5)	Public rental	Public rental	Home-owner	Home-owner
6 (seq 6)	Tenant-owner	Tenant-owner	Tenant-owner	Home-owner

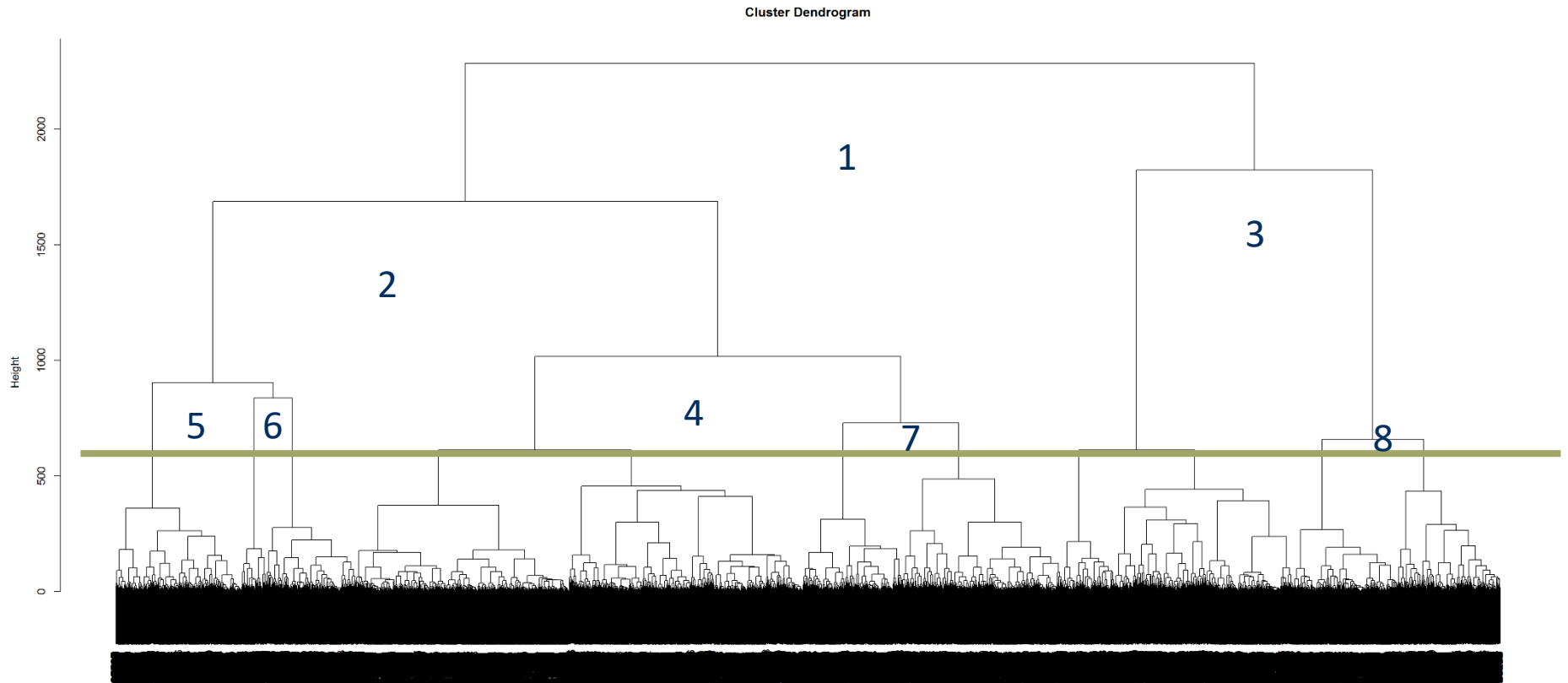


# Sequence analysis III – cluster analysis

- Sequence analysis is often paired with cluster analysis in order to create groupings of sequences for easier interpretation
- Several methods of cluster analysis, we used PAM (Partitioning Around the Medoids) and Ward's hierarchical cluster algorithm, following previous research
- For deciding the number of clusters appropriate, we evaluated ASW (Average Silhouette Width) which measures the quality of different options for the number of clusters.

