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Distributions of owner-occupiers' housing wealth, debt and interest expenditure ratios as financial soundness indicators

Abstract:

The Danish housing market boomed from 1993 to the end of 2006. The house price increases from 2003 to 2006 were especially dramatic and cannot be explained satisfactorily by “fundamentals”. Moreover, the owner-occupiers are highly indebted; Denmark is the nation with the highest household debt/GDP, highest total liabilities/net wealth and highest mortgage debt/net non-financial wealth ratios among 15 OECD countries. Obviously, an analysis of the financial soundness of owner-occupiers is topical in order to analyse financial stability in society.

The financial soundness of Danish owner-occupier families is analysed using relevant financial indicators for the owner-occupiers' capital structure and interest payments. Tax statistics for the owner-occupier families are used here. In a financial soundness perspective macro data are of limited importance as they express total and average changes. Distributional data at the micro level, formed at the family (household) level, are important for recognizing changes in the financial soundness of the nation. The data are used to estimate important financial indicators as debt/income, housing wealth/income, debt/housing wealth and net interest expenditure/income ratios for the families' total financial situation and capital structure.

The result is that the financial soundness of Danish owner-occupiers, measured as net liability housing wealth ratios, has not improved since the owner-occupation crisis in the years 1987-1993. Furthermore, their housing wealth/income and net liability/income ratios have increased since 1993 to “all-time high” levels, just as in the other OECD countries; net interest expenditure/income ratios have been reduced in a before-tax perspective, but not much in an after-tax perspective. The substantial heterogeneity of the families is considerably reduced by adjusting for age as a proxy for the life cycle. Moreover, the income variation is also reduced considerably within each age group.

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1. The Danish housing market is on a knife edge: steeply rising prices have peaked and owner occupiers' debt level is high.

Danish housing prices have been rising for a remarkably long period and the dramatic increases up to the middle of 2006 were among the strongest in Europe, as remarked internationally, (Ball, 2007; Girouard et al., 2006). Housing price statistics for 2005 and 2006 show examples of inflation rates slightly above 25 % for houses, flats as well as summer houses.

Moreover, the strong rise in the Danish housing prices 2003-2006 cannot be explained satisfactorily by "fundamentals" (Økonomi- og Erhvervsministeriet, 2007). Already in October 2006, IMF concluded in an Article IV report on Denmark that: "*All this indicates that the recent increase in house prices cannot be fully explained by general variables such as income, interest rates, and demographics, and should at least in part be attributed to other factors*", see IMF (2006, p. 31). Moreover, the Danish housing market has fulfilled bubble criteria put forward by Case and Shiller (2003), (Lunde, 2007). Actually, Danish housing market prices seem to have crossed the peak. In the last quarter of 2006, prices dropped by 2.0% for houses, 2.8% for flats and 4.0% for summer houses in accordance with Statistics Denmark price indices.

Danish owner-occupiers have access to one of the most efficient mortgage systems in the world (Mercer, 2003; Pannell, 2003). Moreover, Denmark is the nation with the highest household debt/GDP ratio, highest household debt/disposable income ratio, highest total liability/net wealth ratio and highest mortgage debt/net non-financial wealth ratios among the 15 OECD countries analysed (Girouard et al., 2007; OECD, 2006b)¹. Only Iceland and the Netherlands had a slightly higher residential mortgage debt/GDP ratio in 2005, (EMF, 2006). These facts document the need for an analysis of the financial stability of one of the owner-occupier sectors with highest debt level.

The rise in housing prices, mortgages and other household debt to historical levels in several countries, the establishment and expansion of mortgage systems as well as the rapid introduction of new mortgage loan types have been seen in many countries (OECD, 2006a). Therefore, international economic organizations have analysed housing related risk in a financial stability framework. It is annoying to find conclusions in OECD papers, where "*... – dependent on the assumptions adopted – Denmark has the greatest risk of nearing a house price peak, followed by Ireland, Sweden and France.*" (OECD, 2006, p. 53), where Denmark and New Zealand at "*a 1 or 2 percentage-points hike in long-term interest rates from their levels observed in the fourth quarter of 2005*" have "*the probability of a downturn in house prices in real terms ... close to 50 %*" (van den Nord, 2006, p 3), and where Denmark is now in the highest risk class, together with United States and France in OECD's Economic Outlook from November 2006 (OECD, 2006b, p.55).

However, all hope has not vanished for Danish housing prices making a "soft landing", but as formulated by Girouard et al. (2006, p.4): "*If house prices were to adjust downward, possibly in response to an increase in interest rates or for other reasons, the historical record suggests that the drops (in real terms) might be large and that the process should be protracted, given the observed stickiness of nominal house prices and the current low rate of inflation. This would have implications for activity and monetary policy.*"

In Denmark, important and effective restrictions on the access to mortgage loans for owner-occupiers were relaxed through 1992-1993. Afterwards, established owner-occupiers were allowed

¹ In practice, the references are identical. Only the first reference will be mentioned below.

to withdraw equity when raising ordinary mortgages, and the maximum loan term was increased to 30 years in general. Still, only mortgages with fixed interest rates throughout the term were issued to owner-occupiers. Therefore, on an increasing yield curve, debtors had to pay relatively high interest rates and even include an implicit premium for the right to prepay the loans at price 100.

The introduction of adjustable interest rate mortgages (ARM) in 1996 and of interest-only mortgages (IO) in 2003 made it possible for owner-occupiers to reduce payments considerably when remortgaging. At the end of March 2007, the ARM loan type covered 46% of the owner-occupiers' outstanding mortgages, while IO mortgages covered 40%. One-third of the IOs carry fixed interest rates and two-thirds have adjustable-interest rates. Part of the ARMs – both ordinary and IOs – have a cap rate of 5 or 6 %. Currently, the ARM's share of owner-occupier mortgages is decreasing slightly, while the IO's share is increasing slightly (Danmarks Nationalbank, 2007a).

2. The risk of a new housing market crisis and the need for analysing the financial soundness of the owner-occupation market.

Over the last three decades Denmark has experienced two housing market crisis: 1979-1983 and 1987-1993 with more than 10,000 foreclosures annually. Especially the last housing market crisis was an important contributor to the period's financial crisis in Denmark (and Scandinavia). The latest developments in housing prices and owner-occupiers' debt indicate that the housing market has moved into a risky position and, and the international economic organisations have pointed out, the housing related risks have increased remarkably. Therefore, the need to analyse the financial soundness among the Danish owner-occupiers seems obvious. This also involves analysing the threat from the housing market against stability in the financial system and in society. Data in the analysis below cover the years 1987-2005.² However, the results indicate that preliminarily, it could be meaningful to extrapolate the results.

The increases in the Euro interest rates since 2005 have been "shadowed" in the Danish rates and have contributed to the actual drops in housing prices, and further increases in interest rates will effectuate increased downward pressure on housing prices.

Housing crises and banking crises "*are correlated in a remarkable number of instants*" (Herring and Wachter, 2003, p. 217), but such crises represent low-frequency shocks in the economy, and when the subjective probability falls below a certain threshold, it is treated as if it were zero. In the statistical confidence approach a low risk is accepted if it is known that the figure falls inside a confidence limit of 95% or 99%. However, in fact, bad outcomes will be actualized in 5% and 1% of the cases respectively.

Touching upon this "disaster myopia" approach, Herring and Wachter conclude: *Although standard practices are helpful in monitoring, pricing, and provisioning for high-frequency shocks, they are not useful in controlling exposure to a low-frequency hazard because the shock occurs so infrequently that it will not be captured in the usual reporting period. Indeed, the absence of bad outcomes in the accounting data may intensify pressure to reduce default premiums and reserves.*" (Herring and Wachter, 2003, p. 222).

² Income taxation for 2006 is not finalized.

This resembles a description of the Danish housing market and financial institutions' attitudes in recent years. The general argument is that the Danish economy is behaving very well – this is correct in itself – and that until around the end of 2006 there did not seem to be any threats against the housing market. Fourteen years have passed since the sudden end of the last crisis on the owner-occupation market. Each year new people enter the housing market and new decision makers appear in the lending institutions. The structure of commercial and mortgage banks has been reorganized and new managers and operators are doing the jobs. The continually increasing housing prices and the dropping interest rates after September 11th weakened – together with some specific housing factors – analysts' watchfulness for a collapse in housing prices.

Also pertinent is the risk for intensified competition in the financial sector: “*when disaster myopia sets in, lenders believe that they can accept higher loan-to-value ratios, weaker commitments or guarantees, and looser loan covenants without increasing their risk of loss.*” (Herring and Wachter, 2003, p. 224).

3. The financial stability analysis in this paper.

The aim of the financial stability analysis of Danish owner-occupiers is to analyse the quality of the shelters against a downturn in the housing market they have in 1) their income, to manage to repay the debt, and 2) the market value of their house, flat and/or summer house, as security for their mortgage and other loans. Owners' income and equity are also fundamental if they need to raise new loans to manage possible payment difficulties.

A subordinate aim is methodological, as the analysis has been done at the family level with individual data from the tax statistics register, which are used for distributional analysis.³ Relevant ratios have been formed for each family. The analysis thus satisfies the request for real estate indicators made by BIS in its 384-page proceedings on the issue (BIS, 2005).

