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Andersen, Hans Skifter

*Publication date:*  
2023

*Document Version*  
Accepted author manuscript, peer reviewed version

[Link to publication from Aalborg University](#)

*Citation for published version (APA):*  
Andersen, H. S. (2023). *Inadequate housing market filtering in a city with increasing population.*

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# Inadequate housing market filtering in a city with increasing population

*Hans Skifter Andersen*

*Adjunct professor*

*Department of the Build Environment, Aalborg University*

## Abstract

It has been an experience from many countries that housing construction in general is too low and that housing demand from the lower income groups are not satisfied. Housing supply for poor people is dependent on that higher income groups move to new construction and leave cheaper housing in the older stock available for lower income groups, a process called filtering. The research literature shows that this process does not function in a sufficient way due to malfunctions in the housing market (Skifter Andersen 2023). In this article is shown that new construction in the city of Copenhagen, Denmark, does not provide filtering enough to improve the housing situation of poor people in the city.

## Introduction

Since the 1950s, there has been a tradition of empirically oriented research in the USA (e.g. Grigsby 1963, Galster 1996) dealing with how the housing market can satisfy demand for cheaper housing that cannot be provided by new construction due to its high quality (building legislation) and price. The starting point was that the limitations in the technical/economic possibilities for adapting the supply from the existing housing stock to the demand from households with lower incomes made it necessary to continuously redistribute housing between income groups. A possible explanation for how the housing demand of low-income groups could be satisfied was formulated through the so-called "filtering theory". The theory states that dwellings in the course of time go through a filtering process where they with increasing wear and tear become relatively cheaper and are transferred from the higher income groups to the lower ones. The poor are thus dependent on that the more wealthy households move to new construction from older dwellings as these wear down or become obsolete, thereby releasing a housing supply with lower prices and quality. Residential mobility, and the factors that determine it, were considered to have a significant impact on the filtering process.

In this article, filtering from new construction in the city of Copenhagen, a city in a European welfare state, is highlighted. The method used is to examine the so-called vacancy chains that emerge when people move to new construction and leave behind vacant housing available for other households (White 1971). New building leads to a chain of moves that stops when the vacant housing gets occupied by people who come from outside the local market or do not leave vacancies. Not all vacancies in the housing market are,

however, created by new construction. Others are a consequence of that people die, move together with others or leave the local market.

In this study is examined to what extent different kinds of new construction in Copenhagen City during the period 2007 to 2015 have resulted in an improvement in the housing situation of the poor and people with lower incomes in general. The vacancy chains from new construction are followed in up to five successive moves in a chain. It is identified who are moving and how the moves have changed their housing situation depending on the kind of construction made. This article is based on Skifter Andersen 2017.

The questions examined are: To what extent does new constructed housing provide opportunities for low-income groups and improves their housing situation? What kind of new housing has the greatest importance for this?

There is no doubt that the effects of new building on the development in a housing market depends much on the kind of market in question. Filtering in a housing market like the Danish might be much different from what happens in an American city, mainly because housing policy and the composition of housing tenures are very different. Moreover, incomes and purchasing power are more equal distributed in Denmark than in the US and many other countries, which implies that the need for filtering might be lower. The housing market in Copenhagen is described in the beginning of the article to create the framework for the results.

### **Earlier studies of filtering**

A basic assumption for the filtering process has been that housing becomes relatively cheaper over time – partly because of wear and tear, and partly because new construction is of a higher quality that attracts households with higher incomes and weakens the demand for older housing (Ohls, 1975).

The first prerequisite is that homes become less valuable over time and that this happens to a sufficient extent to make the filtering effective. However, actual studies of how much dwellings lose value over time show that this happens to a very different extent and depends much on factors other than the age of the buildings. There is no evidence that buildings automatically deteriorate with age because they can maintain their value through maintenance and renovation (Skifter Andersen, 1995; Margolis, 1982; Rosenthal, 2014).

The likelihood for filtering has been very dependent on the common development of urban neighbourhoods. In the post-war period there was a migration of the middle class from the central districts of cities to the suburbs in the United States. This created a drop in housing demand in the city centres, which led to decay and slums (Skifter Andersen, 1995). Some of the slum housing disappeared from the market because it became vacant or was demolished. This development, however, also created better housing opportunities for low-income families (Weicher and Thibodeau, 1988). Studies of the rent structure in the USA also showed that homes in the cheapest part of the housing market have relatively high rents in relation to their quality, and that they were not particularly much cheaper than other older homes of acceptable quality (Griegsby, 1963; Muth, 1969; Stegman, 1972; Rothenberg et al., 1991).

From the end of the 1980s there was a change in the demand for housing in the central city districts in the USA, which were increasingly found attractive to the middle and upper classes. This led to new investments in housing and rising prices, what has been called 'gentrification'. This later development has counteracted filtering, and in some cases reversed it, as run-down and cheaper housing has been upgraded or demolished (Wyly and Hammel, 2004). However, urban neighbourhoods in the US have developed very differently depending a lot on their qualities and location (Somerville and Holmes, 2001). Gentrification made it more difficult for low-income groups in the US to access affordable housing (Malpezzi and Green, 1996; Skaburskis, 2006; Zuk and Chapple, 2016; Desmond and Wilmers, 2019; Barton, 2011).

In the US the widespread ethnic segregation has, moreover, had a major impact on the functioning of the housing market (Skifter Andersen, 2019). Urban areas dominated by African-Americans and Hispanics are avoided by the white middle class and do not so often become gentrified, but instead have a greater risk of slums.