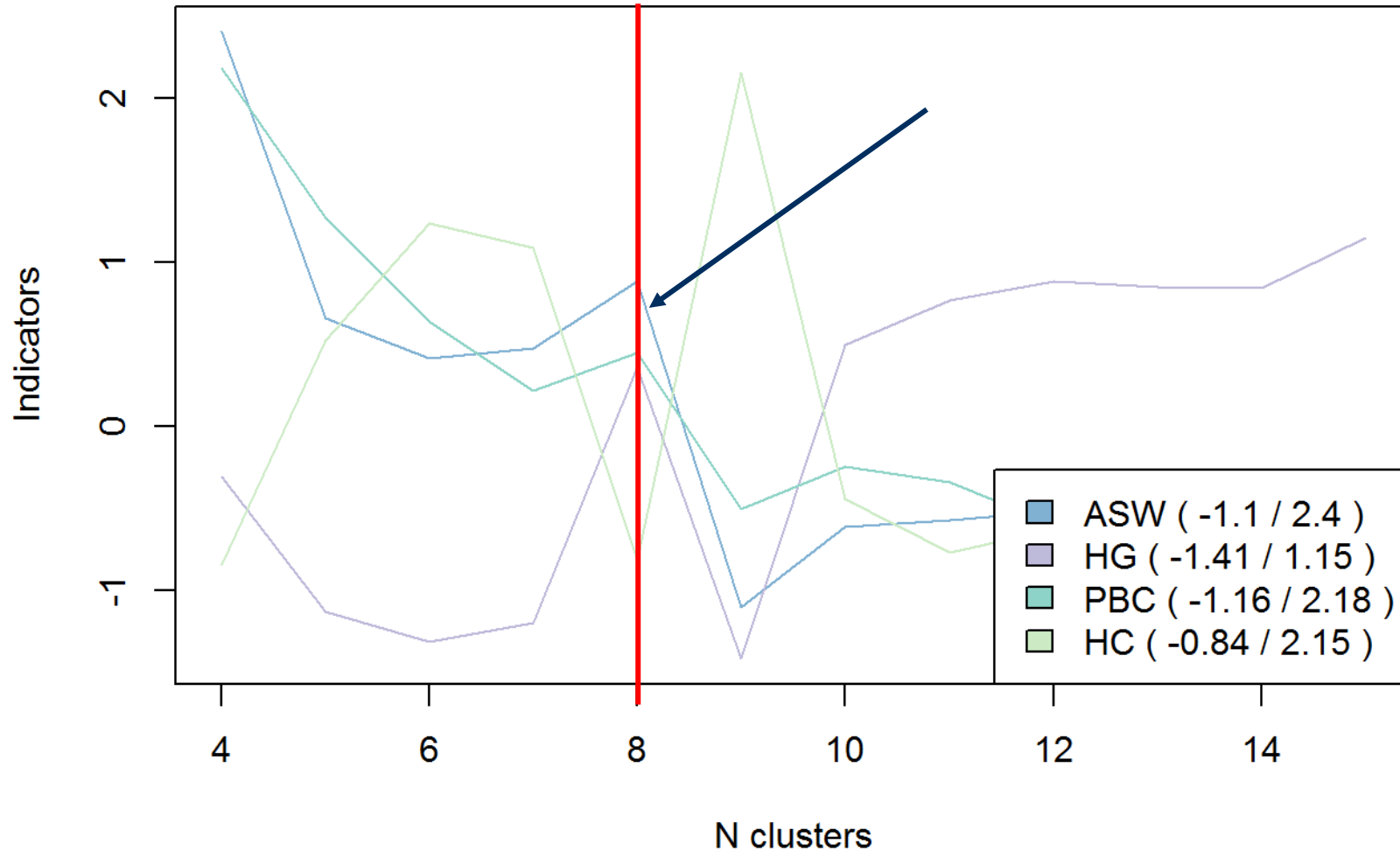


# Dendrogram (hierarchial cluster analysis)



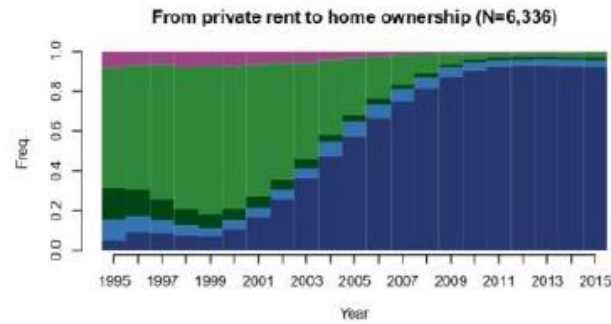
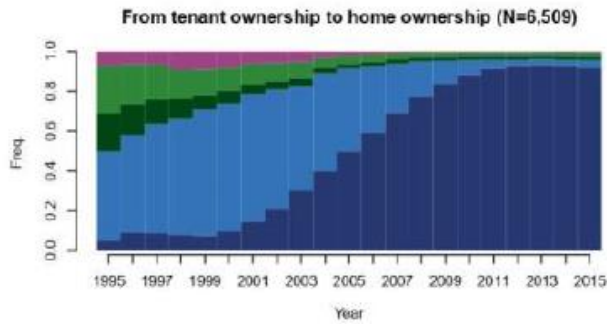
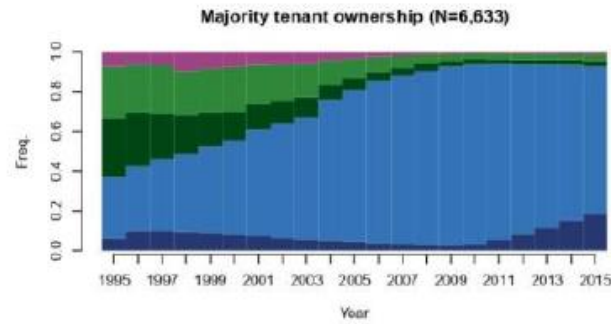
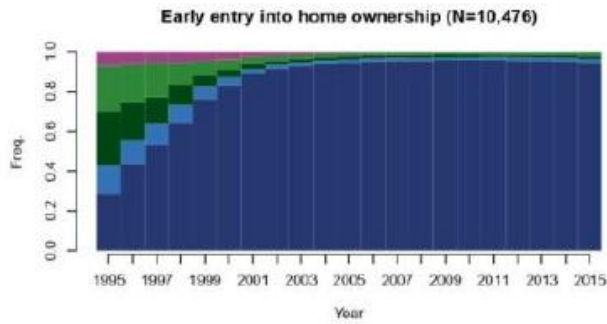
```
as.dist(data_om)  
