The Demand for Rental Homes in Denmark

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Abstract

For a number of years, homeownership rates have been increasing along with increasing GDP per capita in most European countries, but not in Denmark after 2000. Why have increased real incomes kept the demand for rental housing up in Denmark? The present paper takes a closer look at the Danish development, and gives some indications of the future demand for rental housing in Denmark. The results indicate a future stagnant rental demand kept up by an increasing share of persons of old age and young persons undergoing education, and thus a rising homeownership rate. It is believed that the structural traits found on the Danish housing market and the technique employed for prediction are of interest to housing researchers in other countries.

JEL Classification: R21

Keywords: Housing, Demand, Rental Market, Homeownership

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1. Introduction

According to a Danish telephone survey among a sample of 1,512 households asked about their preferences for type of dwelling, Byforum (2001), only 43 per cent of those living in rented homes[1] wanted to become (remain) tenants within the next five years. Among those who reported to plan on moving over the next 5 years, less than one third of renters wanted to continue as renters. Moreover, among all respondents, 79 per cent wanted to be homeowners, and among those with moving plans, only 15 percent wanted to move into rented dwellings against 80 per cent wanting to move into owner-occupied dwellings. Based on this evidence it seems likely that a long term equilibrium rate of homeownership around ¾, with ¼ left for the rental market, would emerge when increasing real incomes lead to a gradual lifting of financial restrictions for households.

With this in mind, and an annual increase of Danish real disposable household incomes around 7.5 per cent between 2000 and 2005, one would expect to see a continuous rise in the rate of ownership and a fall in the demand for rented homes. However, the homeownership rate has, contrary to expectations, been stagnant since 2000 with a homeownership rate around 58 per cent - with cooperative ownership included - today, see figure 1.

The paper seeks explanations for this apparent puzzle and tries to find factors behind the demand for rental homes. It is structured as follows: Section two takes a look at official statistics and seeks explanations from relative housing prices and interrelations between rising real income, changing demographic and educational structures. Section three uses a 20 per cent sample of Danish dwellings and their occupants to detect where financial constraints become binding for households and looks at differences between non-constrained and constrained tenants. Based on this section four gives an estimation of the effect of increasing real incomes on the demand for rental homes, and puts three logit regressions on the sample behind an estimation of the future rental demand in Denmark. Section five concludes that it would be a surprise, if the Danish homeownership rate does not pick up in the future.

[1] With dwellings with cooperative ownership (in Danish: andelsboliger) counted as owned and not as rented dwellings.

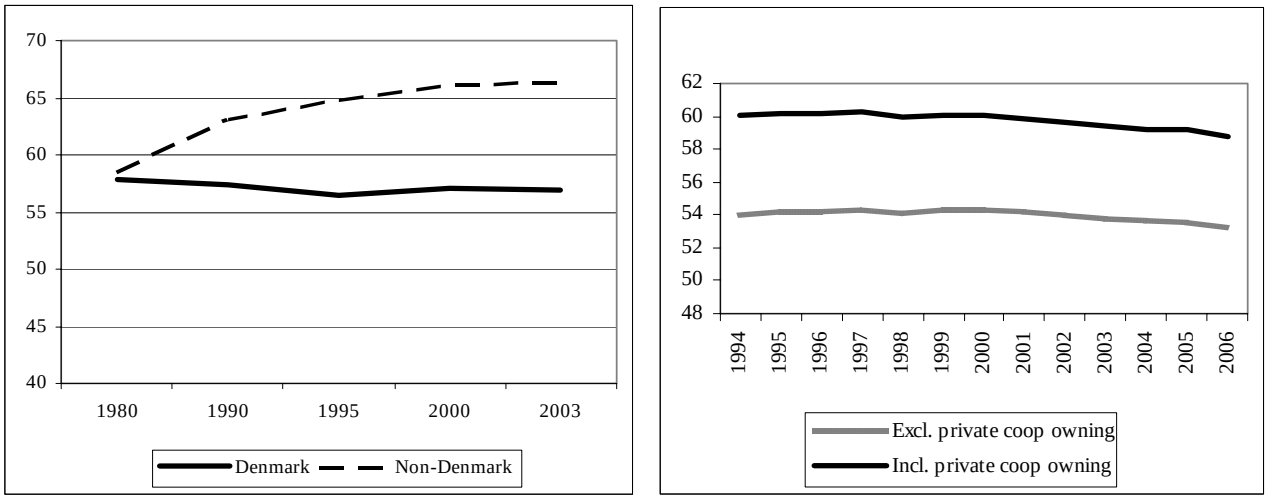
2. Explanations for the steady demand for rental homes based on official statistics

The homeownership rate seems to be constant if not declining in Denmark. In international comparisons, see Boverket (2005), the Danish rate is low, around 53 per cent and has been stagnant since 1980, while in most other European countries the rate has been either increasing or stagnant at levels well above the Danish. This is puzzling because the Danish proportion of homeowners should be expected to increase with the general increase in real disposable income among Danish households. In this section explanations are sought by use of national statistics that reveal the interrelations between rising real income and changing demographic and educational structures.

A remark on cooperative owning

In addition to conventional home ownership, Denmark has private cooperative ownership (andelsboliger) where owners pay an "entrance fee" to the former owner of the dwelling (most often an apartment), and pay a comparatively low rent for the occupation right to the owner society. The entrance fee is set according to rules that keep the fee growing over the years, but usually below the market price. The monthly rent covers debt servicing and exterior maintenance. Owners are free to sell the home, but potential buyers must - in some cases may - be taken from a waiting list. The board is elected by the owners. Recently, some boards have decided entrance fees close to market price for the dwellings. If this becomes widespread, remaining taxation differences between cooperative ownership and ordinary ownership will probably disappear. Private cooperative ownership should not be mistaken for social housing. Besides cooperative ownership, Denmark has a private and a social non-profit rental sector.

Figure 1: Homeownership rates in Denmark and other European countries



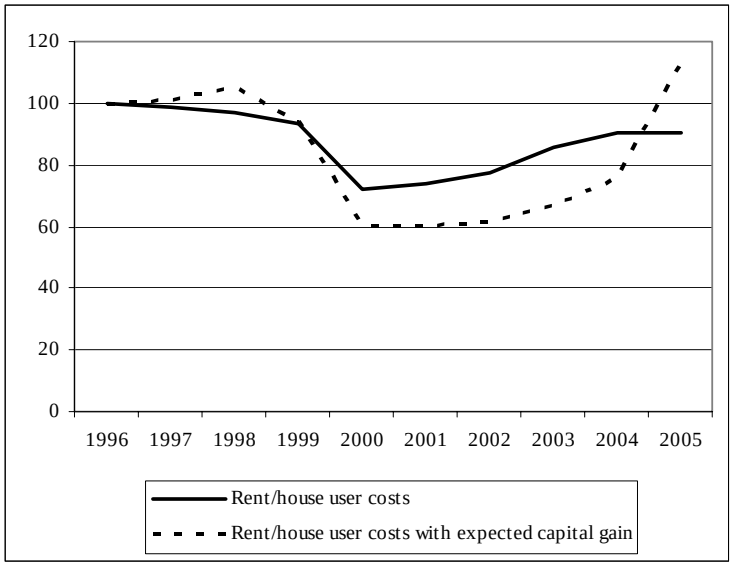
Note: The left-hand panel shows the Danish rate compared to the arithmetic average of the countries in the source that contains data for all the five years, i.e. Finland, France, Luxembourg, Netherlands, Spain, Sweden and United Kingdom. The rate is calculated among dwellings that are either rented or occupied by the owner.
Sources: Boverket (2005). Statistics Denmark. Statistikbanken.

The Danish homeownership rate declined after the mid eighties due to a sharp reduction in the tax rebate on interest payments. However, from the mid 90s it picked up again and reached a peak around the turn of the century. Since then it has shown a falling tendency, see figure 1.