There is no disagreement in the American research that the extent of new construction has an impact on the housing supply from the existing housing stock, but there are very different results from the studies with regard to how much and how, especially of the extent to which it creates better housing opportunities for the lowest income groups. As one might expect, this depends a lot on the nature of the cities studied, on the character of the local housing market and on the current economic situation, e.g. the degree of inequality and population growth with pressure on the housing market.

More recent studies of how effectively the filtering mechanism works have most often examined the extent to which house prices in the older stock fall over time relatively to the rest of the housing market or in relation to income development (Skaburskis, 2006; Kim et al., 2013; Brzezickaa et al., 2019; Been et al., 2019; Rosenthal, 2014). Other studies have examined how households with different incomes move up or down between housing and urban areas of different price and quality (Mast, 2019; Zuk and Chapple, 2016; Magnusson Turner and Wessel, 2019). Some studies have particularly focused on the importance of new construction for filtering and for housing supply for low-income groups. Other studies have examined the so-called 'moving chains' – the extent and character of residential moves and vacant homes a newly built home gives rise to, directly and indirectly.

Rosenthal (2014) used data from the American Housing Survey for the period 1985-2011 to examine the extent to which households moving into older housing received relatively lower prices and had lower income over time than those moving into newly build housing. The relative price changes for owner-occupied homes showed only limited filtering, but based on the income changes he calculated a depreciation rate of 0.5 per cent per year for owner-occupied homes and between 1.8 and 2.5 per cent for rental housing. In addition, he found that many owner-occupied homes changed tenure over time to rental. However, it was primarily in declining cities and neighbourhoods that filtering was found, while in growing cities it was low. This was also found by Somerville and Holmes (2001).

Rosenthal's study showed an average of the development in the USA. Kim et al. (2013) investigated three questions, based on data from urban areas in the city of Orlando 2000-2011: 1. What do differences in the characteristics of urban areas mean for filtering?, 2. What is the significance of the location in relation to

the urban core? and 3. Does filtering vary between periods of time with different conditions in the housing market? They measured the filtering by changes over time in the relationship between house prices and income in urban areas and by changes in the price level in relation to the whole city. During the downturn in the housing market after the financial crisis there was a positive correlation between the age of the homes and the changes in income and price levels, while the opposite was the case in the growth period 2000-07. It was especially urban areas with a high proportion of African Americans that had increased filtering, but here again only during the downturn. Contrary to expectations, new construction and building renovation had no direct effect on the filtering in the urban area where it took place, but may have had an effect in other areas. A significant result was also that filtering occurred both in the central areas and in the suburbs, but in different time periods. Filtering in the suburbs occurred most during the decline period, while it was strongest in the central areas during the growth period. The results can be explained by the changes in the demand in the different periods. During the period of growth, more people from the middle class moved out to the suburbs, leaving vacant homes in the centre, while this did not happen during the period of decline.

Skaburskis (2006) illuminated filtering in 23 urban areas in Canada by looking at differences between housing of different age in terms of incomes, prices and rents. He also examined price and rent developments 1981-96. He found that the age of dwellings had no particular effect on the level of income in rental homes, except that the income in the very newest was higher. The differences between dwellings in different age groups were more significant in owner-occupied dwellings. Rents and prices in the older housing stock rose more during 1981-96 than prices in new construction - a kind of reverse filtering. Skaburskis explains this by the increasing gentrification of the older neighbourhoods, which involved that higher income households moved into neighbourhoods formerly inhabited by low income groups, who were displaced (see also, for example, Helms, 2003).

Zuk and Chapple (2016) examined the relationship between new construction in different regions of California and changes in the income composition of the urban areas. It is a general problem in California that low-income households have got fewer housing options over the years and are being pushed out of many urban areas. The study examined how the extent and nature of new construction has influenced this displacement. They found that increased new construction overall reduced displacement, and that the reduction was twice as great when building subsidized social housing as for private build. Furthermore, there was a tendency for the effect of private construction to disappear over a longer period. In the central neighbourhoods of the larger cities new construction had no effect on displacement. The authors interpret this as being a consequence of the fact that new construction has often taken place in urban areas in growth, which is accompanied by gentrification.

Mast (2019) examined the vacancy chains from new construction in 12 US cities to determine the extent to which this resulted in moves away from neighbourhoods with lower average incomes. He assumed that this was a sign of that households had moved from poor to better housing. In general, he found that the most frequent moves were from districts with lower incomes to districts with higher ones. He estimated that, on average, 100 new rental housing units moved between 17 and 39 households away from districts in the lowest income quartile. The weakness of the study was that there was only data on the location of households and homes, not on their actual incomes, housing characteristics and prices.

One of the main conclusions of these American studies is that filtering depends much on how different urban neighbourhoods develop, which has had a major impact on the development of housing prices and quality (Skaburskis, 2006; Kim et al., 2013; Zuk and Chapple, 2016). The value and price of housing depends a lot on its surroundings. Homes located in run-down and poorly located urban areas are, all else being equal, worth less than similar homes in attractive areas. There has been a tendency in the USA for run-down and cheap housing in run-down urban areas to fall into disrepair and possibly demolished, while in well-functioning areas they are renovated and improved (Skaburskis, 2006, Skifter Andersen, 1995). It is expectations for the future development in an urban area that are decisive for whether dwellings are filtered down or the opposite. Urban areas in decline thus provide the greatest opportunities for filtering.