hclust(*, "ward.D2")
```

# Quality of partitioning

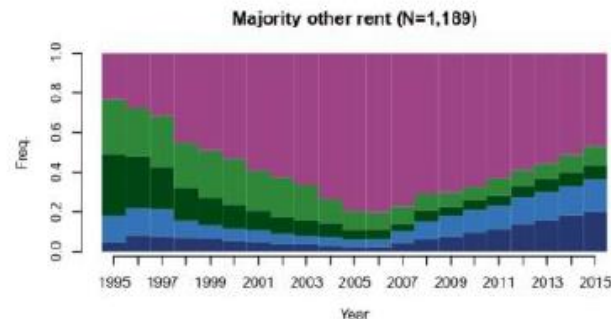
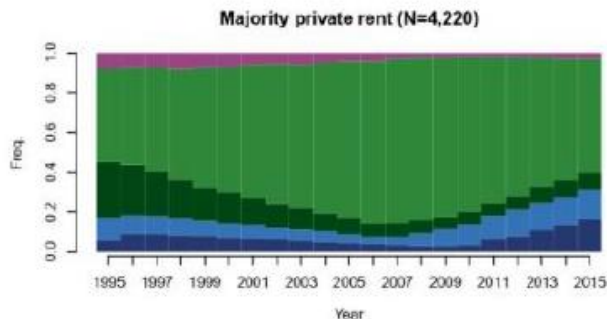
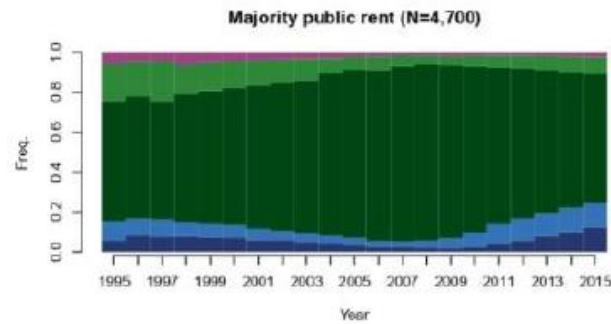
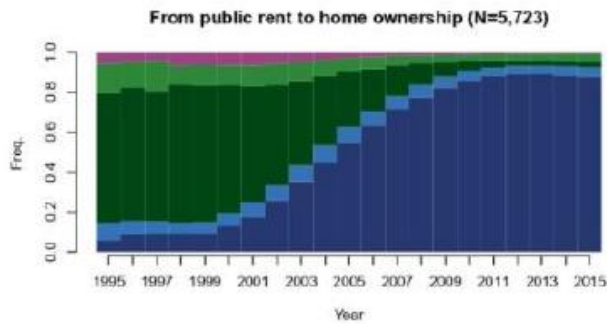


# State distribution figures

We arrived at 8 clusters!