No attempt is made in the paper to estimate the possibility of a shock in the economy, which could trigger a housing crisis in Denmark and – possibly – lead to a financial crisis. A shock like this would for the most part be released through the external economic circumstances of the housing market. However, given the booming housing markets in Denmark and some other countries of the last few years, it would be no surprise if a shock were partly released through internal circumstances of the housing market. The widespread discussions on housing price bubbles, as identified for Denmark (Lunde, 2007), can motivate this possibility. However, the appearance and the content of a “trigger factor” will not be discussed further here.

The Danish central bank, similar to other central banks, publishes annual financial stability reports, most recently for 2007 (Danmarks Nationalbank, 2007). In 2001 and before, the analysis of the household sector included distributional tax data similar to the ones used in this paper. In subsequent years, other statistical sources have been used. Especially for 2005, an analysis of the mortgage debt and payments among the customers in the largest Danish mortgage bank was

³ The data in the paper have been made available for this study by “Lovmodelsekretariatet” of the Danish Ministry of Finance. I am very grateful for these data as well as for the important personal support, willingness and enthusiasm I have met from Martin Ulrik Jensen, Ministry of Economics and Business Affairs, who has provided me with the basic statistics. I have also received invaluable support from the head of the secretariat, Peter Bach Mortensen, who contributed with the basic statistics to earlier versions of the paper together with Sune Enevoldsen Pedersen. The views expressed here are those of the author.

presented (Danmarks Nationalbank, 2005). Girouard et al. mention (2007, p. 31): “*Denmark: No micro data were provided for the study*”. A similar note is found in the OECD Committee on Financial Markets paper (OECD, 2006a, p. 5): “*Due to data restrictions it has not been possible to point out the development for lower-income households in the Danish response*”. Important parts of the data demanded are found in this paper.

4. Total or average figures.

Throughout the years with steep increases in housing prices, the media, real estate agents and lenders informed the public that owner-occupiers’ equity was strong. In an international perspective, the “*total household net wealth, reflecting mostly the sharp appreciation of property values and an increase in homeownership rates, ...has risen sharply*” (Girouard et al., 2007, p. 4). An example in the central bank’s monetary review is that the increase in the owner-occupiers’ equities was estimated at 560 Billion DKK in 2005 and 2006 (Danmarks Nationalbank, 2007b, p. 17) – or around a third of GDP.

Less frequently mentioned is the fact that owner-occupiers’ debt increased to a similar degree. Using aggregate values it was calculated that the Danish owner-occupiers’ average net liability/housing wealth ratio was relatively stable during the years 1987-2003, while their average mortgage loan-to-value increased from 1987 to 1995, only to drop back to the original level in 2003 (Lunde, 2005a). According to Girouard et al. (2007, Table 6), the Danish household debt/net wealth ratio dropped from 1995 to 2005; however, only mortgage debt seems to have been included.

Total figures and “*average data... may be more easily available, but may not always be the most relevant, as they may mask differences in vulnerabilities across income groups*” (OECD, 2006a, p. 2). Obviously, average debt/income and debt/housing value ratios (or equity ratios) do not tell much about the more and the most indebted families among owner-occupiers. Distributional changes, according to age, income, region etc., may have appeared; for example, the high income groups may have expanded their housing wealth/income ratios and/or their net liability/income ratios more than the low income groups. In Denmark the owner-occupation ratio has been relatively stable since 1980 but the age composition of the group has changed; owner-occupiers are becoming relatively older as fewer and fewer young families become owner-occupiers (Lunde, 2005b). Moreover, as seen below, the young owner-occupier families have unchanged (high) net liability/housing wealth ratios, while the older owners have become more indebted.

Therefore, individual data to form distributional analyses are necessary to make reliable conclusions on the financial stability in the owner-occupation sector. In an OECD debt analysis from 2006, the individual data used were from household surveys made every three to five years for most countries. In other cases, such information became available through direct contact with lending institutions. (OECD, 2006a, p. 4). Using annual register data for the nations’ entire population would have improved the quality of the analysis considerably. The data in the register for Danish income tax statistics fulfil this demand. These tax register data are used in this paper to form the relevant ratios and the owner-occupiers’ distribution according to these ratios.

5. The data used and ratios presented.

Income tax statistics in Denmark include data on each family’s income, interest income and interest expenditures, housing wealth (publicly assessed property value), financial assets and financial

liabilities. The statistics have made it possible to analyse owner-occupiers' equity-debt structure, as well as interest incomes and interest expenditures since 1987. The Danish tax payers know from experience that the tax authorities' information is rather precise, as the Danish income tax system is relatively efficient. For financial items, the tax authorities receive precise data directly from the financial institutions.

The data used in the study from the tax statistics have been drawn by Lovmodelsekretariatet as a random sample of about one-thirtieth – approximately 40,000 – of all owner-occupier families within each specific year. All in all the numbers and the high data quality ensure the reliability of the results. The statistical sources are presented in detail in Appendix A. In a previous study, the main result from a total census for 1988 was compared with the results from the random sample for 1988. Only very small differences could be observed, which confirms the random sample's reliability (Lunde, 1999).

A few concepts have to be defined. The owner-occupier family's *housing wealth* includes the total value of houses, flats and/or summer houses, owned solely for the purpose of meeting the family's own housing needs. The housing wealth is measured by the publicly assessed property value (see section 7 below). The owner-occupier family's *net liabilities* are equal to their liabilities (mostly mortgages and bank loans) minus their financial assets, all calculated in *market values*. The family's *gross income* includes all family members' incomes. Disposable incomes are not found in tax statistics. Finally, the family's *net interest expenditures* are equal to their interest expenditures minus interest incomes.

These data have been combined in 1) *the housing wealth/income ratio*, 2) *the net liability/income ratio*, 3) *the net liability/housing wealth ratio* and 4) *the net interest expenditure/income ratio*. For each family the following condition must be fulfilled:

$$(\text{net liability/housing wealth}) = (\text{net liability/income}) : (\text{housing wealth/income})$$

Owner-occupier families have for the most part been divided into deciles and distributed by the size of the relevant ratio. A single family can have different positions in these distributions. Therefore, the connection between the ratios for the single family just mentioned cannot be rediscovered in the distributional tables.

6. The distribution of all owner-occupiers according to the size of their net liability/income ratio.

The distribution of all the owner-occupiers according to their net liability/income ratio for the years 1987-2005 is seen in Table 1. This is the only table for *all* owner-occupiers presented in this paper. The distribution of all owners according to the other three ratios mentioned has previously been presented for 1987-2003 (Lunde, 2005a; 2005b).

For each year the owner-occupiers are divided into deciles according to the size of their net liability/income ratio in Table 1, and similarly in most of the following tables. The decile values mentioned cover the upper limit for the deciles. For example, for 1996, the value 172 in the 8th decile expresses that 80% of all owner-occupiers had a ratio of 172 or below, while the net liabilities of 20% were at a value above 172 % of the family's gross income.

For 2005 the 5th decile, the median value, was 134, i.e. the median owner-occupier family had a debt (net liability), which amounted to 134% of their income in 2005. More than a fifth of the owners had positive savings (negative net liabilities) besides their housing wealth. The 30% most indebted owner-occupiers had net liabilities above twice their annual income. Owner-occupiers in the two highest deciles had a ratio at 256 or above. And for the most indebted 10%, their net liabilities were more than three times as high as their income.

Table 1.

All owner-occupiers (excluding the self-employed), divided into deciles by size of net liabilities as a per cent of gross income. 1987-2005.

Year	1 st decile	2 nd decile	3 rd decile	4 th decile	5 th decile	6 th decile	7 th decile	8 th decile	9 th decile	10 th decile
1987	-147	-37	7	45	79	111	143	178	229	> 229
1988	-149	-38	8	48	84	116	148	184	238	> 238
1989	-141	-35	9	47	81	113	143	177	228	> 228
1990	-150	-39	6	44	77	106	134	166	216	> 216
1991	-165	-44	2	39	72	100	129	160	207	> 207
1992	-172	-42	3	42	75	103	129	159	203	> 203
1993	-170	-42	4	43	77	106	133	164	211	> 211
1994	-159	-43	1	38	70	96	121	147	186	> 186
1995	-159	-41	3	43	77	104	132	160	204	> 204
1996	-161	-41	6	48	83	113	140	172	216	> 216
1997	-153	-33	17	61	96	127	157	192	242	> 242
1998	-154	-33	20	66	103	135	165	201	253	> 253
1999	-152	-31	22	69	105	137	168	202	254	> 254
2000	-155	-30	25	72	109	140	172	208	263	> 263
2001	-156	-33	23	71	108	140	172	208	263	> 263
2002	-152	-28	29	78	116	149	181	220	280	> 280
2003	-157	-30	32	81	119	152	185	224	287	> 287
2004	-163	-31	34	87	127	161	196	238	307	> 307
2005	-169	-29	40	92	134	171	209	256	335	> 335

Methodologically, the development in the median value could be more satisfying to introspect than the changes in the averages, but these results would be close to each other. The median value increased by 70% from 1987 to 2005, the net result of a decrease from 1987 to the low of 11% in 1994 and an increase from 1994 to 2005 of 91%.