Studies of filtering have mostly been carried out in North America, but there are also studies from Poland and Norway. Brzezicka et al. (2019) investigated the correlation between the extent of different kinds of newly built housing and the development in prices 2010-17 in the existing housing stock in different parts of Warsaw. They used the statistical method 'Granger causality analyses' to determine to what extent it was the prices of new construction that determined the price development in the existing housing stock, or vice versa. If new construction leads to filtering, increased new construction should lead to relatively falling prices in the existing stock, but the study showed the opposite. It was price increases in the existing stock that led to increased prices in new construction. It also showed that rising prices in the central parts of the cities spread to the suburbs.

Magnusson Turner & Wessel (2019) investigated the filtering in the Oslo area by a moving chain study, where they used the method 'Markov chain models'. Oslo is characterized by a liberal and unregulated rental market with relatively few rental homes and especially little social housing. The study showed that the moving chains only created relatively few housing options for the 19 per cent of the households characterized as 'poor'. In most of the vacated homes, it was households that came from outside, or from parents or dissolved households that moved in. In particular, moving chains via owner-occupied housing provided few opportunities for the poor.

The literature on housing market filtering has thus shown that new construction mostly does not have a sufficient effect for the supply in the lower parts of the market. Other studies have shown that rents in the part of the housing stock with the lowest quality are often relatively high when measured in relation to the quality of the housing (Griegsby, 1963; Muth, 1969; Stegman, 1972; Rothenberg et al., 1991). This lack of sufficient supply and higher rents especially affects low income families, who have difficulties in finding affordable housing of a reasonable quality.

## **Data**

This study is based on a database made from public registers for the years 2007-2020. There is data on the population of Copenhagen City and their housing for every year, and data on new construction 2007-2015. It is possible to follow the housing pattern of each household in these years and register when they were moving and which kind of housing they moved to and from. These data made it possible to directly construct the actual vacancy chains from new construction in up to five links. It was thus not necessary to use statistical methods like Markov chain models (White 1970, Turner and Wessel 2019).

The objective of the study is to examine how new construction in Copenhagen affects the housing situation of different income groups living in the city. Therefore, only vacancy chains inside the city are followed. The chains stop when households coming from outside the city are moving into vacant housing.

## Housing market and housing situation in Copenhagen City

### The population of Copenhagen City

The municipality of Copenhagen City has about 650,000 inhabitants and is a part of a larger urban area with 1.7 million. After a long period of population decline, the municipality began to grow again in the early 90s (Figure 1). This growth has put a pressure on the housing market.

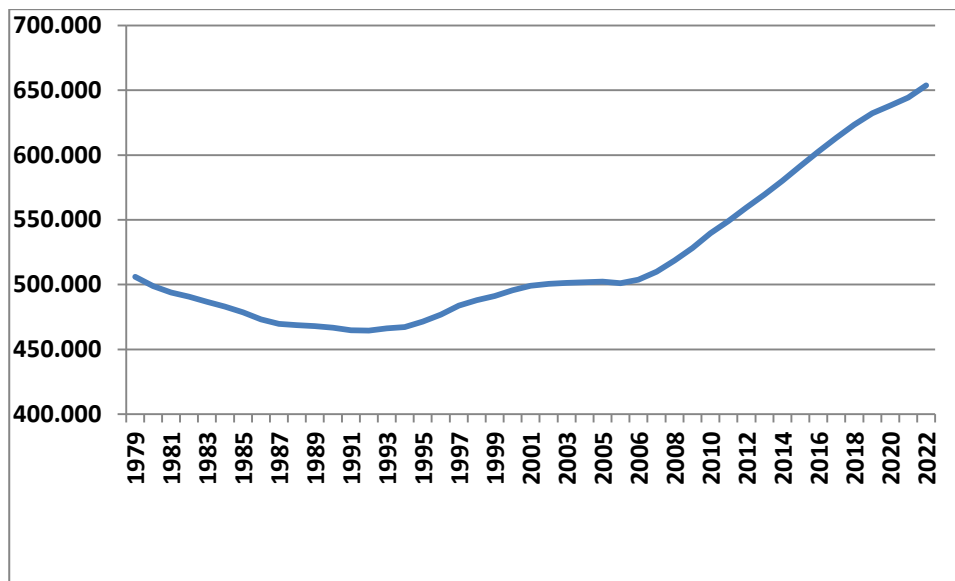
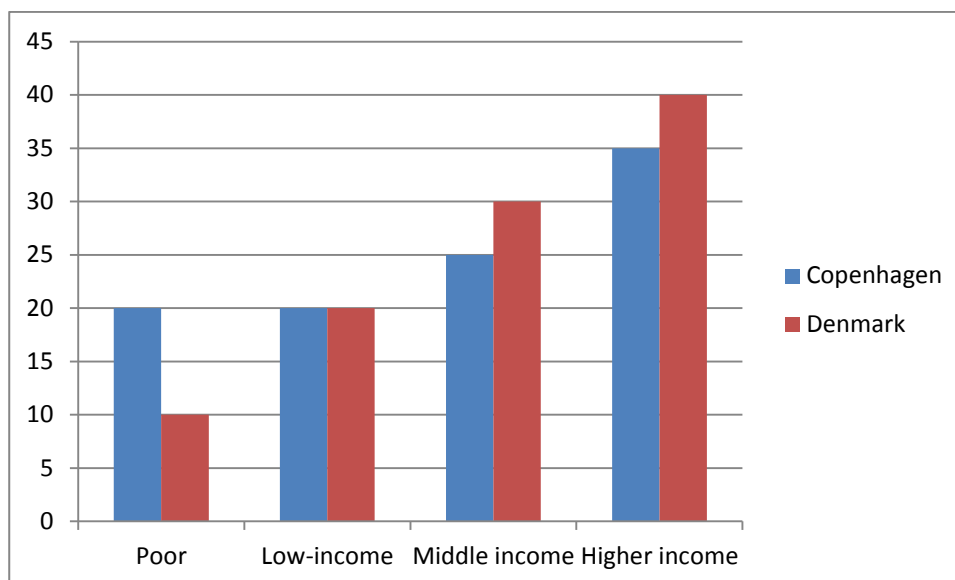


Figure 1. Development in the population of Copenhagen City

The population in Copenhagen City has lower incomes than Denmark in general. In Figure 2 is shown the distribution of the adult population in Copenhagen on income groups compared to the whole country.