Prices, supply and demand

Every economist knows that prices are important for demand and supply and vice versa. When one looks at the development of rents compared to user costs for owned housing, see the solid line in figure 2, it seems evident that it has been comparatively cheaper to rent since the turn of the century, but with an upward relative trend for rents since then. If an estimated perceived capital gain is added for ownership, it becomes relatively cheaper, especially during the last years' booming house prices. Furthermore, if one looks at relative first year payments, costs of owning have been reduced due to more widespread use of variable (short term) interest rate loans and deferred-pay-back loans.

Figure 2: Rent levels compared to user costs for one-family houses.



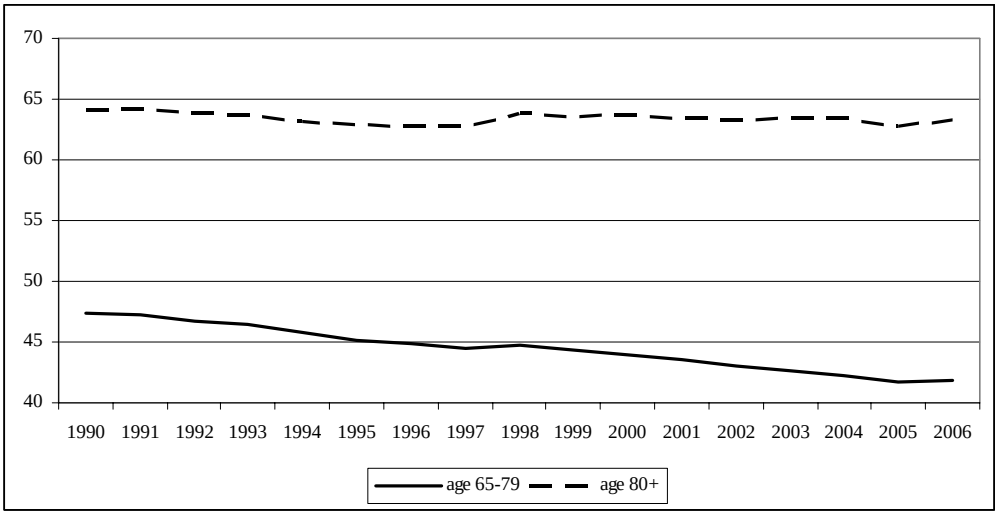
Note: 1996 = 100. User costs incorporate changing interest rates and taxes; and for the dotted line also estimated expected capital gains based on a smoothed expression for past capital gains.
Sources: Danmarks Nationalbank. Mona. Statistics Denmark. Statistikbanken.

But prices equilibrate supply and demand. On the supply side, building activity was low during the 1990s, but has picked up since 1995 to reach levels above normal recently. The drop in the 1990s was most pronounced for detached and semi-detached dwellings – typical for homeownership – where the number of completions dropped to only 25 per cent of the peak year completions against a drop to 50 per cent for multi-storey dwellings – typical for the rental market. This indicates a relative lack of supply for typical homeownership dwellings as an important factor behind the relative upswing in house user costs illustrated in figure 2. But in principle it could also be driven by increased demand for homeownership. A closer look at demand reveals different patterns for the young and the old.

Different demand patterns for the young and the old

Two opposite movements seem to influence aggregated data. One is a clear drop in the number of younger retirees, aged 65–79, that live in rented homes, see figure 3. Factors behind this are improved ability for older persons to stay in their own homes at gradually higher ages because of better health, more advanced hospital treatments, and a policy by municipalities to extend elderly care to people's own homes; these are developments that can be ascribed to a higher general welfare level and an increased tendency for older people to use housing equity for current consumption. However, this development has not yet reached the oldest retirees of age 80+.

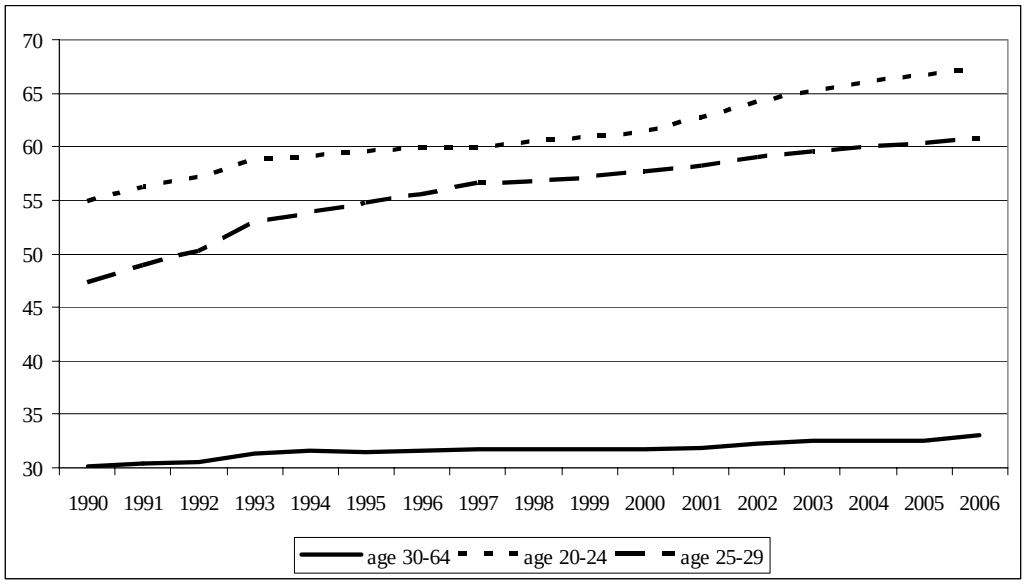
Figure 3: Percentage of people of age 65+ living in rented homes



Source: Statistics Denmark. Statistikbanken.

The tendency illustrated by figure 3 is more than neutralised by developments in the younger age groups. As revealed by figure 4, especially young people in their twenties tend to move out of owner occupied and into rented homes. But it is more surprising that also the big age group 30–64 tend to move out of home owning; maybe because of increased "individualism" in the society implying that people live more separated and consequently tend to live more in rented dwellings. But it could also be seen as a demand reaction to the relative increase of costs of home owning compared to renting as illustrated by figure 2.

Figure 4: Percentage of people of three age groups living in rented homes

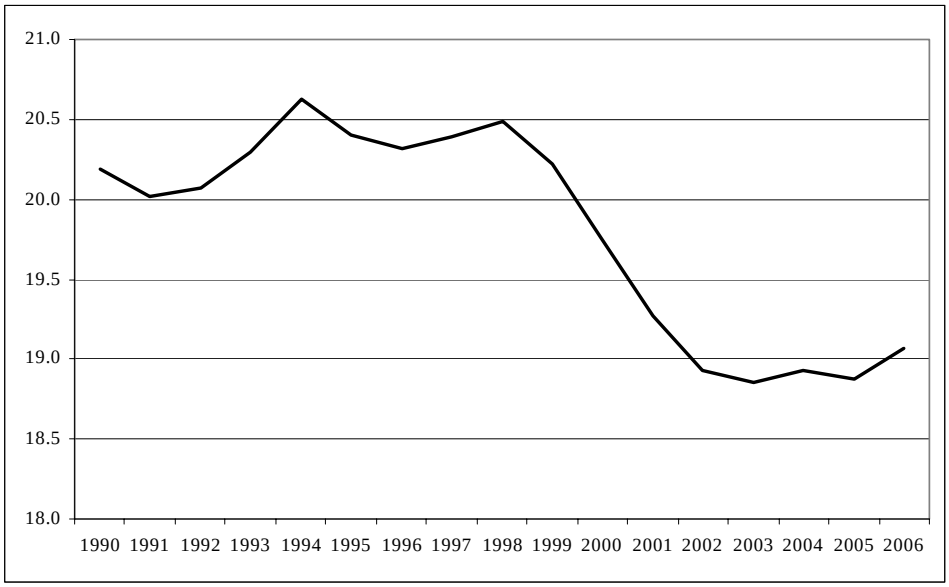


Source: Statistics Denmark. Statistikbanken.