With regard to developments over the years, 20% have had positive savings besides their housing wealth since 1987. For the 3rd decile, the increasing ratio expresses that a still greater share of the owner-occupiers have debts. For the owner-occupiers with debt – especially those in the deciles with the highest ratios – the value of the ratios dropped remarkably from 1988 to 1991, and these drops continued at a lower rate until 1994. In subsequent years the net liability/income ratios among the indebted owners increased much more than incomes and by 2005 they were at a much higher level than in 1987.

Just as it lacks sense to estimate economic and financial soundness by looking at macro numbers and averages, it would be misleading to monitor the distribution of *all* owner-occupiers after a certain ratio. There is substantial heterogeneity among the owner-occupier families. For the single year, a certain *structure* will be found behind the figures. But over the years, the ratios and their distribution will change because of *cycles* in the ratios and *changes in the composition of the inspected group* and in the *economic behaviour of the agents in the group*.

7. Structural differences in the ratios

Owner-occupiers can be distributed according to several demographic, economic and social characteristics in order to identify differences in their housing wealth, capital structure and liquidity strain. These differences and their changes may have high influence on the stability of the housing market and thereby on the financial stability of the owner-occupation sector and among lenders.

The life-cycle approach has been profitable as an explanatory variable in housing market analysis, just as income is traditionally attributed significant influence. In this study, the life cycle – with the oldest family member's *age* as proxy – has influenced the results to a remarkably high degree, as demonstrated below. In contrast, gross income does not seem to exert independent influence.

In the statistical material studied, the owner-occupiers' net liability/housing wealth ratios have also been divided according to the size of housing wealth (publicly assessed property value). However, the results are not trustworthy; presumably, because the publicly assessed property values had to be used as proxy for the housing market values instead of "pure" market values, see the discussion in section 8 below.

Finally, the owner-occupiers could have been distributed according to urban criteria, which are commented briefly.

7.a. Variation according to age in 2005.

The four tenures of the Danish housing market: private rental housing, social housing, owner-occupied housing, and private cooperative housing, have been regulated and subsidized in different ways for decades. As a result, big differences can be observed between the tenures with regard to housing size, type, quality and location qualities. The family's choice of housing position has been more complex, because, in fact, the choice of dwelling form and of tenure is closely connected.

Obviously, the family's life cycle situation influences their housing choice. The actual distribution of the families (excluding the self-employed) by tenure and by the oldest family member's age is depicted in Table 2. Families in private cooperative housing (about 7 % of the housing stock) are counted as tenants here. Half of the families are owner-occupiers.

The average owner-occupation share has been rather stable during the last 20 years, but this covers important changes in the composition of the owner-occupier group according to age. A decreasing share of families below 50 years of age and an increasing share of older families are owner-occupiers; the unchanged average ratio is therefore due to the fact that the younger families' share of the population has been decreasing (Lunde, 2005b). This distribution is to a high degree the result of the tenure's affordability and economic attractiveness several decades back in time. The exclusion of the self-employed reduces the overall owner-occupation ratio by a little more than two percentage points and, by age, most among the families between 50-59 years of age.

Table 2.

The owner-occupation and tenant shares of families (excluding the self-employed), by age. Per cent. 2005.

Age – years	Share of the families in the age group		1000 owner-occupier families	The age group's share of all owner-occupiers	The age group's share of all tenants
	Owner-occupiers	Tenants			
< 30	16.3	83.7	65.0	5.1	26.3
30-39	49.3	51.7	217.6	17.1	17.6
40-49	58.7	41.3	265.3	20.9	14.7
50-59	65.3	34.7	274.0	21.6	11.5
60-69	64.3	35.7	234.8	18.5	10.3
> 70	46.1	53.9	214.2	16.9	19.7
All	50.0	50.0	1270.9	100.0	100.0

The owner-occupation share is about three times as high among families between 30-39 years of age as among families below 30 years of age. Therefore, it makes sense to let the 30-39-year-old owner-occupiers represent the first-time buyers in the analysis below. No public statistics exist for first-time buyers. A priori it might be expected that these young owners are the most indebted and, therefore, their capital structure and debt services are of special importance in a financial stability perspective.

Mostly, the family's housing wealth covers the largest part of their assets and, on the other side, is equal to the net present value of the housing services (or user costs) in the future. A family who receives a capital gain through a house price increase and continues to stay in the same house, must recognize that they have increased the net present value of the future housing services by exactly the same amount. In Table 3, the owner-occupier families are distributed according to the size of their housing wealth/income ratio in the different age groups.

Table 3.

Owner-occupiers (excluding the self-employed), divided into deciles by size of housing wealth as a per cent of gross income, by age. 2005.

Age – years	1 st decile	2 nd decile	3 rd decile	4 th decile	5 th decile	6 th decile	7 th decile	8 th decile	9 th decile	10 th decile
< 30	127	162	188	215	243	276	324	410	581	>581
30-39	133	163	188	213	238	266	299	346	442	>442
40-49	124	157	181	207	235	269	307	366	482	>482
50-59	128	162	192	224	259	298	348	422	571	>571
60-69	172	222	269	320	374	433	518	640	864	>864
> 70	247	319	383	450	521	599	702	850	1128	>1128
All	140	178	213	249	290	340	411	522	736	>736

In 2005, half of the younger owner-occupier families, i.e. families, where the age of the oldest member was below 50 years of age, owned houses, flats and/or summer houses with a publicly assessed value of around 240% of the family income. 30% of these younger families had housing wealth above three times their income. The distributions according to the size of the ratio are nearly identical in the three youngest age groups. Even though these ratios have never been higher, their sizes do not indicate that the owner-occupiers have overbought themselves.

The larger ratios for owner-occupiers above 50 years of age can also be seen in a life cycle perspective. For most families in that age group, “trading up” with increases in income have been brought to an end. In general, age dependent income increases have turned into stabilizing or even

decreasing incomes, as people become pensioners. Large parts of the debt have been repaid. Therefore, the housing wealth/income ratio increases with age for older owners, because most families choose to stay in the house despite the reduced income level.

The distribution of owner-occupiers according to net liability/income ratios for 2005 as seen in Table 1 has been decomposed by age in Table 4. The commonly known fact that owner-occupiers' debt drops when they become older is confirmed. The pattern in Table 3 with stable ratios for owners below 50 years of age is not rediscovered in the net liability/income ratios in Table 4 and, in general, these ratios are found at a lower level.

Table 4.

Owner-occupiers (excluding the self-employed), divided into deciles by size of net liabilities as a per cent of gross income, by age. 2005.

Age – years	1 st decile	2 nd decile	3 rd decile	4 th decile	5 th decile	6 th decile	7 th decile	8 th decile	9 th decile	10 th decile
< 30	96	148	187	217	243	273	310	365	500	> 500
30-39	86	135	164	190	214	239	266	307	378	> 378
40-49	22	81	115	143	169	196	226	269	344	> 344
50-59	-60	10	54	88	120	151	187	231	307	> 307
60-69	-243	-111	-43	5	53	101	146	202	297	> 297
> 70	-567	-330	-208	-128	-63	-19	37	113	222	> 222
All	-169	-29	40	92	134	171	209	256	335	> 335

The variation according to age in the net liability/income ratios confirms that relatively few owner-occupiers had savings when they bought their first flat or house. In the years after, instalments reduced the debt⁴, and as incomes grew in most cases, a reduction in the net liability/income ratios became the result. This variation according to age is not necessarily stable over time.

Corresponding in an OECD study, the median debt as a percentage of per capita income has been shown to be highest among persons between 35-44 years of age in several countries (Girouard et al., 2007, p. 20).

The owner-occupier's net liability/housing wealth ratios, as presented for 2005 in Table 5, express the family's leverage, the lenders' security behind mortgages and other loans, as well as the owner-occupier family's solvency situation. At the macro level, these ratios act as the definite expression of financial soundness among owner-occupiers and express their contribution to financial stability among lenders. In the introduction, several examples were reported of very high macro ratios in Denmark.

An obvious variation in the net liability/housing wealth ratios according to age is found in Table 5, especially as a result of the variation according to age in the net liability/income ratios. Half of the youngest owner-occupier families have negative equity but this share falls with age. Still, however, more than 10 % of the families between 50 and 59 years of age have negative equity. In the oldest age group, half of the owner-occupier families have positive savings besides the value of the house in their portfolio. Presumably, part of the positive savings for owners above 60 years of age is due to withdrawal of institutional pension savings.⁵

⁴ Interest-only mortgages were introduced at the end of 2003, and cannot therefore have much influence on debt size here.

⁵ Institutional savings for pension purposes are not included in the families' assets in the study.

Table 5.

Owner-occupiers (excluding the self-employed), divided into deciles by size of net liabilities as a per cent of housing wealth, by age. 2005.