- Home owner
- Tenant owner
- Public rent
- Private rent
- Other



## We categorized the clusters into THREE different types of trajectories:

- **Renting trajectories:**

Public housing trajectory

Predominantly private landlords' trajectory

Other types of landlords

- **Owning trajectories**

Early entry to home-ownership after a short period in the rental sector

Tenant-owner after a short initial period in the rental sector

- **Transition trajectories (most common)**

Initial period in public rental and then into home-ownership

The initial period in private rental and then into home-ownership

Initial period in tenant ownership and then into home ownership

# Rental trajectories

- **Socio-economic factors**

- low income

- both parents secondary education= other landlords (Lund and Gothenburg)

- foreign background

- **Demographic factors**

- number of siblings

- parent early (18-25 år) (Privat eller allmännytta)

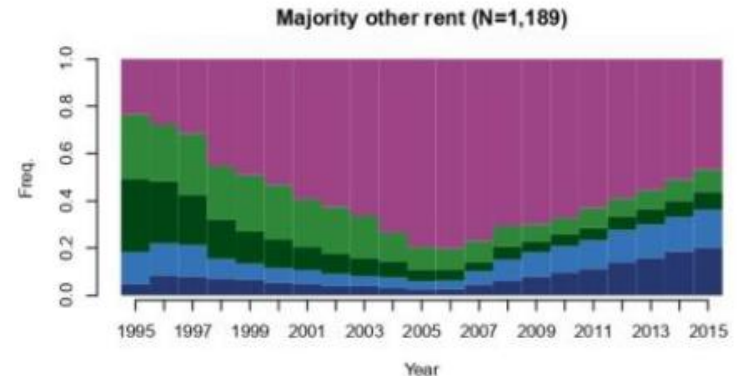
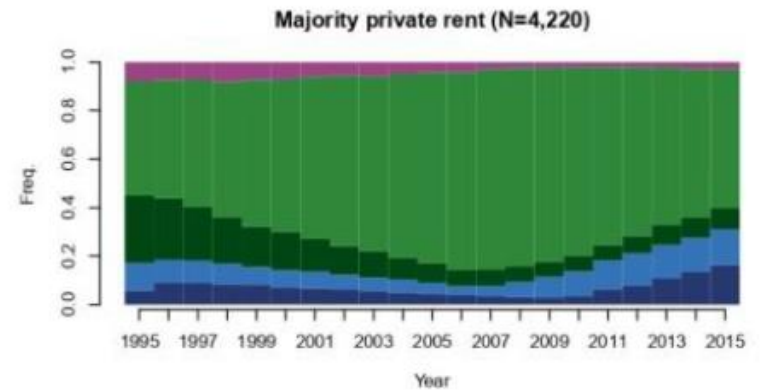
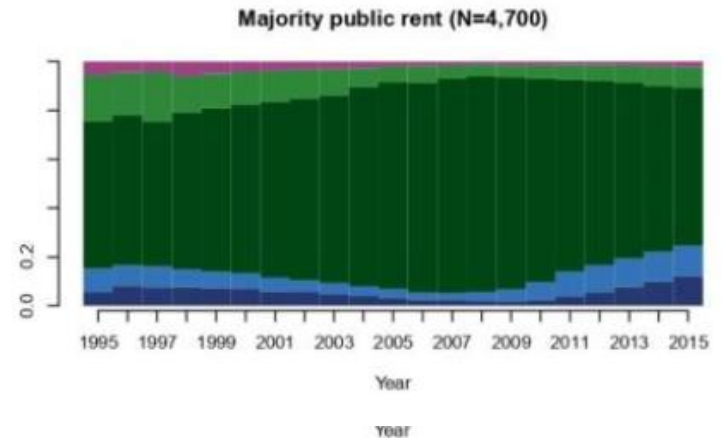
- Single