To throw more light on the moving pattern of young people, one can look at the percentage of "children" of age 18-30 still living at home with their parents, see figure 5. The rate peaked in 1986 at 22 per cent, but has since then shown a decreasing tendency to reach a level around 19 per cent after the turn of the century. Young persons of age 18-30 that leave their parents typically do not look for dwellings to own, but prefer to rent until they have finished their education. The development shown in figures 4 and 5 is influenced by changing habits of young people. E.g., before embarking on a higher education, many young persons take a "sabbatical" year to work and travel and during this keep their parents' address. This should reduce the demand for rented dwellings, but it has also become more common for young people to work during their studies, which prolong the education period and thereby the demand for rented dwellings. Finally, if

younger people in the future feel less attached to their employers in a climate of general high demand for young labour, the wish for high geographical mobility could last into the first part of their working life. In fact, labour market flexibility is high in Denmark measured by European standards.

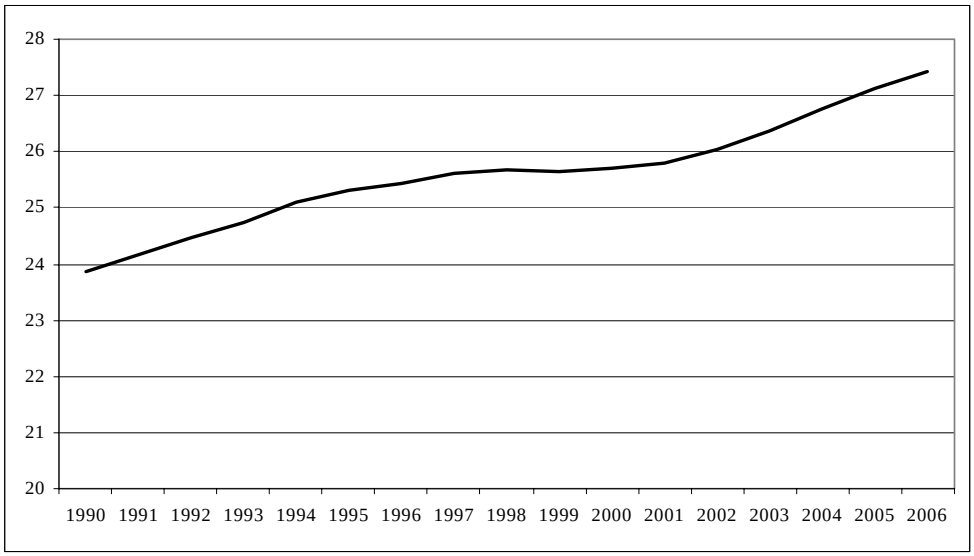
Figure 5: Per cent of "children" of age 18-30 still living with their parents



Source: Statistics Denmark. Statistikbanken.

A general tendency towards increased "individualism" in society with more persons living as singles should also tend to increase the demand for rental dwellings. Figure 6 gives a picture of the number of families with adult persons living as singles as a percentage of all families. The graph shows the last part of a long steady trend towards an increasing fraction of singles among families. Factors behind this development are increasing divorce rates, where one part typically moves into a rental home in the private rental sector until a more permanent new life has been established; see Bech-Danielsen and Gram-Hansen (2006). Also women's penetration into higher education gives them a more equal status vis-à-vis men and makes it more easy and acceptable for women to live as singles. In Denmark, the number of women obtaining higher education degrees has recently surpassed the number of men. There is no reason not to believe that this tendency towards more separated living will push up the demand for rental homes also in the future.

Figure 6: Single families as per cent of all families. Age 30-64



Note: The figure shows the number of families with only one adult person of age 30-64 as percentage of all families with persons of age 30-64.

Source: Statistics Denmark. Statistikbanken.

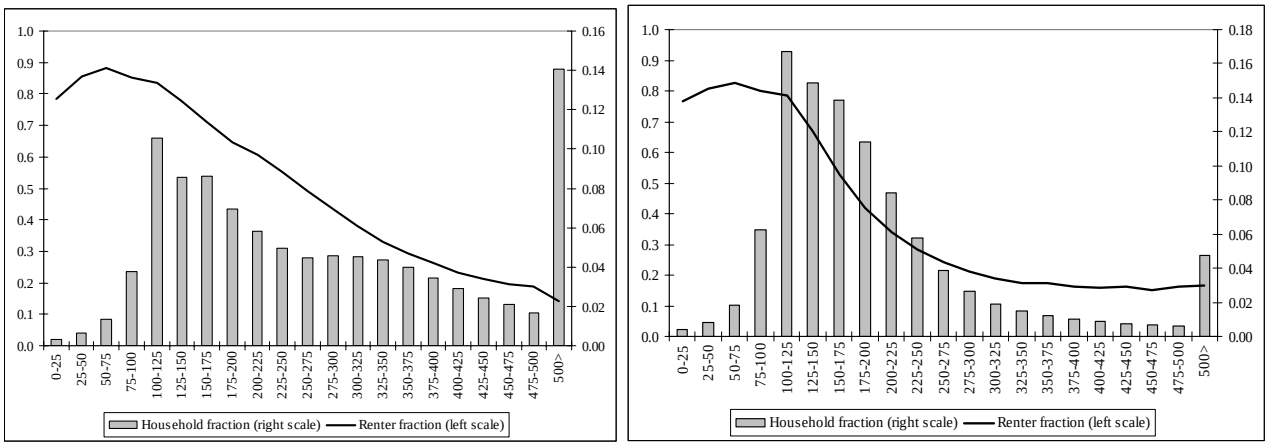
Summing up section 2

As stated in the introductory section, the wish for homeownership clearly surpasses the homeownership rate in Denmark, but in spite of this, the rate has shown a declining tendency since the turn of the century. Relative prices may have favoured renting somewhat, but with reduced first year payments for owners, "perceived" relative prices may not have changed at all. A better explanation for the dwindling homeownership rate seems to be a low supply of the typically owner-occupied detached and semi-detached dwellings in the 1990s, and improved welfare in terms of increasing real household income accompanied by a number of factors that in total increase the demand for rental dwellings: At first, the increasing fraction of elderly drives up the demand for owned homes, but, secondly, increasing rental demand comes from earlier separation of children from their parents with respect to residence and a tendency towards more separated living between the sexes. Obviously, these last developments have been dominant in Denmark over the last years. The next section uses a 20 per cent sample of Danish households to take a closer look at tenants who may shift from tenancy into home ownership when real income increases.

3. Who are tenants because of financial constraints and who are not?

Financial capacity in terms of disposable household income is probably the most decisive variable for the demand for type of housing. Based on a 20 per cent randomly picked sample of Danish households, the picture of figure 7 emerges[2]. The graph shows the fraction of households that are renters (solid line and left scale) within each income bracket, with the share of households in each income bracket shown as columns (right scale). The figure has two panels; the left classifies households along the horizontal axis according to their disposable household income, i.e. total income minus all direct taxes. In the right panel equivalent disposable household income is used. Equivalent disposable household income is calculated as the disposable household income divided by 1 for the first adult + 0.5 times other adults + 0.3 times the number of children in the household. The figure illustrates that the size of the equivalent disposable household income is decisive for the choice of type of home in the sense that the shift from rental to owner demand happens over a much shorter income interval for this concept than for disposable household income. The interpretation seems to be that a part of households' non-housing spending is inelastically tied to the number of members of the household, so that income left for housing expenses in the household budget is best calculated by the equivalent disposable household income. This income concept may also be close to the concept used by lending institutions for credit rating when households ask for housing loans.

Figure 7: Rental demand as a function of household income



Note: Income brackets are in 1000 DKK. The fraction of households living in rented homes is shown to the left, and the fraction within each income bracket is shown to the right. The left panel is for uncorrected disposable household income and the right panel shows the picture for equivalent disposable household income.
Source: 20 per cent sample of Danish households. January 2004.

[2] The data are drawn from various public register files with information about dwelling and household characteristics. Income data are from the annual tax base statistics, which – with few exceptions – are reported by employers, etc.