Age – years	1 st decile	2 nd decile	3 rd decile	4 th decile	5 th decile	6 th decile	7 th decile	8 th decile	9 th decile	10 th decile
< 30	44	66	80	91	101	110	121	135	158	>158
30-39	37	59	71	81	91	100	111	125	148	>148
40-49	10	35	49	62	73	83	95	112	135	>135
50-59	-23	4	22	35	47	60	73	89	112	>112
60-69	-61	-28	-11	2	15	28	41	56	80	>80
> 70	-115	-65	-39	-24	-12	-3	7	21	43	>43
All	-40	-8	13	32	49	65	81	98	123	>123

The net interest expenditure/income ratios, by age, are presented in Table 6, where the owner-occupiers are divided into the deciles according to increasing size of the ratios. Interest expenditures are only a part of the total debt service and of the total housing expenditures. However, it might be supposed that a narrow correlation exists between these concepts, especially for the most indebted (younger) owner-occupiers. It is obvious that the net interest expenditure/income ratios, like the net liability/income ratios, decrease with age. As 10% of the youngest owner-occupier families pay more than one-fifth of their gross income as net interest payments and therefore have even higher debt services and housing expenditures, they are rather liquidity strained. Given the relatively high Danish income taxation, these payment parts of disposable income must be somewhat higher. It must be remarked that here, we have identified a minor group of owner-occupiers, who will be rather susceptible towards changes in housing and financial conditions.

Table 6.

Owner-occupiers (excluding the self-employed), divided into deciles by size of net interest expenditures as a per cent of gross income. 2005.

Age-years	1 st decile	2 nd decile	3 rd decile	4 th decile	5 th decile	6 th decile	7 th decile	8 th decile	9 th decile	10 th decile
< 30	3.7	5.9	7.7	9.2	10.7	12.1	13.8	16.0	20.1	> 20.1
30-39	4.5	6.5	7.9	9.1	10.2	11.5	12.9	14.5	17.4	> 17.4
40-49	2.4	4.6	6.1	7.2	8.5	9.7	11.1	12.9	16.2	> 16.2
50-59	0.0	2.2	3.9	5.3	6.7	8.1	9.7	11.6	14.9	> 14.9
60-69	-3.2	-0.6	0.7	2.7	4.6	6.4	8.3	10.9	14.9	> 14.9
> 70	-11.1	-5.0	-2.3	-0.7	0.0	1.6	4.6	7.8	12.6	> 12.6
All	-1.6	0.7	3.5	5.5	7.1	8.7	10.4	12.5	15.9	> 15.9

Girouard et al. (2007, p 22) present distributions of debt service burdens of indebted households as a per cent of disposable income, but only by age. No distributions within the single age groups are presented. Despite the conceptual differences between the concepts presented, the variation in debt service according to age looks somewhat similar to the variation according to age in this study.

7.b. Variation according to income in the single year.

It may also be expected that the owner-occupiers' debt and thereby debt services varies with income. The owner-occupier families are divided into deciles according to the size of their income and age in Table 7. For each decile, the *average* net interest expenditure/income ratio has been calculated. As seen already, the ratios fall with increasing age, and within the age groups, the net interest expenditures ratios drop significantly with increasing income. The last effect has to be explained partly by the use of adjustable-rate mortgages, which increases somewhat with income (Danmarks Nationalbank, 2005). Also, the ratios studied fell slightly with income back in the years

when only fixed interest rate mortgages were offered, as seen in Table 15 below, i.e. a weak income dependency in the net interest payments fundamental exists.

Girouard et al. (2007, p. 22) present a distribution of debt service burdens as a per cent of disposable incomes by percentiles of income. This comparison does not tell much about the financial soundness among owner-occupiers, as can be seen by comparison with the similar distribution of the Danish data in Table 7. Clearly, the financial soundness among owner-occupiers is better analyzed through their distribution according to the size of the net interest expenditure/income ratio, as shown in Table 6 above.

Table 7.

Average net interest expenditures as a per cent of gross income for owner-occupiers (excluding the self-employed), divided into deciles according to size of gross income and by age. 2005.

Income-decile/ years	1 st decile	2 nd decile	3 rd decile	4 th decile	5 th decile	6 th decile	7 th decile	8 th decile	9 th decile	10 th decile	All, average
< 30	21.0	13.9	10.8	11.2	10.5	10.7	10.2	10.7	10.4	9.4	10.8
30-39	17.5	11.3	10.9	10.8	10.9	10.6	10.3	10.2	9.7	8.5	10.4
40-49	14.4	10.2	9.9	9.2	9.0	8.8	8.5	7.9	7.8	6.2	8.4
50-59	11.0	8.3	8.1	7.4	6.8	7.0	6.5	6.5	6.0	5.3	6.7
60-69	8.9	4.5	4.7	5.3	5.3	5.0	4.6	4.5	5.0	3.9	4.7
> 70	4.9	2.6	-1.0	0.9	1.1	0.8	-0.5	-0.7	-0.3	-3.8	-0.6
All	12.5	8.7	8.1	7.9	7.7	7.6	7.0	6.8	6.5	5.0	7.0

According to traditional economic thinking, *ceteris paribus*, the families' saving ratios are expected to increase with income. Similarly, it may be expected that the owner-occupiers' capital structure varies with income. The assumption could be that owner-occupiers with lower incomes could have relatively less savings before buying and have to take out additional loans in order to continue to hold the dwelling. Or the assumption might on the contrary be that families with higher incomes can more easily raise mortgages to finance the buying, and that their debt-asset ratios are therefore higher than for families with lower incomes.

However, more or less no variation by income in the net liability/housing wealth ratios is seen for owner-occupiers between 30-39 years of age, who are divided into deciles according to gross income in Table 8 for 2005.

Table 8.

Net liabilities as a per cent of housing wealth within the specific deciles, divided according to gross income deciles. 30-39 year-old owner-occupiers (excluding the self-employed). 2005.

	1 st decile	2 nd decile	3 rd decil	4 th decil	5 th decile	6 th decile	7 th decile	8 th decile	9 th decile	10 th decile
1. income decile	8	40	57	72	82	94	107	123	148	>148
2. income decile	25	54	68	82	93	106	115	131	155	>155
3. income decile	34	64	82	94	103	114	125	140	162	>162
4. income decile	46	70	84	95	106	114	125	141	166	>166
5. income decile	54	73	86	96	104	115	125	137	160	>160
6. income decile	55	73	84	96	105	114	125	138	160	>160
7. income decile	44	67	80	90	99	109	119	132	153	>153
8. income decile	53	69	81	93	101	111	123	134	158	>158
9. income decile	47	68	80	89	99	108	117	131	154	>154
10. income decile	42	60	73	84	93	102	112	126	147	>147
All 30-39 years o-o	41	64	78	89	99	109	120	133	157	>157

For 2005 as well as for all other years since 1987, the net liability/housing wealth ratios in the deciles are close to identical in all income deciles. However, income of course influences the property value the family can afford to buy, and the loans the family can manage to raise. The only weak income dependency in the net liability/housing wealth ratios is that the mean income groups have slightly higher net liability/housing wealth ratios. Some of the variation in the structures for the lowest and highest deciles may possibly be explained by the fact that people whose annual incomes fluctuate considerably tend to be found among the lowest and highest incomes. In other words, the size of the owner-occupier family's income has at most a slight influence on the family's solvency.

The data indicate that many owner-occupiers buy their first house or flat without having had any substantial savings in previous years, and that the down payment percentage seems to be independent of income size. Moreover, the connection indicates a partial confirmation of the point typically raised by real estate agents that "people buy what they can afford to buy" on the basis of their income.

The conclusion that the distribution of the owner-occupiers according to the net liability/housing wealth ratio is nearly identical in the income deciles, implying that differences in income do not result in differences in the capital structure, is an unexpected result of this study.

7.c. Variation in owner-occupiers' capital structure by urban criteria.

Structurally, the owner-occupation share falls with increasing urbanisation on the Danish housing market. Therefore, the owner-occupation share in the single region depends on the degree of urbanisation in the region. A result of the first analysis of the owner-occupiers' distribution after net liability/housing wealth ratios for 1988 was that the distribution of the owner-occupiers according to the ratio was rather similar within the single urbanisation group, (Lunde, 1990). Therefore, a priori regional and urbanisation dimensions were not expected to improve the analysis much.

The structure in house and flat prices according to the degree of urbanisation has formed a relatively stable relation for many years. From 1996-97 on, however, the relatively stronger increase in the house prices for the capital region (and Århus) than the other regions has led to higher price differences. Therefore, it cannot be denied that greater regional and urbanisation differences have been created in the owner-occupiers' capital structure and liquidity strains. Obvious, adding a regional analysis of these items could be proposed, but such an expansion of the study would require a very large data set.

8. Publicly assessed property value as a proxy for housing wealth at market prices.

Ideally, market prices should be used for the valuation of properties. However, only a minor share of houses, flats and summer houses are sold each year. Therefore, in practice, valuations of the owner-occupied dwellings have to rely on the publicly assessed property values as the only possible measures for estimating the market values of the stock of owner-occupied dwellings.