- **Spatial factors**

- metropolitan cities

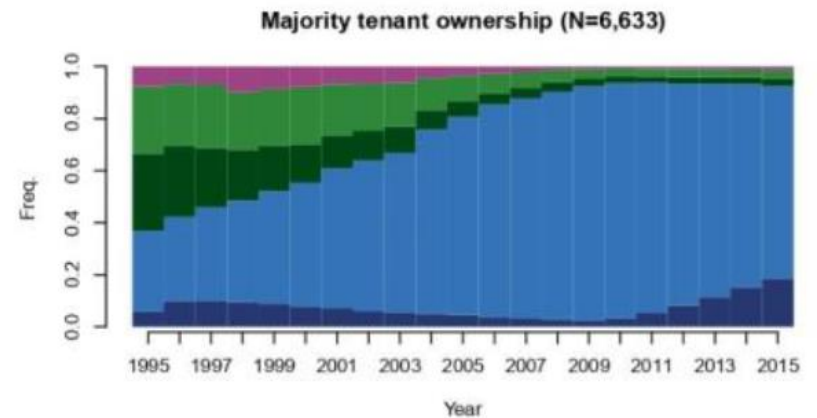
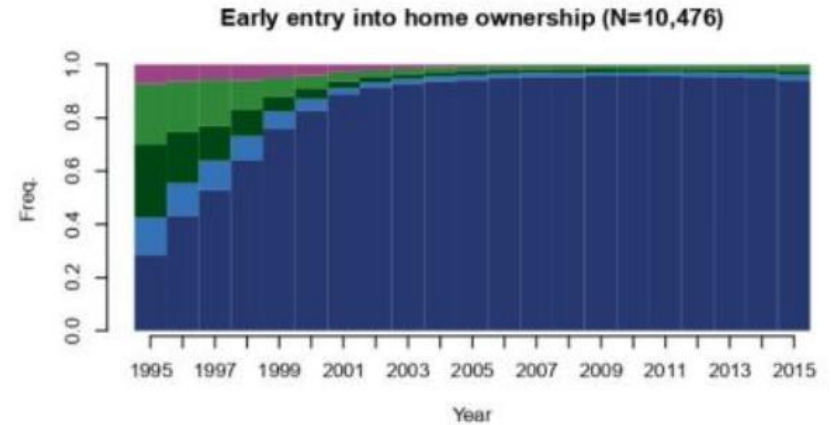
- public rental: suburbs

- over-representation of public rent in 1995 – two times more likely to follow public rent trajectory



# Owning trajectories

- **Socio-economic factors**
    - high incomes
    - parental high education
  - **Demographic factors**
    - men more likely to enter tenant-owned trajectories
    - single more likely to enter tenant-ownership
  - **Spatial factors**
    - metropolitan
- Overrepresentation of tenant ownership in 1995