It is possible to calculate a cross section semi income elasticity for rental housing demand from figure 7. If total disposable household income is used and the semi elasticity is defined as the absolute change of the probability of renting (over the shown income span from 0 to 500,000 DKK) divided by one per cent income change, using the median income, one gets a semi elasticity equal to -0.003, so that a ten per cent increase of disposable household income gives a reduction of the demand probability for rental housing equal to 3 percentage points, e.g. a probability drop from 0.5 to 0.47. However, the right panel of figure 7 shows that rental demand changes only in the equivalent disposable household income bracket from 100,000 to 275,000 DKK. Here, the semi elasticity can be calculated to – 0.006, implying that a ten per cent increase in the equivalent disposable household income gives a reduction of the demand probability for rental housing equal to 6 percentage points around the median equivalent disposable household income.

In the Danish telephone survey Byforum (2001) 62 per cent of those who wanted to become (or remain) tenants within the next five years said that freedom from repair work and maintenance was most important. This was the highest per cent among those who wanted to become (remain) tenants and seems to be an important reason for high income households[3] to demand rental housing. 59 per cent classified low housing costs as most important – a reason most relevant for financially constrained low income households, and 48 per cent found that high moving ability was most important.

It is not surprising that households with low income (below 100,000 DKK equivalent disposable household income) demand rental housing; it is more interesting to take a closer look at the app. 20 per cent low income households that demand owned dwellings. Table 1 indicates some characteristics of this group. Low income owners are clearly dominated by married/cohabitating couples, but also widowed owners play a role. In addition, the duration of marriage and age of breadwinner indicate a domination of old owner households, i.e. old age and early old age pensioners, who may use part of their housing equity to keep homeowner status. It is difficult to explain the high homeowner rate for breadwinners on sick leave, but the fact that self employed homeowners dominate among low income households may indicate that self employed persons pay special attention to ownership. The Byforum (2001) survey reports that free disposal of the home is most important to the big majority (89 per cent) of owners and is mentioned more often than

[3] The survey has no information on incomes.

economic considerations. Self employed homeowners obviously gain especially high satisfaction from "home ruling". This observation is in line with the Hansen and Skak (2005) model for tenure choice. Finally, it is obvious that renting is more dominant in bigger towns than in countryside.

Table 1: Descriptive statistics for a 20 per cent random sample of Danish households

Equivalent disposable household income/No. of observations	**< 100,000 DKK**		**100,000–275,000 DKK**		**275,000 DKK <**	
	29,110	**7,018**	**158,653**	**133,965**	**10,876**	**51,135**
	tenant	**owner**	**tenant**	**owner**	**tenant**	**owner**
breadwinner is a man	0.99	1.04	0.87	1.16	0.93	1.01
married/cohabitating	0.78	1.91	0.61	1.46	0.77	1.05
duration of marriage[1)]	27.6	30.2	22.4	21.4	19.4	21.4
widow	0.99	1.05	1.22	0.74	1.00	1.00
divorced	1.05	0.78	1.34	0.60	1.41	0.91
single	1.11	0.54	1.26	0.70	1.70	0.70
age of breadwinner[1)]	46.6	55.8	49.5	49.9	47.4	50.5
breadwinner is wage earner	1.00	1.02	0.87	1.16	1.02	1.00
unemployed	1.04	0.83	1.29	0.66	1.43	0.91
on sick-leave	0.88	1.49	1.03	0.97	1.04	0.99
social pensioner	1.20	0.18	1.72	0.15	2.65	0.65
pre pensioner	0.99	1.06	1.52	0.39	1.52	0.89
old age pensioner	0.94	1.27	1.17	0.80	0.98	1.00
early old age pensioner	0.79	1.86	0.78	1.26	0.81	1.04
self-employed	0.74	2.07	0.56	1.52	0.78	1.05
undergoing education	1.15	0.37	1.43	0.50	1.04	0.99
with final education	0.92	1.31	0.86	1.16	0.96	1.01
immigrant	1.12	0.48	1.41	0.51	1.45	0.90
descendant of immigrant	1.12	0.50	1.30	0.65	1.68	0.85
living in Copenhagen area	1.15	0.36	1.40	0.24	1.68	0.85
town above 100,000 inhab.	1.14	0.43	1.23	0.72	1.12	0.94
town 50,000-99,999 inhab.	1.11	0.53	1.08	0.91	0.85	1.03
town 20,000-49,999 inhab.	1.09	0.63	1.11	0.87	0.87	1.02
town 0-19,999 inhabitants	0.72	2.14	0.64	1.42	0.76	1.01

Notes: Personal characteristics are those of the breadwinner of the household. The figure indicates the importance of each characteristic within each income fraction and housing type. E.g. calculated as the renter fraction among widows in the group divided by the renter fraction for all households in the income group. 1) Average years. The translation from Danish is sygedagpenge = on sick-leave, kontanthjælp = social pensioner, førtidspension = pre pensioner, folkepension = old age pensioner, efterløn = early old age pensioner, selvstændig = self employed, erhvervskompetencegivende uddannelse = with final education.
Source: A 20 per cent sample of Danish households. January 2004.

It is equally interesting to look at the app. 20 per cent of high income households (above 275,000 DKK equivalent disposable household incomes) who demand rented dwellings in spite of their ability to buy. Table 1 gives some characteristics of high income tenants. Obviously, many divorced

and single persons are found in the group. As shown by Bech-Danielsen and Gram-Hansen (2006), one part of a divorced couple often moves into a rental home until a more permanent new life has been established, also when there are economic means for buying. High income single persons may have similar reasons for rental demand, but a single life with freedom from repair work and maintenance is no doubt also an important reason for rental demand in this group. It is not surprising to find unemployed, social pensioners, pre pensioners and immigrants as typical tenants; it is more surprising to find them among high income earners. But as one can see from table 2.c they constitute only 3 to 4 per cent of the group. Hence, one should not attach much importance to the high ratios for these types of breadwinners.

The homeownership rate for all homes (households) in the (cleaned) sample of table 1 is only 49 per cent compared to close to 54 per cent in figure 1 (excl. cooperative owning). This is somewhat surprising and indicates that our "cleaning" of the sample has missed a number of "curious" tenants compared to the data used for figure 1.

4. Estimating and predicting rental demand

The random sample of Danish households presented above is a January 2004 snapshot, simultaneously influenced by supply and demand, which again is influenced by relative prices and price expectations. To interpret the observations as a picture of demand is therefore somewhat crude, and section 2 indicated that the 2004 picture may have been influenced by some supply shortage from the 1990s, especially of the typical owner-occupied detached and semi-detached dwellings. If this is the case, a long term equilibrium where supply is elastic may give a higher homeownership rate[4], which in the future will be helped by an increasing fraction of older ownership demanding generations. But increasing welfare and changing family lifestyles also gives increasing rental demand from earlier separation of children from their parents and a tendency for more single living. With all this in mind we dare to assume that the 2004 picture can be used as a long term equilibrium picture under elastic supply conditions: In the following text, it will be the basis for prediction of long term demand trends, assuming an elastic supply and that cross section results can be useful not only under structural changes, but also when the real income grows.

[4] This is the forecast adjustment to equilibrium proposed by Hendershott and Weicher (2002).

All predictions of future residential demand rely heavily on demography, see Mankiw and Weil (1989), Macpherson and Sirmans (1999), Hendershott and Weicher (2002), AE-rådet (2004) and Socialministeriet (2006). However, as stressed by Hendershott and Weicher (2002), major policy and structural shifts must be added to demography to avoid errors. In the present paper, the balance between renting and owning is the core of the prediction, and the influence of structural trends on this balance is sought. Policy changes are not incorporated, and the estimated number of rented dwellings will be a final back-of-the envelope calculation.

To start the exercise, three logit regressions on rental demand versus home ownership have been run on the above specified income groups in the 20 per cent sample. The table 2.a-c shows the result.

Table 2.a: Logit on rental choice for households with equivalent disposable income below 100,000 DKK.