In accordance with Danish law, the tax authorities must assess the value of houses, flats and summer cottages at market prices. The authorities use multiple regression analysis, where the value of a number of characteristics is determined by properties sold to construct the publicly assessed property values. In the past, the appraised values were adjusted for the previous year's price

changes for houses and flats on 1 January each year. However, from 2003 on, assessments have been done on 1 October every other year instead.

Over the decades, an inspection of the sale price statistics documents that the market prices for houses sold around the time of valuation are, on average, about 10% above the publicly assessed property values; see (Lunde, 2005a, Table 9). However, the variation from house to house is considerable. The average 10% spread between the market prices for sold houses and their publicly assessed property values can be compared with the seller's transaction costs, typically 7-8% of the sale price. On average the publicly assessed property value is closer to the seller's proceeds than the market price at the time of valuation.

However, an exception to this rule was seen in 2005. In the second half of 2005, average market prices for sold houses were 18% above the publicly assessed property values of 1 October 2005.⁶ See also the average correction to market values in Table 12 below.

The exactness of the publicly assessed property values is regarded with suspicion in the market. However, no documentation exists to support the notion that the "market's valuation" - i.e. often a real estate agent's valuation - should be more precise than the public assessment. Similarly, the mortgage banks' estimates of property values when a loan is accepted cannot be proved on the market.

Other valuation methods have been used. For example, Girouard et al. state: "*For Denmark, housing wealth has been estimated using the stock of dwellings at constant prices and house price data from Statistics Denmark*" (2007, p. 28). And the largest mortgage bank estimates the actual credit quality by calculating the market values of the debtors' properties by taking their estimate of the market value at loan origination and indexing this amount with the increase in the house price index for the local area. None of these methods represents an improvement in valuation quality compared to the publicly assessed property values.

In conclusion, it may be stated that a) the publicly assessed property values are good *indicators* of the market values and b) the relative differences between market values and publicly assessed property values seem to have been stable for an even longer period than 1987-2005, and the – high – variances seem to have been stable, too. Therefore, the publicly assessed property value may be assumed to have the same quality as an indicator for the housing wealth ratios throughout the period of this study.

9. The development in housing wealth/income ratios for owner-occupiers between 30-39 years of age.

In studying the Danish owner-occupation sector's financial soundness, it is important to follow the changes through the years in the owner-occupiers' wealth positions, in their capital structure and in their interest expenditures as part of the debt services. Denmark was part of the so-called Scandinavian Banking Crisis at the end of the 1980s and the early 1990s, even though Denmark was hit less hard than the other countries (Økonomiministeriet, 1994). An important factor behind this was the housing crisis 1987-1993, when nominal house prices dropped by 21% and real house

⁶ An explanation could be that the tax authorities have underestimated the strong housing price rise in the second half of 2005 as price statistics are not fully known when the valuations are done.

prices by 36%, resulting in widespread foreclosures. Fortunately, it has been possible to establish the tax register data at family level using 1987 as the starting year.

In the annual income and wealth assessment for taxation, the families' wealth includes the publicly assessed property values on 1 January of the house(s) and/or flat(s) they own as well as the market values of their financial assets and liabilities. Therefore, 1994 represents the turning point in the analysis, as 1993 was the year when house prices turned. The minima values in 1994 are found in Table 9 below.

The housing wealth/income ratios for owner-occupiers between 30-39 years of age are presented for 1987-2005 in Table 9. Of course, the developments in the ratios for the median group and in real house prices have followed similar paths. However, the changing housing wealth values – the numerator in the ratios – do not only include the effects of the rising house prices but also the wealth additions gained from new buildings and renovation and wealth reduction through wear and tear.

Of course, on isolated reflection, increases in the ratios are very positive as they show that owner-occupiers in the age group have become wealthier. At the same time, the ratios form an “affordability index”, where an increase expresses the fact that houses and flats have become more expensive to buy. To reach further conclusions on affordability, the changes in interest rates and in debt services must be included.

In a financial stability context the changes in the ratios represent the booms and busts in housing prices and thereby a certain threat towards stable economic development for society and the individual families.

Table 9.

Owner-occupiers (excluding self-employed) between 30-39 years of age, divided into deciles by size of housing wealth as a per cent of gross income. 1987-2005.

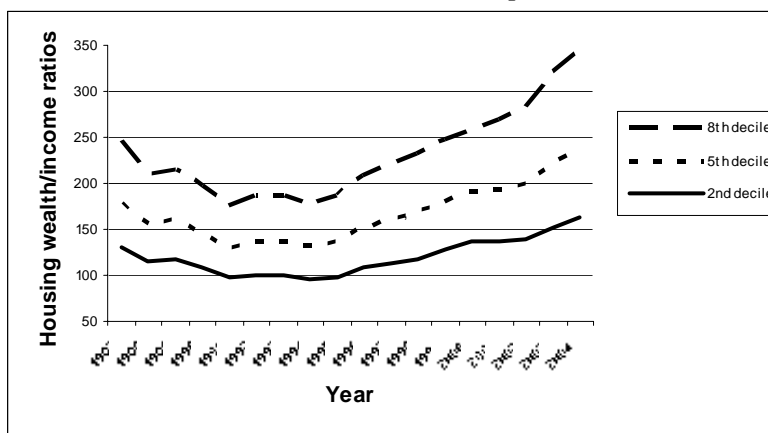
Year	1 st decile	2 nd decile	3 rd decile	4 th decile	5 th decile	6 th decile	7 th decile	8 th decile	9 th decile	10 th decile
1987	105	130	147	162	179	195	215	245	294	> 294
1988	93	115	131	144	157	171	188	211	252	> 252
1989	95	117	134	148	161	176	192	215	261	> 261
1990	90	109	122	134	146	159	175	198	242	> 242
1991	79	97	110	120	131	143	156	176	210	> 210
1992	83	100	114	126	138	151	166	188	225	> 225
1993	82	100	114	126	138	150	166	186	228	> 228
1994	78	95	109	122	133	145	160	179	215	> 215
1995	78	97	112	125	138	151	166	187	223	> 223
1996	84	108	125	139	153	169	187	208	250	> 250
1997	91	113	130	145	160	176	196	221	265	> 265
1998	93	117	136	153	170	187	207	232	280	> 280
1999	102	128	148	165	180	198	218	247	298	> 298
2000	109	137	157	174	191	210	231	259	314	> 314
2001	111	137	158	176	194	214	237	269	325	> 325
2002	111	140	161	179	200	221	246	282	351	> 351
2003	117	143	164	185	206	229	256	297	375	> 375
2004	116	142	164	184	204	226	253	291	369	> 369
2005	133	163	188	213	238	266	299	346	442	> 442

- For 2004 the publicly assessed property values of 1 October 2003 had to be used. From 2003 on the assessments are renewed every other year only. Therefore, the 2004 housing wealth/income ratios are too low compared to market values in that year with steep increases in housing prices.

As seen in Table 9 the different ratios dropped by a third from 1987 to 1994. Subsequently, the ratios increased by 79 % up to 2005 in the median value and in the deciles around that level. In the highest deciles, the ratios doubled, possibly due to the fact that house and flat prices increased more in the capital than in the rest of the country. These changes are also depicted for the 2nd decile, the median and the 8th decile in Figure 1.

Figure 1.

Development in the values of the housing wealth/income ratios in the 2nd, 5th, and 8th deciles, as presented in Table 9.



From 2000, the housing wealth/income ratios approached an all-time high each year. Nothing indicates that the ratios have been higher in any year before 1987. In 2004-2006 the increases in housing prices were far above the growth rates in income (Lunde, 2007). Therefore, the 2005 all-time high must have been outmatched by the beginning of 2007.

10. The development in net liability/income ratios for owner-occupiers between 30-39 years of age.

An obvious reason to compare the owner-occupiers' debt with their income is that the family's income forms the basis for their repaying of debt. Therefore, at a certain interest rate level, an increasing debt/income ratio involves an increased risk of the debtors experiencing difficulties in making payments; this forms the credit risk for the lenders. For the most part, a family can use liquid financial assets to eliminate debt. Therefore, only the owner-occupiers' net liabilities are compared with income.

In Table 10 below, the ratios for owners between 30-39 years of age are shown for all years, 1987-2005. Nearly all these younger owner families and recent buyers have debt.

Table 10.

Owner-occupiers (excluding the self-employed) between 30-39 years of age, divided into deciles by size of net liabilities as a per cent of gross income. 1987-2005.