- Home owner
- Tenant owner
- Public rent
- Private rent
- Other

# Transition trajectories

- **Socio-economic factors**

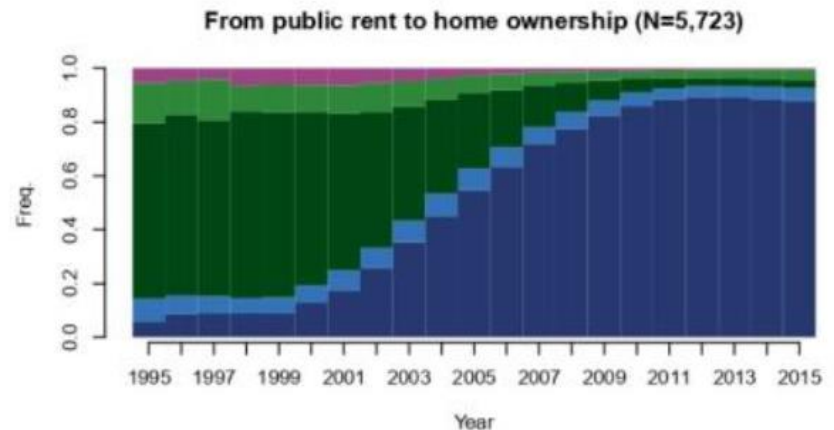
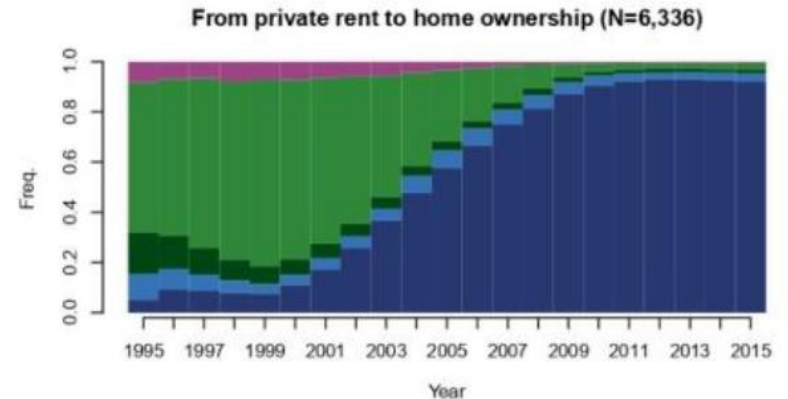
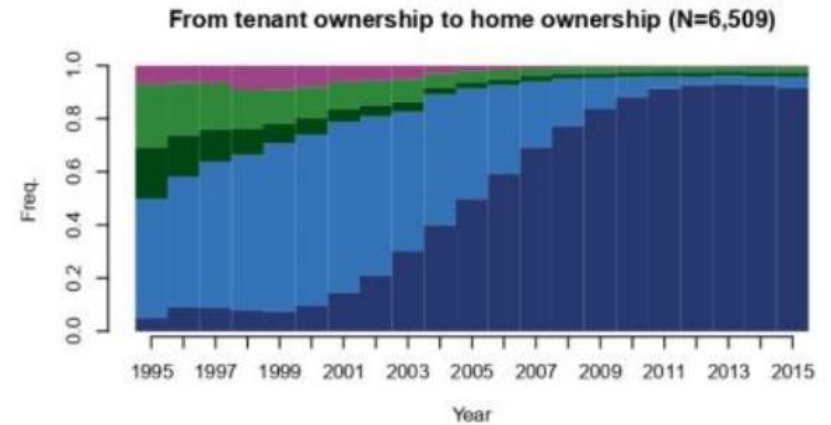
- high education among parents (the first two)
- high income

- **Demographic factors**

- foreign background – more likely to enter these trajectories than early entry into home-ownership
- cohabiting with children, start in the first one

- **Spatial factors**

- first and third: metropolitan areas



# Conclusions

- Stability in tenures (not necessarily immobility)
- Stable and long ***rental trajectories***, not found in previous research on the UK, the US and Australia.
- Socio-economic factors are important for getting into the trajectories ending up in or starting with ownership. But also spatial factors are important for the type of trajectory.



# Discussion

- Background matters for entering owner-occupied housing. Where you live and your socioeconomic position will influence your future possibilities in the housing market.
- Housing is increasingly becoming an asset, and not just a place where you live. Is Sweden turning towards an asset-based welfare state? Due to unequal access to owner-occupied, will some groups fall behind?
- Tenure neutrality? Both in terms of individual's beliefs about "investing" in housing, and governmental support towards owner-occupied