Variable	**Mean**	**Coefficient**	**dy/dx**
Log equivalent disposable household income	11.18	0.2150***	0.0240
Breadwinner is wage earner	0.23	Ref.	Ref.
is self employed	0.04	-0.4331***	-0.0558
is social benefit recipient	0.28	1.0617***	0.1010
is old age pensioner	0.32	0.8735***	0.0875
is early old age pensioner	0.03	0.8136***	0.0680
is undergoing education	0.10	0.3821***	0.0381
Breadwinner has final education	0.28	-0.3215***	-0.0379
is immigrant	0.13	1.0331***	0.0875
Age of breadwinner (abw)	48.46	-0.1350***	-0.0150
abw squared	2910.97	0.0012***	0.0001
Married/cohabitating	0.25	Ref.	Ref.
widow	0.16	0.1928***	0.0205
divorced or single	0.58	0.6307***	0.0735
Duration of marriage (dm)	5.82	-0.0618***	-0.0069
dm squared	250.08	0.0009***	0.0001
living in the Copenhagen area	0.33	Ref.	Ref.
in towns above 100,000 inhabitants	0.16	-0.3159***	-0.0382
in towns 50,000-99,999 inhabitants	0.05	-0.4171***	-0.0535
in towns 20,000-49,999 inhabitants	0.14	-0.5710***	-0.0741
in towns 0-19,999 inhabitants	0.33	-2.0160***	-0.2934

Notes: See notes to table 1. Covers 35,961 households because the Stata program reduces the sample slightly. Mean column is mean log income (mean income is DKK 77,951), mean years and the fraction of the group with the stated characteristic respectively. Significance at 1% level: ***. Pseudo $R^2 = 0.26$.
Source: A 20 per cent sample of Danish households. January 2004.

Table 2.b: Logit on rental choice for households with equivalent disposable income 100,000-275,000 DKK.

Variable	**Mean**	**Coefficient**	**dy/dx**
Log equivalent disposable household income	11.99	-2.8146***	-0.6941

Breadwinner is wage earner	0.59	Ref.	Ref.
is self employed	0.03	-0.6868***	-0.1697
is social benefit recipient	0.13	0.8152***	0.1879
is old age pensioner	0.20	-0.1201***	-0.0297
is early old age pensioner	0.04	-0.3008***	-0.0749
is undergoing education	0.001	-0.5074***	-0.1262
Breadwinner has final education	0.56	-0.2615***	-0.0643
is immigrant	0.06	0.7768***	0.1772
Age of breadwinner (abw)	49.66	-0.0430***	-0.0106
abw squared	2783.01	0.0004***	0.0001
Married/cohabitating	0.41	Ref.	Ref.
Widow	0.13	0.3197***	0.0773
divorced or single	0.47	0.8284***	0.2009
Duration of marriage (dm)	8.08	-0.0495***	-0.0122
dm squared	274.90	0.0008***	0.0002
living in the Copenhagen area	0.26	Ref.	Ref.
in towns above 100,000 inhabitants	0.11	-0.6564***	-0.1626
in towns 50,000-99,999 inhabitants	0.04	-1.0382***	-0.2505
in towns 20,000-49,999 inhabitants	0.17	-0.8841***	-0.2173
in towns 0-19,999 inhabitants	0.42	-1.9413***	-0.4495

Notes: See notes to table 1. Covers 292,542 households because the Stata program reduces the sample slightly. Mean column is mean log income (mean income is DKK 166,446), mean years and the fraction of the group with the stated characteristic respectively. Significance at 1% level: ***. Pseudo $R^2 = 0.28$.
Source: A 20 per cent sample of Danish households. January 2004.

Table 2.c: Logit on rental choice for households with equivalent disposable income over 275,000 DKK

Variable	**Mean**	**Coefficient**	**dy/dx**
Log equivalent disposable household income	12.99	0.1941***	0.0258
Breadwinner is wage earner	0.84	Ref.	Ref.
is self employed	0.12	-0.2488***	-0.031
is social benefit recipient	0.04	0.4478***	0.0683
Breadwinner has final education	0.79	-0.2039***	-0.0280
is immigrant	0.03	0.2541***	0.0366
Age of breadwinner (abw)	47.33	-0.0572***	-0.0076
abw squared	2348.69	0.0004***	0.0001
Married/cohabitating	0.72	Ref.	Ref.
divorced or single	0.28	0.3543***	0.0498
Duration of marriage (dm)	13.62	-0.0491***	-0.0065
dm squared	371.34	0.0011***	0.0001
living in the Copenhagen area	0.18	Ref.	Ref.
in towns above 100,000 inhabitants	0.06	-0.4978***	-0.0569
in towns 50,000-99,999 inhabitants	0.02	-0.9163***	-0.0897
in towns 20,000-49,999 inhabitants	0.13	-0.8192***	-0.0886
in towns 0-19,999 inhabitants	0.60	-1.0291***	-0.1474

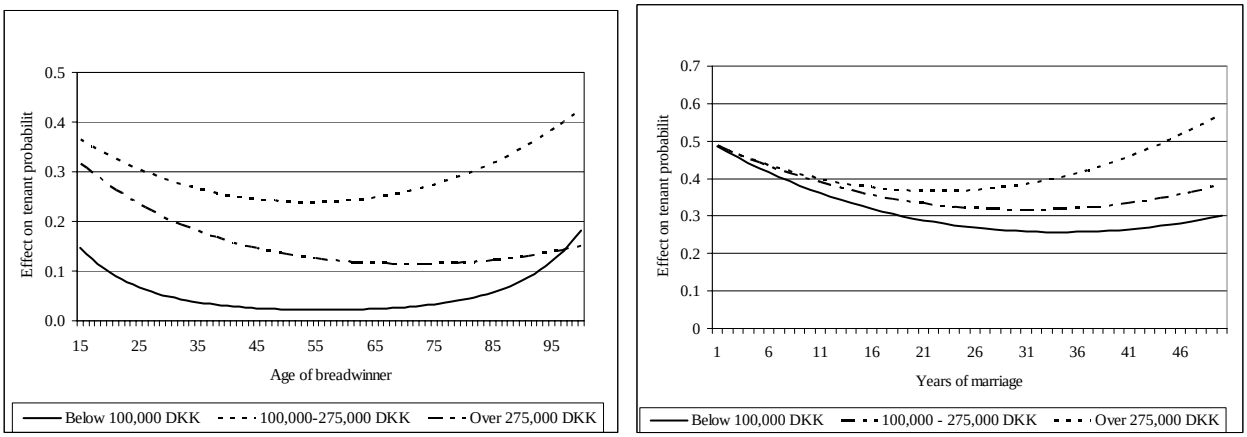
Notes: See notes to table 1. Covers 54,604 households because the Stata program reduces the sample slightly. households of the sample. Mean column is mean log income (mean income is DKK 486,305), mean years and the fraction of the group with the stated characteristic respectively. Significance at 1% level: ***. Pseudo $R^2 = 0.07$.
Source: A 20 per cent sample of Danish households. January 2004.

The regressions repeat the picture of figure 7: only in the middle income group do we see the expected negative relation between income and rental demand, and both above and below the middle income bracket are coefficients so small that income changes are literally without effect on the housing choice. The semi elasticity in the middle income bracket is estimated to – 0.0069, which is fairly close to the one calculated from figure 7. Hence, based on cross section data, a 10 per cent increase of the equivalent disposable household income gives a 7 percentage points drop in rental demand (probability).

One could also note that being (early) old age pensioner increases rental demand for the low income group, but reduces it for the middle income group and is dropped from the high income regression group because of insignificant effect.

Looking at fractions (means) reveals that all breadwinners under education are in the low income group where they demand rental housing (in fact there are none in the high income group, which is why it has been dropped from the regression). When final education is achieved, this reduces rental demand for all income groups.

Figure 8: Effect from age and marriage duration on probability of being a tenant



Note: Effects are calculated using coefficients from table 2. The left panel shows the age effect and the right panel the marriage duration effect.
Source: Table 2, a-c.