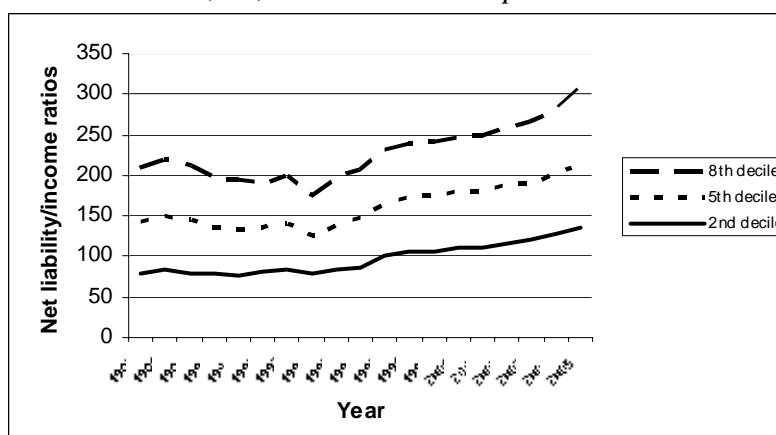
Year	1 st decile	2 nd decile	3 rd decile	4 th decile	5 th decile	6 th decile	7 th decile	8 th decile	9 th decile	10 th decile
1987	41	79	104	124	143	162	183	210	255	> 255
1988	43	84	110	130	150	169	191	219	267	> 267
1989	41	80	105	126	145	163	184	211	257	> 257
1990	39	80	102	120	136	153	172	197	244	> 244
1991	39	76	98	117	133	150	170	194	237	> 237
1992	49	82	103	119	135	151	168	191	226	> 226
1993	49	83	107	124	140	157	175	199	242	> 242
1994	42	78	96	112	126	141	157	176	211	> 211
1995	48	83	104	122	139	155	173	196	232	> 232
1996	45	87	111	130	148	166	186	208	245	> 245
1997	65	101	126	147	165	185	206	231	273	> 273
1998	65	107	131	152	172	192	213	240	286	> 286
1999	69	107	133	155	174	193	216	241	286	> 286
2000	69	110	138	159	179	199	219	247	293	> 293
2001	66	110	137	158	179	198	219	248	291	> 291
2002	74	117	145	167	188	209	232	259	312	> 312
2003	72	121	149	170	190	211	234	267	319	> 319
2004	80	127	155	178	201	222	248	282	342	> 342
2005	86	135	164	190	214	239	266	307	378	> 378

For the 30-39-year-old owner-occupiers, the net liability/income ratios were lowered in nearly all of the years from 1988 to 1994. After 1994, the net liabilities increased more than the 30-39-year-old owner-occupiers' incomes. The ratios have thereby grown to a markedly higher level in all deciles. In 2005, half of the 30-39-year-old owner-occupiers had a debt of more than twice their family income. More than 10% had a debt of at least at three times the income. In 1994, 90% of the owner-occupiers in the age group had a net liability/income below the median ratio for 2005.

For the single year, the end of year market values of financial assets and liabilities are calculated. The minimum – and turning points – are found in 1994 and not in 1993, which is also partly due to the fact that interest rates for a 30-year mortgage bond increased by a little more than 2.5% throughout 1994, which lowered the market values of debtors' mortgages significantly.

Following the median values, the 30-39-year-old owner-occupiers' net liability/income ratios increased by 50% from 1987 to 2005, which covers a drop of 12% from 1987 to 1994, and a subsequent increase up to 2005 of 70%. The size of the reduction up to 1994 varied positively with the degree of indebtedness in 1987. After 1994 the changes in value of the different deciles have been very similar. As is also expressed in Figure 2, the net liability/income ratio was nearly unchanged 1987-1994 for owners in the 2nd decile, while the ratio was reduced by 20 % in the 8th and 9th deciles.

Figure 2.
Development in the values of net liability /income ratios in the 2nd, 5th, and 8th deciles as presented in Table 10.



Remarkably, net liability/income ratios of older owner-occupiers have increased more than for owners between 30 and 39 years of age. However, as the increase started from a much lower debt level, the older owners are still much less indebted than the younger owners, as seen in Table 4.

In general it can be concluded that owner-occupiers have become more indebted in relation to their incomes since the middle of the 1980s and, of course, especially since the housing market cycle turned in 1993-1994. Also, the net liability/income ratios were at an all-time high in 2005. Since the turn of the century a record ratio has been presented each year. Danish owner-occupiers are simply more indebted than ever before. This can be interpreted as showing that the owner-occupation sector – an important part of the Danish economy – has been influenced by a higher degree of financial fragility.

11. The development in net liability/housing wealth ratios for owner-occupiers between 30-39 years of age.

According to macro data in the Girouard et al. study (2007), Denmark and the Netherlands had the most indebted households as they had the highest debt/net wealth ratios in 2005. The owner-occupiers represent the group of households with large assets and liabilities, as the debt level is much lower among tenants (Lunde, 2006).

In this section, the net liability/housing wealth ratios for owner-occupiers between 30 and 39 years of age are presented. The house and flat values act as security for the debt. Therefore, the net liability/housing wealth ratio expresses the owner-occupier family's degree of indebtedness as well as the security for the lender. According to legislation, foreclosure is defined as the ultimate security. In case of foreclosure, the family must move out of their home. Afterwards, the family will still have debts the forced sale could not cover, and the costs of the foreclosure will be added to the debt.

The main and unexpected result of the study was that for younger owner-occupier families, net liability/housing wealth ratios and their distributions into deciles were lying at a stable and rather similar level throughout the whole period from 1987 to 2005. This means that the frequency of negative equity and the degree of leverage had not improved since the housing and financial crisis of 1987-1993, even though the experiences of the following years included reduced unemployment, lowered interest rates, economic growth and – in general – a “sound” economy.

The net liability/housing wealth ratios contain a strong age dependency as shown in Table 5. While the younger owner-occupier families, who bought relatively few years before the year in question, have rather stable and high ratios, as seen in Table 11 below, the growing share of older owner-occupiers have increasing but still lower ratios throughout the period (Lunde, 2005a).

Table 11.

Owner-occupiers (excluding the self-employed) between 30-39 years of age, divided into deciles by size of net liabilities as a per cent of housing wealth. 1987-2005.

Years	1 st decile	2 nd decile	3 rd decile	4 th decile	5 th decile	6 th decile	7 th decile	8 th decile	9 th decile	10 th decile
1987	25	46	60	71	81	91	101	115	138	> 138
1988	30	56	73	85	96	107	119	134	160	> 160
1989	29	53	69	81	91	100	112	125	148	> 148
1990	29	57	72	84	94	105	116	131	154	> 154
1991	34	63	79	91	102	113	126	141	166	> 166
1992	39	65	79	90	99	108	118	129	150	> 150
1993	40	67	82	92	102	111	121	134	157	> 157
1994	37	64	77	86	95	104	114	126	147	> 147
1995	38	67	81	92	101	111	121	135	160	> 160
1996	36	63	76	87	96	105	116	129	153	> 153
1997	44	68	82	93	102	113	124	138	163	> 163
1998	44	68	82	92	102	112	124	138	163	> 163
1999	42	63	76	87	96	106	116	130	153	> 153
2000	41	61	73	84	93	102	113	126	147	> 147
2001	37	59	72	82	92	101	110	123	145	> 145
2002	40	62	74	85	94	103	114	127	148	> 148
2003	37	59	73	84	93	103	113	127	149	> 149
2004	41	64	78	89	99	109	120	133	157	>157
2005	37	59	71	81	91	100	111	125	148	>148

- For 2004 the use of the publicly assessed property values on 1 October 2003 resulted in too high ratios.

Throughout the whole period 1988-2005, 40-50% of the owner-occupiers between 30-39 years of age had negative equity, as their net liabilities were larger than their housing wealth, measured by the publicly assessed property value. Already at the limit between the 2nd and 3rd deciles, owners in

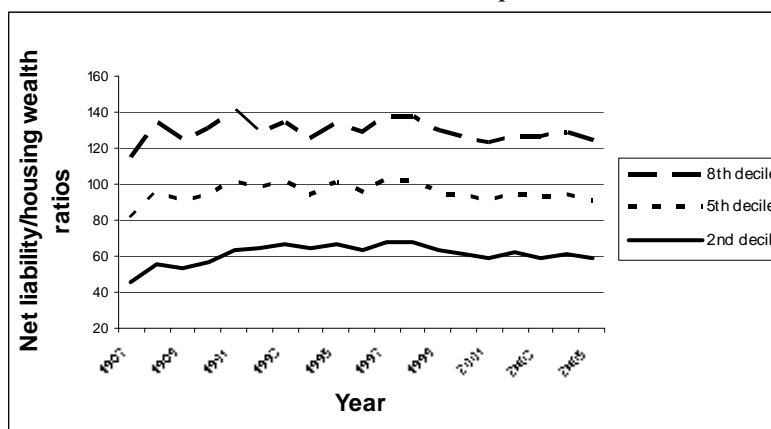
this age group have a net debt around 60% of the housing wealth. And in the two highest deciles the debt is 25% or more above the housing wealth.

For owner-occupiers between 30-39 years of age, the capital structure has not improved in the direction of a better equity ratio or on the contrary worsened into a higher debt ratio over the 18 years after 1987. Most of the worsening of the capital structure from 1996 to the higher ratios in 1997 can be explained by the increase in mortgage debt of about five percentage points in the single deciles, as seen in Table 13 below.

The fact that the age group with most first time buyers has not improved their equity ratios also indicates that most of them must have bought in the years with steeply rising housing prices and must have financed their purchase by raising loans. Buyers with some savings beforehand must have been hit by the strong house price rise, as their savings covered less of the price than earlier. This problem was reduced for buyers who “traded up”, realising some capital gains on the former owner-occupied dwelling and thereby being able to make a larger down payment or to buy a more expensive house. The last group seems to account for a minority of owners in the 30-39 years age group.