**Figure 2. The adult population in Copenhagen distributed on income groups<sup>1</sup> compared to the whole country.**

Poor people, defined by having an equivalent income less than half the median for the entire country, constitutes 20 per cent in Copenhagen City, which is the double of the country average. Even if Copenhagen has gone through a development of gentrification in the last 30 years there still is a considerable population of poor people in the city. However, a considerable proportion of the poor and low-income people are students (respectively 40 and 26 per cent).

## Housing

Copenhagen is favoured by a housing stock that should provide good opportunities for people with lower incomes. As can be seen from Figure 3 owner-occupied housing constitutes 47 per cent in Denmark. The share in Copenhagen is much lower, only 18 per cent. The dominant tenure in Copenhagen is cooperatives. The main reason for this has been a rule that requires private landlords to offer their properties to tenants as cooperative housing when they want to sell them. Social housing and private renting makes about 20 per cent both in the city and in the country as a whole. There are no restrictions on who can move into social housing.

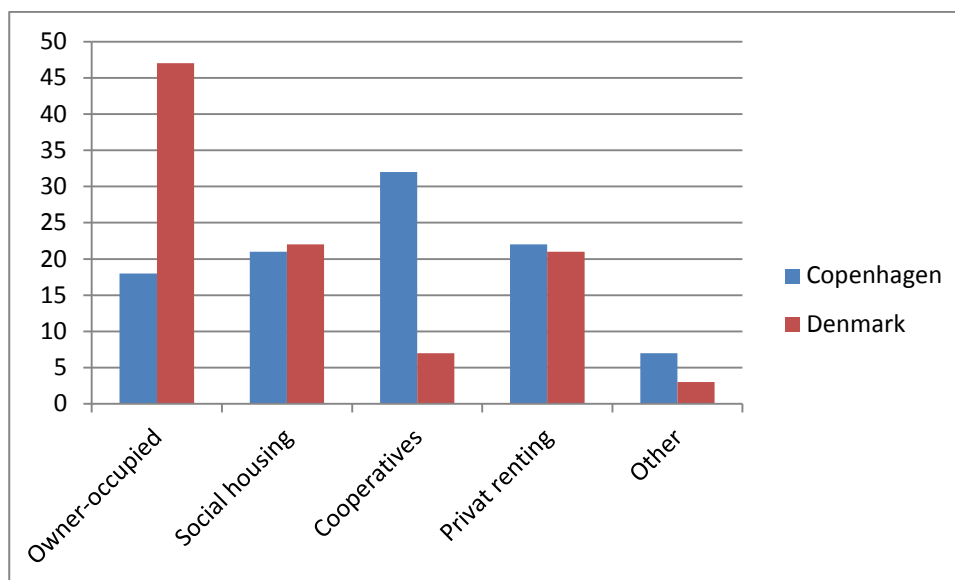
<sup>1</sup> Definition of the income groups is based on equivalent income as defined by OECD:  

$$\text{Equivalent income} = \frac{\text{household income}}{(0.5 + 0.5 \cdot n_v + 0.3 \cdot n_b)}$$
 where  $n_v$  = number of adults and  $n_b$  = number of children

Income groups:

1. Poor: equivalent income is less than half the median for the entire country.
2. Low-income: Other people in the three lowest deciles for equivalent income
3. Middle income: 4.-6. decile
4. Higher income: 7.-10. decile





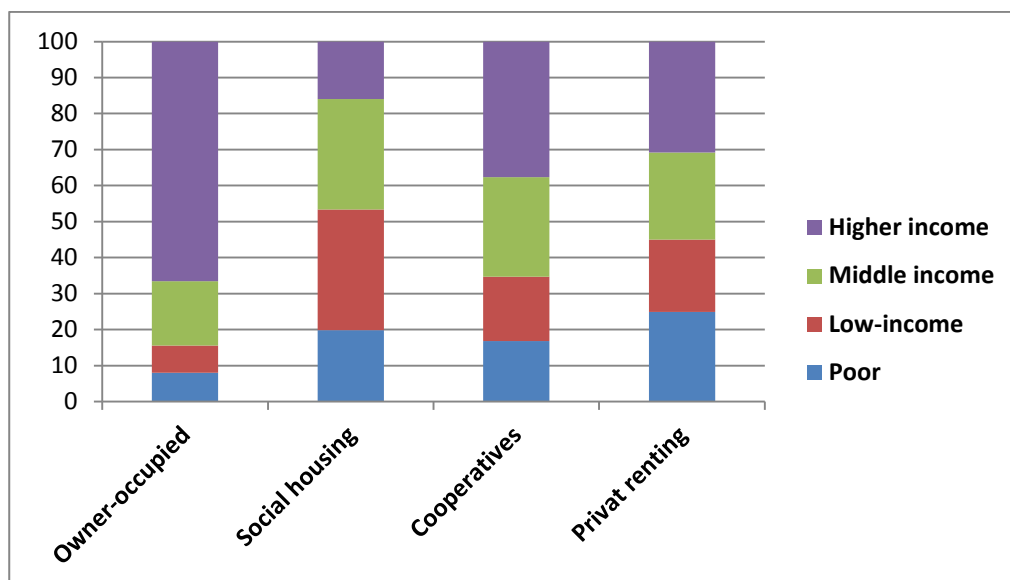
**Figure 3. Housing in Copenhagen distributed on tenures compared with the whole country.**