Age and duration of marriage influence rental demand in a pattern shown in figure 8. The shapes of the graphs are as expected, but it is difficult to find good reasons why the tenancy probability effect

from age and marriage duration increases with income. Single living as a divorced or unmarried person clearly increases rental demand in all income groups, and this is also the case for widows in the middle and low income groups.

Finally, rental demand falls for all income groups the further one travels from bigger cities and into the countryside.

Table 3: Probabilities for renting

Equivalent disposable households income	Reference breadwinner	Average breadwinner
below 100,000 DKK	0.8404	0.8720
100,000-275,000 DKK	0.7104	0.5584
over 275,000 DKK	0.3036	0.1581
Total	0.6646	0.5308

Source: See previous tables.

The reference person in table 3 is a breadwinner who is a wage earner with equivalent disposable household income equal to the mean for the respective group, without final education, non-immigrant, of average age, married/cohabitating with average duration and living in the Copenhagen area. An average person is a breadwinner who takes all the specified mean values of table 2. Hence, in the low income group, renting probabilities are lifted e.g. because of high mean values for social benefit recipient and old age pensioner. For the higher income groups, renting probability is reduced e.g. because of less single and more countryside living.

Prediction method

Predictions are made by plotting estimated future mean values in the regression equations. This requires some good and consistent guesses about future developments of the variables based on structural developments as illustrated in section 2 and in the appendix.

Before discussing appropriate values for a prediction, the technique will be described briefly. Table 4 shows how a ten per cent increase in the (real) equivalent disposable household income influences demand when three different techniques are employed.

Table 4: Prediction methods for a 10 per cent increase of equivalent disposable household income

Equivalent disposable households income	Actual values			10 per cent increase of equivalent disposable households income		
	Mean probability[1)]	Mean of transformed prob.	Average breadwinner	Mean probability	Mean of transformed prob.	Average breadwinner
below 100,000 DKK	0.8057	0.8917	0.8720	0.8080	0.8932	0.8743
100,000-275,000 DKK	0.5421	0.5677	0.5584	0.4976	0.5115	0.4861
over 275,000 DKK	0.1771	0.0093	0.1581	0.1796	0.0106	0.1606
Total	0.5148	0.5185	0.5308	0.4814	0.4759	0.4761

Note: 1) The shown probabilities are the means of predicted probabilities, which are equal to tenant fractions calculated on the observations.
Source: See previous tables.

Prediction by *means of probabilities* implies calculation of predicted probabilities for all households and then calculating the average of these, see column 2 of table 4. This method reproduces the actual mean values for the dataset and so is most reliable. The second method by *means of transformed probabilities* calculates the predicted probabilities $\hat{p}$ for all households and uses the rule: if $\hat{p} < 0.5 \Rightarrow \hat{p} = 0$ (*owner*) else $\hat{p} = 1$ (*tenant*). The average tenant fractions are subsequently calculated. This method gives fairly wrong predictions for the non-medium income groups, especially for the high income group, see the third column of table 4. Finally, prediction using the *average breadwinner* for the three income groups gives the predicted renting probability for the *average breadwinner*; see table 3 and the fourth column of table 4. Also this method yields some deviations from the actual fractions, but less than the means of transformed probabilities method. Hence, judged by the outcome of table 3, the means of probabilities method is better than the average breadwinner method, which is better than the means of transformed probabilities method.

However, it is difficult to use the means of probabilities and the means of transformed probabilities methods, because a number of important variables behind the tenure choice are binary which implies that "correct" new values would have to be inserted for every household. This is not possible and hence, the average breadwinner method will be used in the following with new (future) mean values inserted into the regression equations for the three income groups.

To get a grasp of the prediction abilities, table 4 also shows the outcome of a ten per cent increase of the (real) equivalent disposable household income using the three methods. As indicated in figure 7, this gives literally no change in the demand for rental housing for the non-medium income groups, but a good 8 per cent reduction of rental demand for the medium income group using the means of probabilities method, close to 10 per cent reduction using the means of transformed probabilities method, and close to 13 per cent reduction in rental demand using the average breadwinner method[5]. This indicates that the method used may tend to overshoot the negative effect on rental demand from an income increase.

Predicting rental demand for 2020

The following prediction of rental demand for the year 2020 is first and foremost a prediction of the rental share of housing demand; but when this is done a back-of-the-envelope calculation is used for an estimation of the number of rental dwellings. The prediction is a long run prediction that implicitly assumes that supply will follow demand elastically. However, as indicated earlier, the rental demand was probably on the high side at the outset, because the 2004 picture used in the regression on which the prediction is based is somewhat influenced by a lack of supply of dwellings typical for ownership.

The new (future) mean values are intended to catch the trends discussed in the preceding sections in interaction with demographic and economic trends. No housing policy changes are incorporated.

The first step is to insert a sensible (real) equivalent disposable income for 2020 households, which involve both a guess on income developments, income taxes and future demographic structures. A shortcut is to look at recent developments of the equivalent disposable household income as shown in figure A.1[6] and extend the trend into the future. Over the years 1996 to 2005, tenants' real income showed an annual increase of 3.3 per cent compared to an annual real income increase for owners of 2.2 per cent without capital gains. However, comparing figure A.1 with A.2 reveals that the development in real private consumption nicely follows the trend in the calculated real disposable household incomes, but housing consumption develops much more modestly, around 0.7

[5] Due to the non-linearity of the logit function this is more than the income elasticity of table 2.b indicates.

[6] Figures with an A are found in the appendix.

per cent annual increase. Based on this, it seems wrong to use the income trend combined with the cross section income coefficients (elasticities) of table 2.a-c for predictions. Furthermore, taking into account that real income developments have been fairly high in recent years, only a 0.5 per cent annual increase has been used to calculate the mean value for 2020 equivalent disposable incomes for all three income groups in table 5.

An income increase of this kind will of course imply that some households flow from the two lower income groups and into higher ones. For the low income households who pass the separating income threshold and enter the medium income group this will reduce rental demand compared to predictions. However, for middle income households who pass the separating income threshold and enter the high income group, rental demand will not be as low as predicted. Taking the number of households into account, there tends to be an underestimation of the rental demand. Another factor that is left out is a recent tendency towards increased income dispersion among Danish households. However, because of insufficient evidence on future developments in this area it has not been incorporated in the 2020 values in table 5.

Demographic developments - see the prognosis from Statistics Denmark in table A.3 - show a remarkable increase in the fraction of persons of age 65+ from 15.3 to 20.6 per cent of the Danish population between 2007 and 2020. This is an annual increase in the fraction of 2.3 percent over 13 years, which is used for the future values of old age and early old age pensioners in table 5. Note that this increases the rental demand for the low income group, but reduces rental demand for the big middle income group and has no influence on rental demand in the high income group. The net effect is a reduction in rental demand, which hopefully reflects the future trend of figure 3.

Figure A.3 also shows an increase in the fraction of young people aged 20-29 from 11.4 to 12.7 per cent over the 13 years. Moreover figure A.4 reveals steadily rising educational enrolment rates. Both tendencies have been taken into account in the new value for persons undergoing education in table 5. Figure A.4 also shows a steady increase in the number of persons with final education among those aged 25 to 69. If this continues, the future mean values for breadwinners with final education shown in table 5 will ensue. The high mean value in the high income group is probably approaching a limit and may be a little high.

The share of immigrants, see table A.5, will approach 8 per cent of the population in 2020 according to the prognosis from Statistics Denmark, implying an annual increase in the share of 1.4 per cent. This has been used to calculate the 2020 mean values in table 5.

Figure A.6 shows the future average age of the population aged 25 years and more. Between 2007 and 2020 it will rise from 51.2 to 53.7 years. Based on this the future age of breadwinners is set between 50 and 53 years in 2020. However, this change has only a modest impact on the renting probability as can be seen from figure 8.