The depiction of the net liability/housing wealth ratios in the three deciles in Figure 3 does not change the impression of stability in the ratios.

*Figure 3.
Development in the values of the net liability/ housing wealth ratios in the 2nd, 5th, and 8th deciles as presented in Table 11.*



The house price statistics include the relative distance between the prices of all houses sold and their publicly assessed property values. These average differences have been used to recalculate the net liability/housing wealth ratios for 2000-2005 in Table 11 to a market price level in Table 12. It must be underlined that this simple average correction is in conflict with the nature of the individual family data otherwise used in the paper.

Table 12.

Owner-occupiers (excluding the self-employed) between 30-39 years of age, divided into deciles by size of net liabilities as a per cent of housing wealth, by age. 2000-2005.

After a simple average correction for the distance between the publicly assessed property value and the market value.

Years	1 st decile	2 nd decile	3 rd decile	4 th decile	5 th decile	6 th decile	7 th decile	8 th decile	9 th decile	10 th decile
2000	35	52	62	71	79	87	96	107	125	> 125
2001	33	52	63	72	81	89	97	108	128	> 128
2002	36	55	66	76	84	92	101	113	132	> 132
2003	34	54	66	76	85	94	103	116	136	> 136
2004	33	52	63	72	80	88	97	108	127	>127
2005	30	48	58	66	75	82	91	103	121	>121

Of course, after this correction the young owner-occupier families appear less indebted, as the denominators of the ratios have been increased, and the ratios are closer to the “true ratios”.⁷ Still, 20-30% of the owner-occupiers between 30-39 years of age have negative equity. However, especially the ratios for 2005 have improved a little. Of course, this will only be a stable improvement if the steep increases in Danish housing prices make a “soft landing” during the coming years.

The conclusion must be that negative equity seems to exist as a rather permanent feature among owner-occupiers in the Danish house and flat markets. Also, this conclusion must hold even after a correction for the difference between the market values for the houses and flats and their publicly assessed property values is made to achieve a relative reduction in the level of negative equity.

12. The development in mortgage debt/ housing wealth ratios for owner-occupiers between 30-39 years of age.

The owner-occupiers’ mortgage debt⁸ is the most important single item, besides the housing wealth, in their capital structure. The owners-occupiers’ mortgage debt is close to three times as big in the aggregate as the debt on their loans in commercial banks – both including and excluding the self-employed owners. Other loan sources are quantitatively unimportant.

According to Danish legislation, the mortgage loan-to-value (LTV) must not exceed 80% when a mortgage is issued to an owner-occupier. The mortgage debt/housing wealth ratios for established owner-occupiers between 30-39 years of age in Table 13 represent the LTVs for already established owners, who for several reasons may have a mortgage LTV above 80%. The ratios have been calculated by the mortgage debt at market values at the end of the year, and changes in interest rates throughout the year will therefore influence the ratios. A fall in the market interest rate for a fixed interest bond drives the market prices for these mortgage bonds up towards a maximum of slightly above 100%. Another explanation is that house and flat prices may have dropped since the mortgage loan was raised, as was the case in 1987-1993. Also the use of the publicly assessed property value as a proxy for the market estimates of housing wealth simply increases the level for the LTV ratios in Table 13.

⁷ However, when the “true values” are used in the analysis, no consideration has been given to the fact that when an ordinary sale takes place the seller has to pay transaction costs in a range of 7-8% of the sale price.

⁸ Figures do not exist for the year 1994.

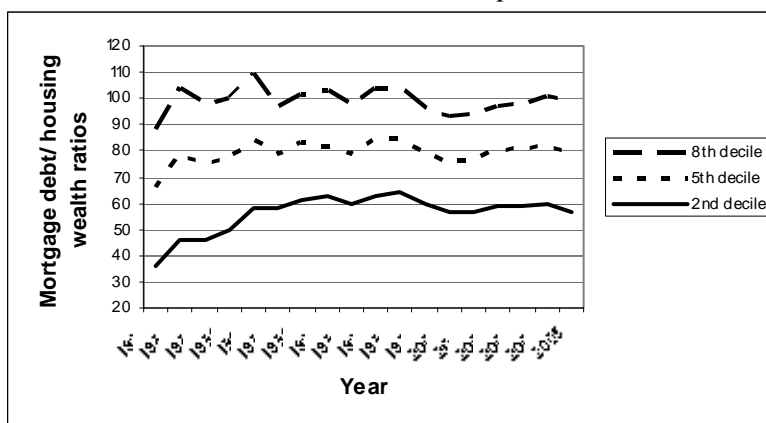
Table 13.

Owner-occupiers (excluding the self-employed) between 30-39 years of age, divided into deciles according to the size of their mortgage debt as a per cent of housing wealth. 1987 – 2005.

Year	1 st decile	2 nd decile	3 rd decile	4 th decile	5 th decile	6 th decile	7 th decile	8 th decile	9 th decile	10 th decile
1987	19	36	49	58	66	72	79	88	103	> 103
1988	26	46	61	71	79	86	94	104	123	> 123
1989	26	46	59	68	75	81	88	98	115	> 115
1990	29	50	62	71	77	83	90	100	117	> 117
1991	34	58	70	77	84	90	98	109	127	> 127
1992	37	58	67	74	79	84	89	96	107	> 107
1993	43	61	71	78	83	88	94	102	114	> 114
1994	---	---	---	---	---	---	---	---	---	---
1995	47	63	71	77	82	88	94	103	118	> 118
1996	44	60	67	74	79	85	91	98	113	> 113
1997	47	63	72	79	85	90	96	104	118	> 118
1998	47	64	73	79	85	90	96	104	118	> 118
1999	47	60	68	74	79	84	89	96	108	> 108
2000	44	57	65	71	76	81	86	93	104	> 104
2001	41	57	65	72	77	82	88	94	107	> 107
2002	43	59	68	75	80	84	90	97	110	> 110
2003	42	59	70	76	81	86	91	98	111	> 111
2004	44	63	73	80	85	90	96	103	118	> 118
2005	36	57	67	73	79	84	91	99	114	> 114

In practice, all first-time buyers raise a mortgage, but not everyone takes the maximum mortgage. Also, as is clear from Figure 4, the younger owner-occupiers in the deciles with lowest mortgage debt/housing wealth ratios have increased their mortgage debt throughout the years, while the owners in the higher deciles seem to have raised maximum mortgages throughout the whole observed period.

Figure 4.
Development in the values of the mortgage debt/housing wealth ratios in the 2nd, 5th, and 8th deciles as presented in Table 13.



13. The development in net interest expenditure/gross income ratios for owner-occupiers between 30-39 years of age.

An analysis of the financial soundness among the owner-occupiers must include their wealth, capital structure, and debt services. The Danish tax data contain the families' interest expenditures, an important part of the debt services, and their interest income, and are always influenced by changes in the debt behind and in the interest rates, which fell through most of the years 1987-2005. Besides, adjustable-rate mortgages were introduced in 1996 and amounted to 50% of the owner-occupiers' outstanding mortgages at the end of 2005 (Danmarks Nationalbank, 2007a). The low interest rates of ARM mortgages at the period's increasing yield curves have reduced interest payments further. However, analysing nominal interest expenditures is less convincing unless consideration is given to inflation or income growth. Below, the net interest expenditures are equal to the interest expenditures minus the interest incomes.

The Danish owner-occupiers' net interest expenditures are compared to their gross income in the study and these ratios are shown to have fallen significantly from 1987 to 2005, regardless of whether the ratios for all owner-occupiers (Lunde, 2005a) or the ratios for owner-occupiers between 30 and 39 years of age, as in Table 14 below, are observed. For this group the net interest expenditure/income ratios have been nearly halved, whether the changes over the years in the median values in Table 14 or in the averages in Table 15 are observed.

Some rough data on the interest-service burdens for several OECD countries indicate that the interest payments have been reduced since the late 1980s (Girouard et al., 2007, p. 14), but not to the same degree as in Denmark.

Furthermore, an investigation into the liquidity strain of interest expenditures might include the fact that in Denmark, the tax rates for deduction of net interest payments have been reduced through three tax reforms that came into effect in 1987, 1994, and 1999. The statistics only contain pre-tax values, but the example below illustrates the influence of the lowered tax rates.

As the young owner-occupiers act as a proxy for the first-time buyers, the falling ratios indicate that the affordability of owner-occupation has improved. However, after 1994 this conclusion does not hold in an after-tax perspective, as indicated by Figure 5.

The 30-39 years old owner-occupiers have been divided into deciles according to the size of their net interest expenditure/income ratios in Table 14. As described above, the decile values mentioned cover the upper limit for the deciles. For example, in 2003, 60% of the owners in the age group had a net interest expenditure/income ratio of 12.8% or below, while 40% used more than 12.8% of their gross income on net interest payments.

Table 14.