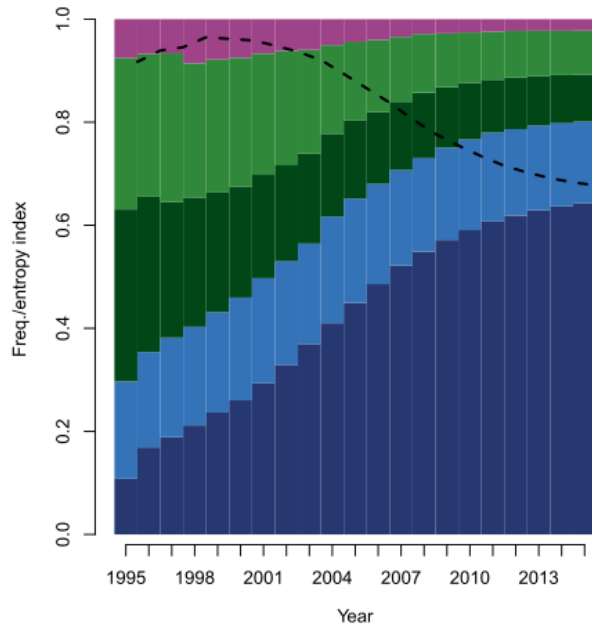
**Thank you for your attention!**

**Questions?**

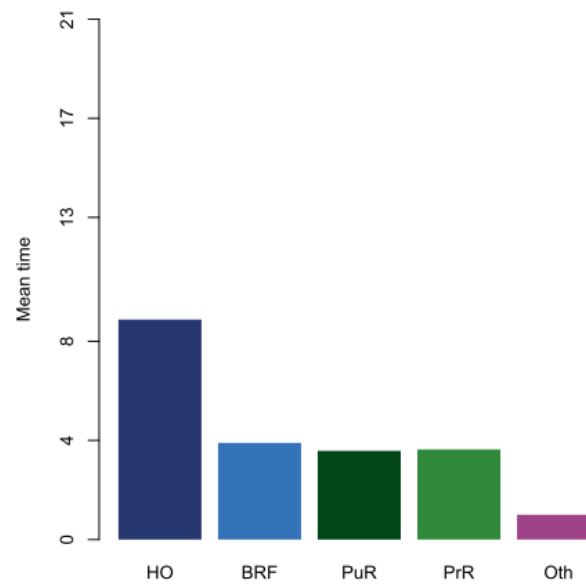
Link to the article:

<https://www.sciencedirect.com/science/article/pii/S1040260822000077>

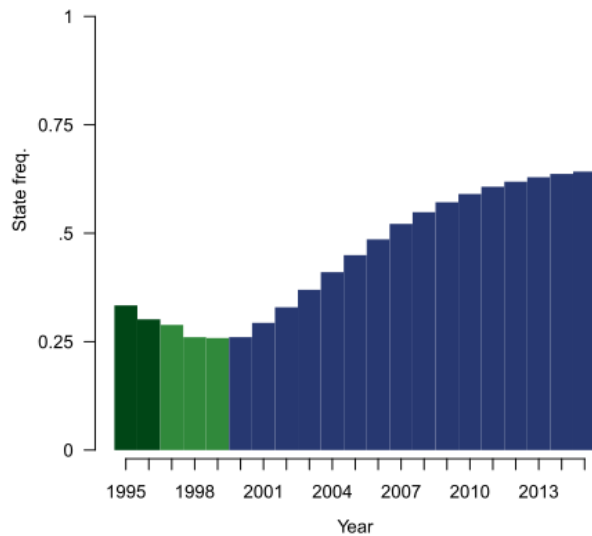
a) states distribution and entropy



b) mean time

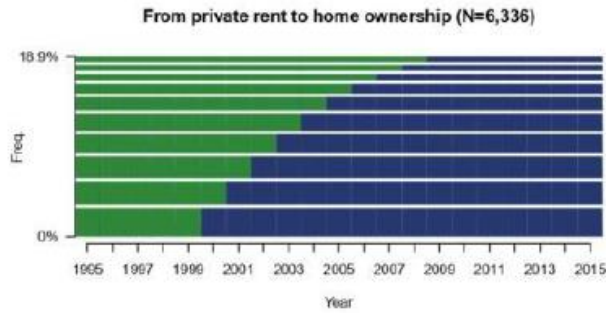
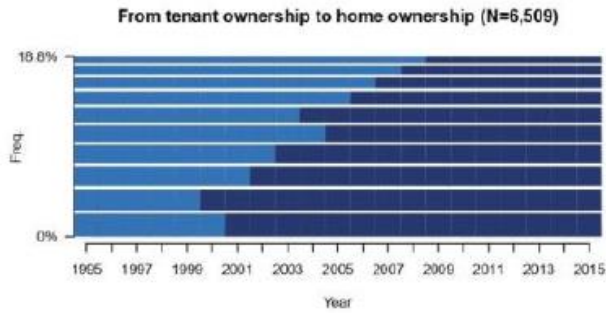
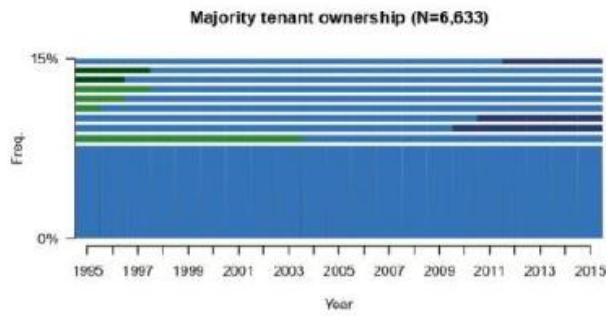
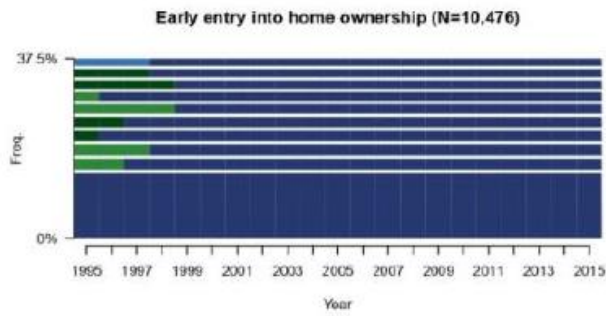