Table 5: Year 2004 and expected year 2020 mean values

Equivalent disposable household income	< 100,000 DKK		100,000-275,000 DKK		275,000 DKK <	
Year	2004	2020	2004	2020	2004	2020
Log equivalent disposable household income	11.18	11.26	11.99	12.07	12.99	13.07
Breadwinner is wage earner	0.23	0.18	0.59	0.50	0.76	0.73
is self employed	0.04	0.02	0.03	0.03	0.12	0.11
is social benefit recipient	0.28	0.15	0.13	0.12	0.04	0.04
is old age pensioner	0.32	0.46	0.20	0.29		
is early old age pensioner	0.03	0.04	0.04	0.06		
is undergoing education	0.10	0.15	0.001	0.001		
Breadwinner has final education	0.28	0.34	0.56	0.69	0.79	0.96
is immigrant	0.13	0.16	0.06	0.07	0.03	0.04
Age of breadwinner (abw)	48.46	51.39	49.66	52.66	47.33	50.19
abw squared	2910.97	3205.56	2783.01	3084.72	2348.69	2798.52
Married/cohabitating	0.25	0.20	0.41	0.35	0.69	0.66
widow	0.16	0.13	0.13	0.10		
divorced or single	0.58	0.67	0.47	0.55	0.28	0.32
Duration of marriage (dm)	5.82	5.82	8.08	8.08	13.62	13.62
dm squared	250.08	250.08	274.90	274.90	371.34	371.34
living in the Copenhagen area	0.33	0.34	0.26	0.27	0.19	0.20
in towns above 100,000 inhab.	0.16	0.16	0.11	0.11	0.06	0.07
in towns 50,000-99,999 inhab.	0.05	0.05	0.04	0.04	0.02	0.02
in towns 20,000-49,999 inhab.	0.14	0.14	0.17	0.17	0.13	0.13
in towns 0-19,999 inhabitants	0.33	0.31	0.42	0.41	0.60	0.59

Source: See previous tables and the text.

As shown in figure 6, there seems to be an ongoing trend for more single living, and figure A.7, moreover, shows a tendency for an increased share of unmarried and divorced persons, and a fall in the share of married or cohabitating couples. More surprising is the slight decline of the share of widows.

No statistics on marriage duration has been found, but the duration of marriage for couples who divorce seems to be approaching a low point. Moreover, longer living by itself must bring about longer marriages. Based on this, the safest strategy is probably not to change the mean marriage duration between 2004 and 2020.

Finally, figure A.8 shows recent developments in urbanity fractions of the Danish population. Since the 1990s, people have moved from the countryside towards towns, with an inflow most pronounced for towns with more than 100,000 inhabitants. Contrary to this, the Copenhagen area saw a relative drop from the 1980s and into the 1990s, but has since witnessed a relatively increasing population. The presumption is that the Copenhagen area and the bigger towns will increase their share in the future towards the year 2020 as shown in table 5.

Table 6: Year 2004 and year 2020 prediction of rental demand

	Tenancy probabilities for the average breadwinner		Demanded rental dwellings based on 2004 sample size	
Year	2004	2020	2004[2)]	2020
Below 100,000 DKK	0.8720	0.8804	31,358	31,660
100,000-275,000 DKK	0.5584	0.5105	163,356	149,343
Over 275,000 DKK	0.1581	0.1631	8,633	8,906
Total	0.5308	0.5045[1)]	203,346	189,909
Homeownership rate			0.47	0.50

Note: 1) calculated on the 2004 sample weights. 2) As calculated from column 2 probabilities.

Source: See the text and previous tables.

Based on the year 2020 values in table 5, table 6 shows the predictions. The demand for rental dwellings is higher for the low income group primarily because of an increase in the fraction of elderly and persons undergoing education. For the big medium income group, rental demand is decreasing because of the estimated increase in the equivalent real disposable household income, which dominates other effects, e.g. increasing rental demand from one-person households. Increased income raises rental demand for the high income group, and so does increased single

living. But the estimated increased educational level and age of the average breadwinner lowers rental demand. In total, one should expect to see a decreasing rental share in years to come and an increase in the Danish homeownership rate. The specific structural demand factors studied above in section 2 will affect future demand, but it will be a surprise if the homeownership rate does not pick up in the future and thereby follows the trend seen in most other European countries.

A back-of-the-envelope calculation of the total demanded rental dwellings in year 2020 could be done by multiplying the numbers[7] in the last column of table 6 by 1.083 (the estimated increase in housing demand based on the figure A.2 trend and used for prediction is 8.3 per cent). This would raise the total number from 189,909 to 205,684 rented dwellings in year 2020, i.e. less than 2,500 new dwellings to be let over 16 years from 2004. Hence, the demand for new rented dwellings will be very modest if not helped by a demand from refurbishment, demolition and conversion of existing rental dwellings into ownership.

5. Conclusions

According to Danish surveys, people's wish for homeownership clearly surpasses the homeownership rate in Denmark, but in spite of this, the rate has shown a declining trend since the turn of the century. Relative prices may have favoured renting somewhat, but with reduced first year payments for owners and possible real capital gains, "perceived" relative prices may not have changed at all. However, a low supply of the typically owned detached and semi-detached dwellings in the 1990s, and improved welfare in terms of increasing real household income accompanied by a number of structural factors that in total increase the demand for rental dwellings seem to explain the curious Danish development. Among structural demand factors are an increasing fraction of older people who demand owned homes, but also an increasing rental demand from more persons of age 80+ who demand rental dwellings. Furthermore, increasing rental demand from earlier separation of children from their parents and an increasing tendency towards more single living have emerged. Using a 20 per cent sample of Danish households, it is shown that the shift from renting to ownership occurs for households with equivalent disposable income in the 100,000-275,000 DKK bracket where higher equivalent income clearly reduces rental demand.

[7] Because the 20 per cent sample has been cleaned for unusual observations, the numbers and calculations presented are not exact, but give an indication of the future demand for rented dwellings.

Based on this, three cross section logit regressions were run for the low, the middle and the high equivalent disposable income groups. The regression equations were subsequently used for prediction of the future rental demand and homeownership rate. The result indicates that one should expect to see a stagnant rental demand in years to come and an increase in the Danish homeownership rate in line with the trend in most other European countries. However, specific structural factors will continue to affect future rental demand, which will come mainly from an increasing fraction of old persons and from young people undergoing education.

References

AE-rådet (2004): Ledige almene boliger og årsager hertil. October 2004. Copenhagen.

Bech-Danielsen, Claus and Kirsten Gram-Hansen (2006): Boligsituationen omkring skilsmisser (Housing when divorcing). *Byplan*, No. 4 October.

Byforum (2001): *Det danske boligmarked – udvikling i boligforsyning og boligønsker*. Projekt nr.: F8-156. Februar-juni 2001. Copenhagen.

Boverket (2005): National Board of Housing, Building and Planning: *Housing statistics in Europe 2004*. Sweden.

Hansen, J.D. and M. Skak (2005): *Economics of Housing Tenure Choice*. Working paper. Odense: University of Southern Denmark, Department of Business and Economics.

Hendershott, Patric H. and John C. Weicher (2002): Forecasting Housing Markets: Lessons Learned. *Real Estate Economics*. Vol. 30, No. 1, pp. 1-11.

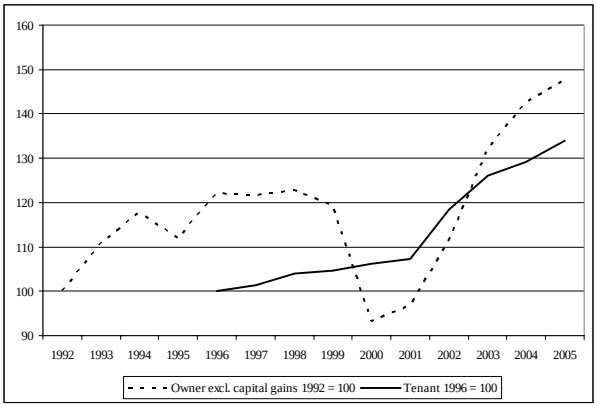
Macpherson, David A. and G. Stacy Sirmans (1999): Forecasting Senoir Housing Demand in Florida. *Journal of Real Estate Portfolio Management*, pp. 259–74.