Different regulations and rent control are found in social housing, co-operatives and private renting that intent to keep rents below 'market prices and rents'. In all social housing rents are determined by costs in the individual estate. This implies that new constructed housing is somewhat more expensive than older and therefore more difficult to achieve for poor and other low-income people. New social housing is thus mostly occupied by residents with middle income.

In private renting some of the older housing (build before 1991) are subject to a rent control similar to social housing, but this control is deteriorating rapidly in these years because new vacancies are set free if housing improvements are made. Much of the new vacancies have thus close to market rents. The prices for shares in co-operatives are regulated based on a comparison with property prices in private renting. As these prices are soaring because of the deregulation, the prices on shares in co-operatives also have increased much.

Housing coverage has, however, fallen steadily since the beginning of the 90s from approximately 58 homes per 100 inhabitants to 48 – a decrease of 16 per cent. This is counteracted somewhat by the fact that a larger part of the inhabitants today are children, who do not have an independent housing need.

As could be expected the income composition of residents in the different tenures differ somewhat as can be seen from Figure 4.



**Figure 4. The income composition of residents in different tenures in Copenhagen.**

There are few poor people in owner-occupied housing, but the proportion of them is somewhat similar in the three other tenures. In social housing other low-income and middle income people are dominating, while higher and middle income groups are more common in co-operatives and private renting.

The housing situation in the city is divided into the following categories:

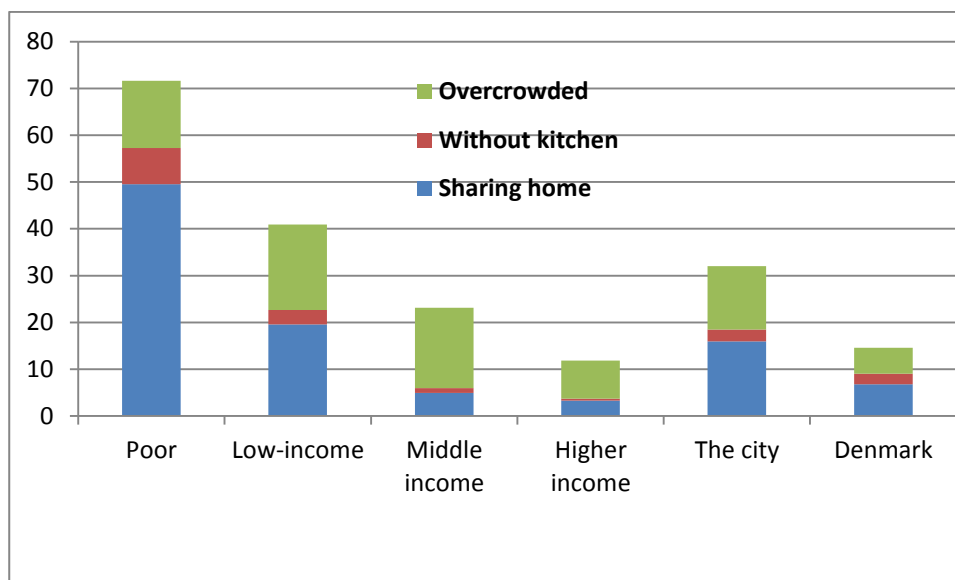
1. Without a home of your own, but sharing accommodation with someone you are not related to<sup>2</sup>
2. Dwellings without kitchen, e.g. dorms etc.
3. Overcrowded housing<sup>3</sup>
4. Acceptable accommodation

In the following the first three groups will be called 'unacceptable' housing. In Figure 5 is shown the proportion of people in the different income groups that have unacceptable housing.

<sup>2</sup> Some of these might be homosexuals

<sup>3</sup> Overcrowding is defined by

1. Single person without children: < 50 m<sup>2</sup> living area
2. Single person with children: < 50 m<sup>2</sup> + number of children × 10m<sup>2</sup>
3. Couple without children: < 60 m<sup>2</sup>
4. Couple with children: < 60 m<sup>2</sup> + number of children × 10m<sup>2</sup>



**Figure 5. Proportion of adult residents with unacceptable housing in different income groups in Copenhagen City and in Denmark, 2015.**

In average more than 30 per cent of the adults in Copenhagen are living in unacceptable housing according to the specified criteria. 16 per cent are sharing accommodation and 14 percent are in overcrowded housing. This is somewhat more than is common in the whole country. 40 per cent of those sharing accommodation are students. Among non-students 25 per cent have unacceptable housing. Due to population increase (13 per cent) and relatively low construction activity from 2007 to 2015 the number of people living in shared accommodation was increased by 60 percent. People in acceptable housing were increased by nine per cent in the same period (Skifter Andersen 2017).

There is, as one could expect, considerable differences between income groups. For the group of poor people in Copenhagen (20 per cent of the population) more than 70 per cent had unacceptable housing in 2015. In particular, there is a large group sharing accommodation. 80 percent of this group are singles, which is the reason why overcrowding is less common. Among people in the low-income group 40 per cent have unacceptable housing.