c) modal state sequence

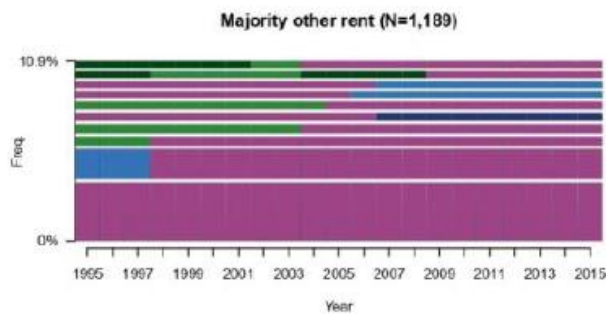
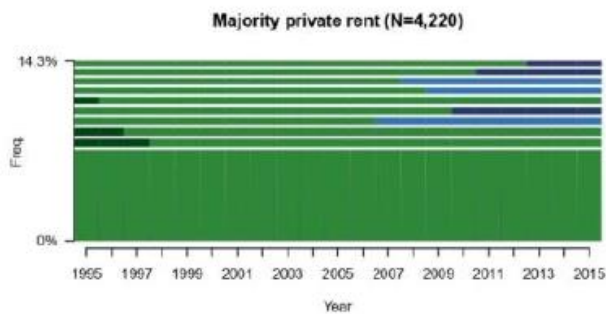
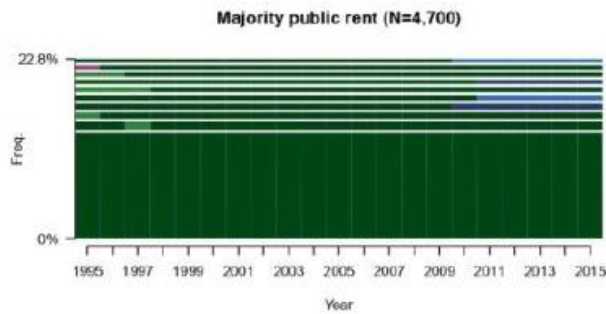
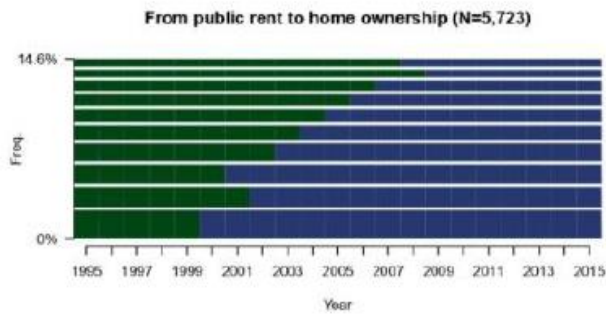


- Home owner
- Tenant owner
- Public rent
- Private rent
- Other

# Sequence frequency plots



- Home owner
- Tenant owner
- Public rent
- Private rent
- Other



Trajectory group	Typical states (Pr=Public rental, Pr=Private rental, BRF =Tenant ownership, HO=Home ownership, Oth=Other)	Short description	Freq. weighted	Perc. weighted
Ownership	PuR/1-PrR/1- HO/19	Early entry into home ownership	10,476	22.88%
Ownership	PuR/2-PrR/3- BRF/16	Majority tenant ownership	6,633	14.49%
Transition trajectories	PrR/1-BRF/8- HO/12	From tenant ownership to home ownership	6,509	14.22%
Transition trajectories	PrR/8-HO/13	From private rent to home ownership	6,336	13.84%
Transition trajectories	PuR/8-HO/13	From public rent to home ownership	5,723	12.50%
Rental trajectories	PuR/4-PrR/2- PuR/15	Majority public rent	4,700	10.27%
Rental trajectories	PuR/1-PrR/3- PuR/2-PrR/15	Majority private rent	4,220	9.22%
Rental trajectories	PuR/2-PrR/1- Oth/2-PrR/3- Oth/13	Majority other rent	1,189	2.60%
<b>Total</b>			<b>45,786</b>	