Mankiw, N. Gregory and David N. Weil (1989): The Baby Boom, the Baby Bust, and the Housing Market. *Regional Science and Urban Economics*. Vol. 19, pp. 235-58.

Socialministeriet (2006): Ministry of Social Affairs: *Den almene boligsektors fremtid*. Copenhagen.

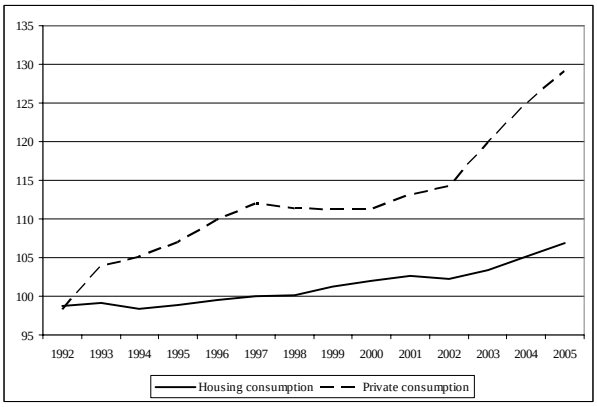
Appendix

Figure A.1: Development of equivalent disposable household incomes



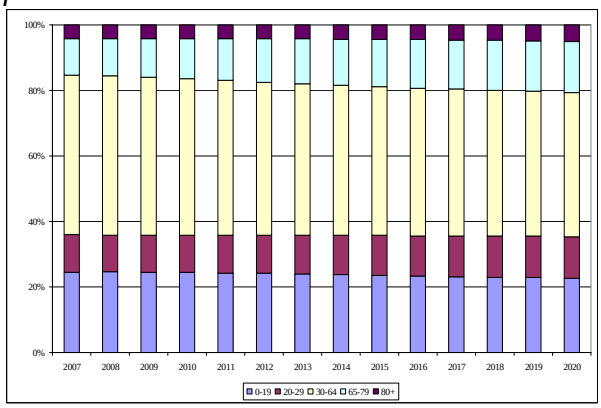
Note: The equivalent disposable household incomes have been deflated by user costs for owners and rents for tenants.
Source: Statistics Denmark. Statistikbanken.

Figure A.2: Development of real housing consumption and total private consumption



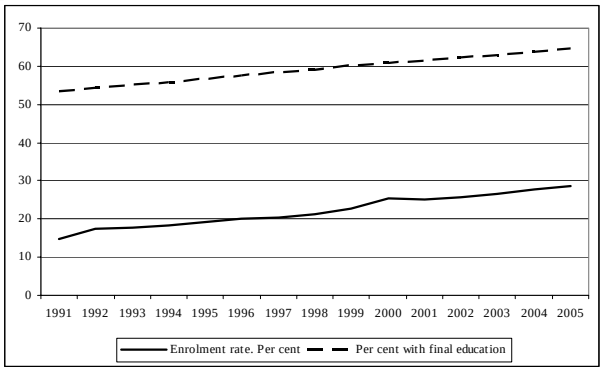
Note: The graphs show the development in constant 2000 prices. Data are from national accounting.
Source: Statistics Denmark. Statistikbanken.

Figure A.3: Future development of age group fractions



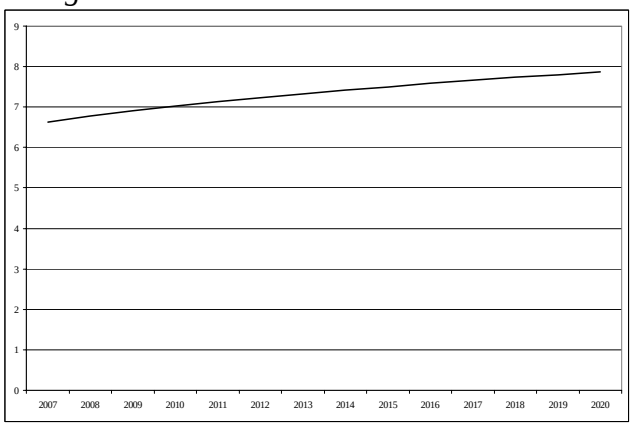
Note: Developments follow the 2007 demographic prognosis from Statistics Denmark.
Source: Statistics Denmark. Statistikbanken.

Figure A.4: Enrolment and educational rates, per cent



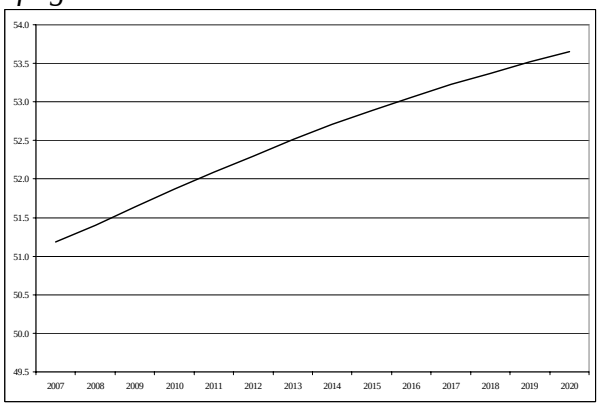
Note: The enrolment rate is the number of persons starting (or restarting) a final education as a percentage of all persons aged 18 to 25 years. The percentage with final education is calculated among persons aged 25 to 69 years.
Source: Statistics Denmark. Statistikbanken.

Figure A.5: Future population share of immigrants. Per cent



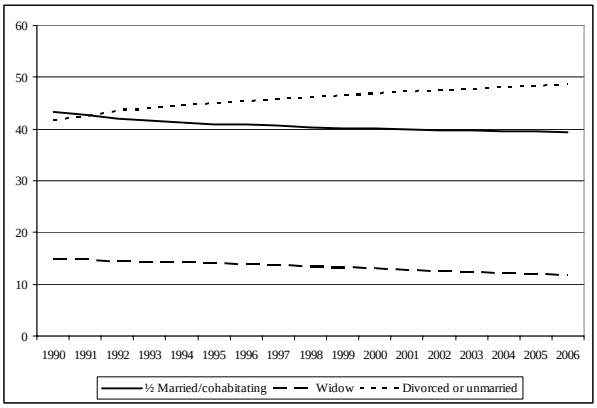
Note: Developments follow the 2007 demographic prognosis from Statistics Denmark.
Source: Statistics Denmark. Statistikbanken.

Figure A.6: Future average age of population of age 25+



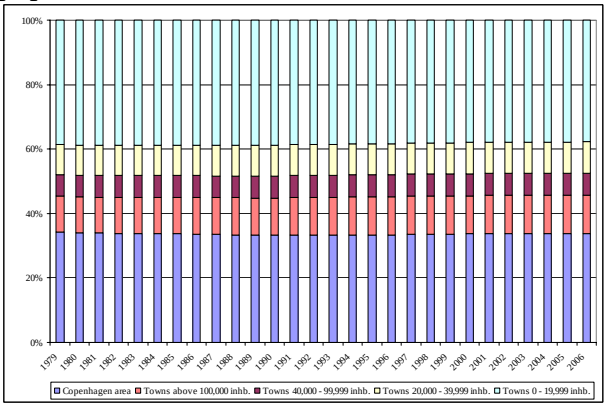
Note: The graph shows the average age of the population of age 25 and above. Developments follow the 2007 demographic prognosis from Statistics Denmark.
Source: Statistics Denmark. Statistikbanken.

Figure A.7: Civil status of Danish population of age 25+. Per cent



Note: The graphs show fractions among the population of age 25 and above. The number of persons married or cohabitating has been divided by two.
Source: Statistics Denmark. Statistikbanken.

Figure A.8: Urbanity fractions of the Danish population



Note: The graphs show fractions of population living in different urbanisation areas.
Source: Statistics Denmark. Statistikbanken.