### Housing construction 2007-15

The construction of housing in Copenhagen City in the period after the global financial crisis was not very extensive. As can be seen from Table 1 it only constituted four per cent of the existing stock.

**Table 1. Constructed new dwellings 2007-15 in different tenures and its part of the existing housing stock in Copenhagen**

	Dwellings	Prop. of constr.	Prop. of stock
Owner-occupied	4,091	34	13
Social housing	1,741	15	3
Co operatives	117	1	0
Privat renting	5,490	46	7
Other (without own kitchen)	548	5	3
Total	11,987	100	4

The tenures in new construction had a somewhat different composition than in the stock. Nearly half of it was private renting, which led to a growth of seven per cent in the stock of this tenure. One third of the construction was owner-occupied housing that increased the stock with 13 per cent. 15 per cent was built as social housing, which increased the stock by three per cent.

### Vacancy chains in Copenhagen City

Construction of new housing makes it possible for people to move and leave vacant housing in the existing housing stock. However, some of those moves do not leave vacant housing inside the city because they come from a place outside, or because someone stay put in the housing they leave, e.g. children leaving home. As an average for new construction in Copenhagen City only 45 per cent of the first moves immediately lead to other vacancies inside the city in the first link of vacancy chains. These vacancies led to 17 per cent vacancies in the third link and respectively seven and two vacancies per 100 new dwellings in the fourth and fifth link. In total every new constructed dwelling only led to 0.7 other vacancies inside the city. The multiplier effect for new construction was thus 1.7.

This effect depended, however, on what kind of housing is constructed. In Figure 6 is shown the multipliers found for different tenures.

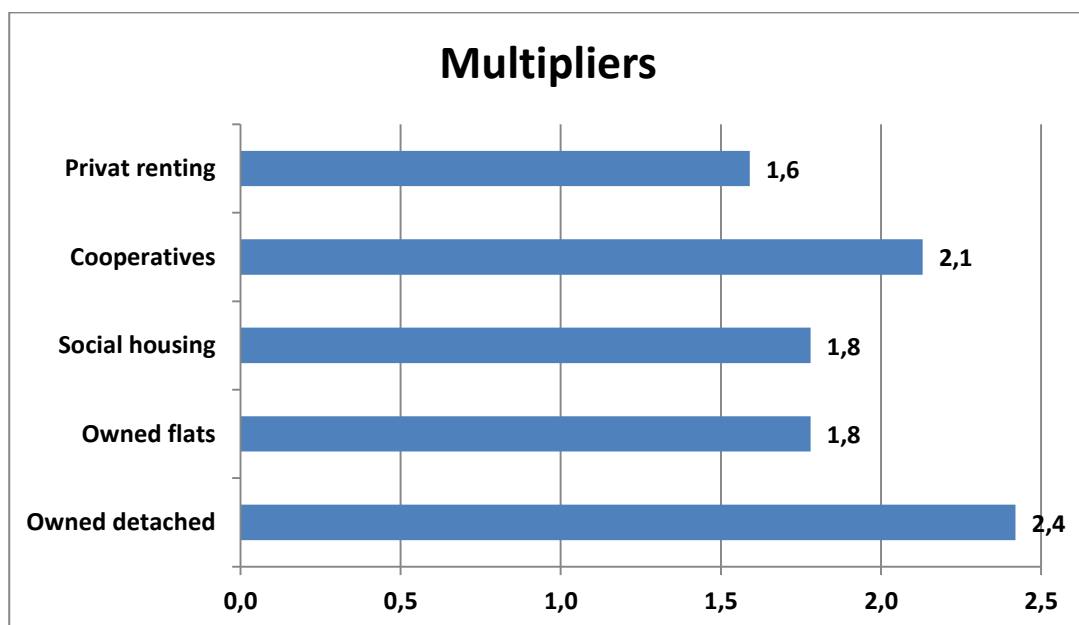


Figure 6. Vacancy chain multipliers for new constructed housing in different tenures.

Construction of owner-occupied detached housing had the greatest multiplier effect with 2,40 vacancies, followed by co-operatives with 2.1. Private renting had the shortest vacancy chains with only 160 vacancies per 100 new dwellings.

### Filtering

New constructed housing only provided limited housing supply for the poorest as can be seen from Figure 7. Near 80 per cent of the in movers belonged to the two highest income groups and most of the few people with lower income had to share accommodation with others.

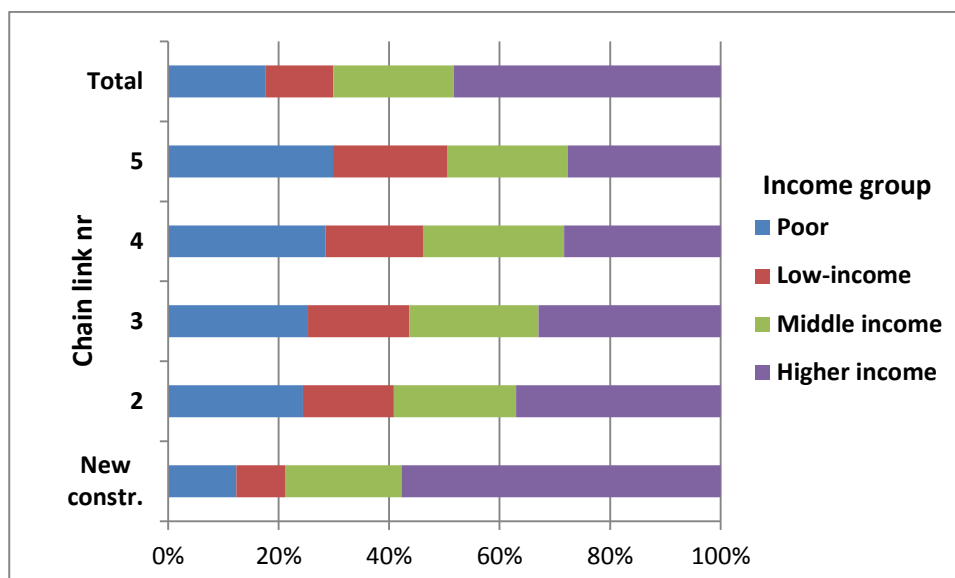


Figure 7. The composition of income groups among those moving into new constructed housing and into vacant housing in the chain links.

More of the poor and low income people had their chance in the vacant housing created by the vacancy chains, and their opportunities increased with the link number. However, in total nearly 50 per cent of all the vacant housing created by new construction was occupied by the highest income group, who only constitute 35 per cent of the population. The poor and the low income group obtained together 30 per cent of the vacancies while they constitute 40 per cent of the population.

The income composition in the chains depended on the tenure of the constructed dwellings (Figure 8).

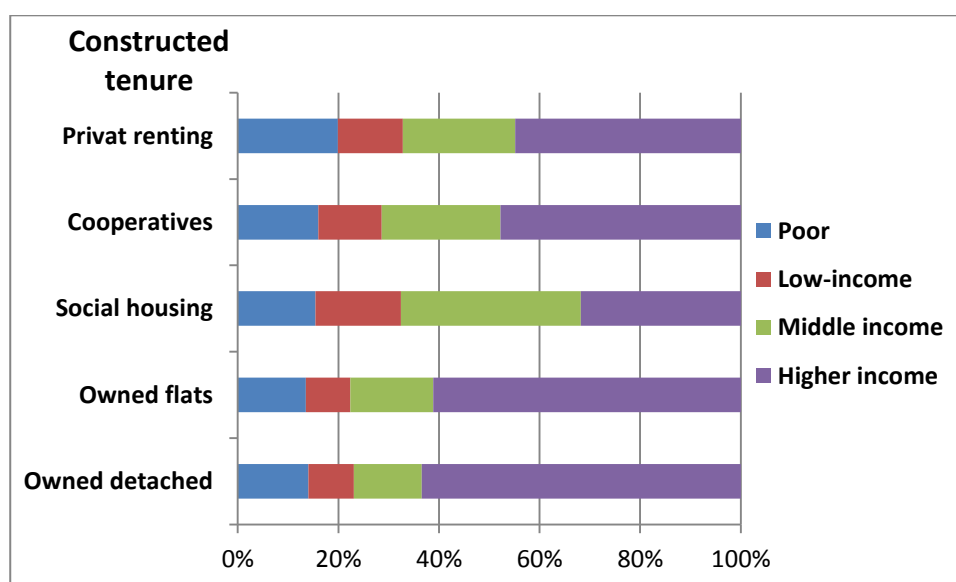


Figure 8. Income composition in vacancy chains created by different tenures in new construction

The proportion of poor and low income people in the chains was around 20 per cent when owner-occupied housing was constructed, while it was more than 30 per cent for private renting and social housing. New social housing in Copenhagen and its vacancy chains are especially getting occupied by people with middle incomes (36 per cent).

## Improvements in housing conditions for the movers

The following examines the extent to which those moving into new construction and its moving chains have obtained better or worse housing conditions in connection with the move. The following changes are being investigated:

1. **Worse housing conditions:** People with acceptable housing conditions have moved to overcrowded housing or to shared accommodation or homes without kitchen.
2. **Same housing conditions:** Same housing situation before and after moving.
3. **Obtained own accommodation:** No longer sharing accommodation with others
4. **Obtained kitchen:** People living in homes without kitchen before the move have now obtained a home with a kitchen.
5. **Obtained not-overcrowded home:** Lived in overcrowded housing before moving, but not after.
6. **Moved away from parents:** Have left parents' home.

In Figure 9 is shown these changes in the housing situation for each of the income groups. Students have here been separated as a special group.

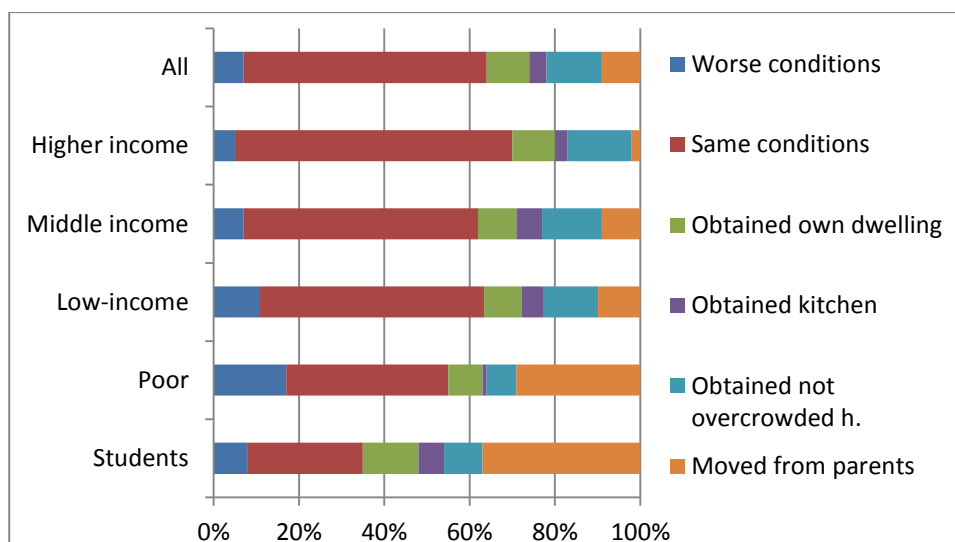


Figure 9. Changes in the housing conditions for income groups among movers in the vacancy chains

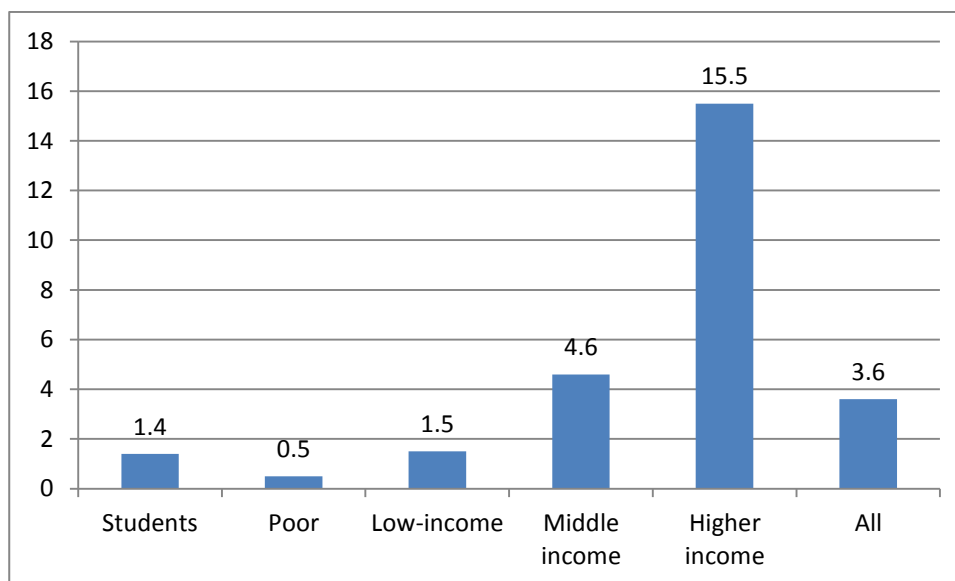
In general the moves improved the housing conditions for 28 per cent of the movers and 9 per cent could move away from parents home. 7 per cent, however, obtained a worse situation in accordance with the specified criteria. Especially students did improve their situation (28 per cent) and could move from parents (37 per cent). Among the poor 16 per cent improved their conditions, while 17 per cent obtained a worse situation. So for this group there was no improvement. 29 per cent of the movers in this group, however, were given the possibility to leave parents' home.

## The total effects of filtering for the housing situation in Copenhagen

The main question for this article is to what extent new construction in the city of Copenhagen from 2007 to 2015 did lead to improved housing conditions for the poorer part of the population in the city.

To answer this question we compare the number of people who have improved their housing with the number who had unacceptable housing at the beginning of the period in 2007. In total 3.6 per cent of the adult residents in Copenhagen, that had unacceptable housing in 2007, improved their housing through a

housing construction that increased the stock by 3.9 per cent. Most of the improvements occurred, however, among the group with higher incomes (Figure 10).



**Figure 10. Proportion of people with an unacceptable housing situation in 2007 in income groups that have improved their situation by moves created by new construction and vacancy chains (per cent).**

The housing improvements for poor and low income people in the city, provided by filtering from new construction, showed up to be very modest. Only 0.5 per cent of poor people with unacceptable housing conditions in 2007 did improve their housing through filtering. For others with lower incomes it was only 1.5 per cent.

## Discussion

As shown in the referenced literature housing construction seldom is able to generate sufficient housing options for the poorer part of the population. This study has also showed that filtering from new construction only has had a small effect on the housing situation of poor and low-income residents in the city of Copenhagen. The result is quite similar to the study made in Oslo (Magnusson Turner and Wessel, 2019).

Copenhagen differs from most cities in other countries by being situated in a strong welfare state and by having a considerable housing stock with regulated rents in social and private renting that might bring about much less dependency on filtering for the poor. Nevertheless, housing problems in Copenhagen are still considerable and these problems have increased in the period 2007 to 2015 where the proportion of adult residents with unacceptable housing grew from 29 to 32 per cent. For the poor and low-income people the increase were respectively 9.8 and 8.7 percentage points (Skifter Andersen 2017).

If the general situation should have been unchanged the level of new construction should have been more than doubled. The size of new construction has thus been much too small. This can partly be ascribed to the financial crisis in 2007, which had a substantial effect on investments in construction in the following years. Moreover, Copenhagen city had a population increase in the period that generated more pressure on the housing market.

The experiences from the period before the financial crisis showed, however, that even in a period with substantial growth in construction, and when relocation from the city to the suburbs were greater, the housing market in Copenhagen was not able to solve housing problems among the poorer people in the city. One of the reasons has been that gentrification has occurred in some owner-occupied housing, in co-operatives and partly in private renting, where dwellings increasingly has been exempted from rent control.

It has also been an experience from many other countries that housing construction in general is too low, partly because of troubles with finding available building sites, but also because of general malfunctions in the housing market resulting in that housing demand from the lower income groups are not satisfied (Skifter Andersen 2023).

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