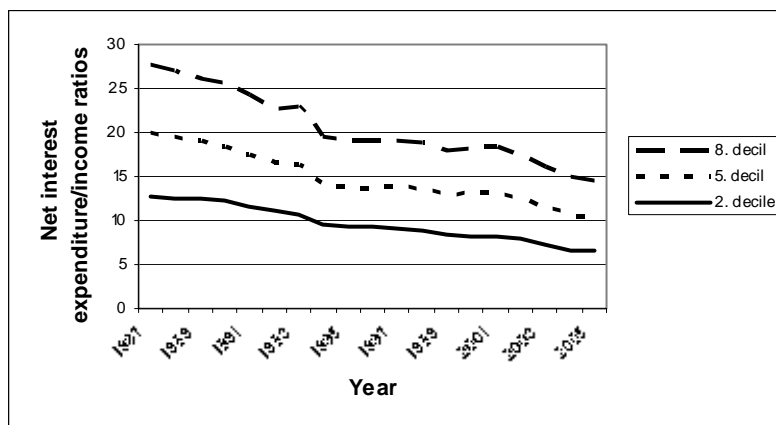
Owner-occupiers (excluding the self-employed) between 30-39 years of age, divided into deciles by size of net interest expenditures as a per cent of gross income. 1987-2005.

Year	1 st decile	2 nd decile	3 rd decile	4 th decile	5 th decile	6 th decile	7 th decile	8 th decile	9 th decile	10 th decile
1987	8.9	12.7	15.5	17.7	20.0	22.2	24.5	27.7	32.7	> 32.7
1988	8.8	12.6	15.4	17.5	19.6	21.7	24.0	27.0	32.2	> 32.2
1989	8.6	12.5	15.0	17.1	19.1	21.0	23.2	26.2	31.8	> 31.8
1990	8.5	12.2	14.7	16.5	18.3	20.3	22.6	25.6	30.7	> 30.7
1991	8.0	11.5	13.8	15.7	17.5	19.3	21.4	24.3	29.3	> 29.3
1992	7.7	11.1	13.2	15.0	16.7	18.4	20.4	22.8	27.1	> 27.1
1993	7.3	10.7	13.0	14.7	16.4	18.2	20.2	23.0	27.6	> 27.6
1994	6.8	9.6	11.4	12.9	14.2	15.6	17.3	19.5	23.0	> 23.0
1995	6.8	9.4	11.1	12.6	13.9	15.4	17.1	19.1	22.4	> 22.4
1996	6.3	9.3	10.9	12.4	13.7	15.2	16.9	19.0	22.2	> 22.2
1997	6.4	9.1	10.9	12.5	13.9	15.4	17.1	19.0	22.4	> 22.4
1998	6.2	8.9	10.7	12.1	13.6	15.1	16.7	18.8	22.0	> 22.0
1999	5.8	8.3	10.1	11.6	13.0	14.4	15.9	17.9	20.9	> 20.9
2000	5.6	8.2	10.1	11.6	13.1	14.5	16.0	18.1	21.0	> 21.0
2001	5.4	8.2	10.0	11.6	13.1	14.5	16.2	18.3	21.3	> 21.3
2002	5.2	7.9	9.7	11.1	12.5	13.9	15.5	17.4	20.5	> 20.5
2003	4.8	7.3	8.9	10.4	11.5	12.8	14.3	16.1	19.2	> 19.2
2004	4,6	6,7	8,2	9,5	10,6	11,9	13,2	14,9	17,9	> 17,9
2005	4,5	6,5	7,9	9,1	10,2	11,5	12,9	14,5	17,4	> 17,4

The liquidity strains of interest payments have been sharply reduced in all deciles from 1987 to 2005. Half of the owner-occupiers between 30-39 years of age used 20% or more of their gross income for net interest expenditures in 1987, while less than 10% were at that height in 2005. The ratio in the 9th decile has been reduced from 32.7% in 1987 to 17.4% in 2005. The high net interest expenditure/income ratios in the highest decile numbers at the end of the 1980s explain part of the background for the “housing crisis” in Denmark at that time.

Most of the improvements in the net interest expenditure/income ratios happened from 1987 to 1994, as clearly seen in the curves for the 2nd, 5th, and 8th decile ratios in Figure 5. The nearly stable ratios in subsequent years indicate that the ratios would have been close to increasing, if the ARM mortgages had not become widespread, at least for the years after 2000.

Figure 5.
Development in the values of the net interest expenditure/income ratios in the 2nd, 5th, and 8th deciles as presented in Table 14.



The fall in the net interest expenditures after tax would have been much less pronounced than in the pre-tax perspective above as illustrated in this example: the decile limits for the most indebted 10 % of young owner-occupiers are followed. The income tax rate is assumed to be 50 %:

- the 1987 ratio: 32.5 %; tax rate for deduction of interest expenditures 50 %; the net interest expenditures after tax cover 32.5 % of the disposable income.
- the 1994 ratio: 23.0 %; tax rate for deduction of interest expenditures 44 %; the net interest expenditures after tax cover 25.8 % of the disposable income.
- the 2005 ratio: 17.4 %; tax rate for deduction of interest expenditures 33.3 %; the net interest expenditures after tax cover 23.2 % of the disposable income.

This demonstrates that the reduction of net interest expenditures has been much less than it was before tax, as shown above.

The net interest expenditure/income ratios for the 30-39-year-old owner-occupiers are presented again in Table 15. Here, the owners have been divided into deciles according to the size of their income. For the owners in each decile, the average net interest expenditure/income ratio has been calculated.

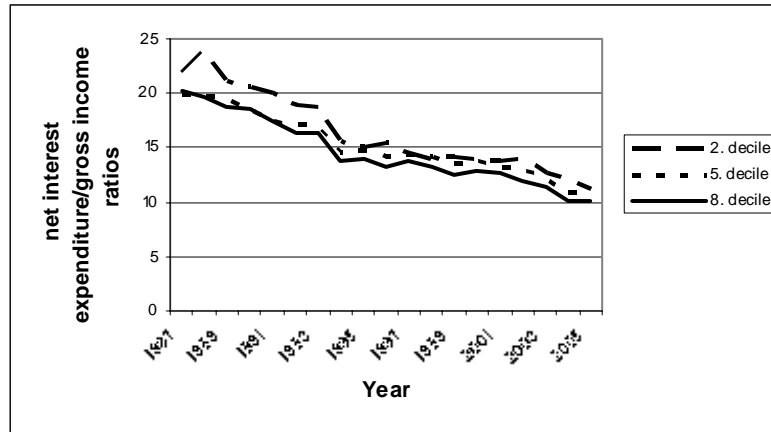
Table 15.

Average net interest expenditures in per cent of gross income for owner-occupiers (excluding the self-employed) between 30-39 years of age, divided into deciles by size of income 1987-2005.

Income deciles / Year	1 st decile	2 nd decile	3 rd decile	4 th decile	5 th decile	6 th decile	7 th de-cile	8 th decile	9 th de-cile	10 th decile	All
1987	24.9	21.9	21.0	20.4	19.8	20.2	20.2	20.2	19.9	19.2	20.3
1988	25.8	23.9	21.7	19.9	19.6	19.5	19.2	19.6	20.0	18.5	20.1
1989	24.8	21.2	21.1	19.8	19.4	18.8	19.3	18.8	19.2	17.6	19.4
1990	25.2	20.5	20.5	19.7	18.3	18.5	18.7	18.6	18.6	17.8	19.0
1991	23.7	20.0	18.0	18.5	17.5	17.7	17.8	17.4	17.2	18.1	18.1
1992	22.6	18.9	17.0	17.0	17.1	16.9	16.9	16.4	16.4	16.0	17.0
1993	21.0	18.8	17.1	17.0	17.0	16.4	17.1	16.3	16.3	16.9	17.0
1994	16.7	15.7	14.9	14.8	14.5	14.6	14.5	13.7	13.9	12.7	14.3
1995	17.7	15.0	14.3	14.4	14.7	14.3	14.0	14.0	13.6	12.5	14.1
1996	16.6	15.4	14.6	14.1	14.1	14.2	14.0	13.3	13.5	11.7	13.7
1997	17.1	14.6	14.4	14.4	14.4	14.3	14.0	13.8	13.6	12.2	13.9
1998	16.0	14.0	14.3	14.3	14.1	14.2	13.9	13.3	13.2	11.4	13.5
1999	17.3	14.2	13.7	13.3	13.6	13.3	13.0	12.5	12.1	9.9	12.7
2000	16.4	14.0	13.6	13.3	13.7	13.6	13.0	12.9	12.4	10.1	12.8
2001	16.2	13.7	13.8	13.9	13.3	13.5	13.6	12.7	12.6	10.4	12.9
2002	17.4	13.9	13.4	13.4	13.1	12.6	12.3	11.9	11.3	9.9	12.3
2003	16.8	12.6	12.4	12.0	12.2	11.9	11.6	11.4	10.4	7.9	11.1
2004	15.4	12.1	11.5	11.4	10.8	11.0	10.4	10.2	10.3	8.5	10.6
2005	17.5	11.3	10.9	10.8	10.9	10.6	10.3	10.2	9.7	8.5	10.4

As seen in Table 15, the average net interest expenditure/income ratios decrease with increasing income for all years. Of course, the strong reduction of the ratios throughout the whole period has been found here, too. As also seen in Figure 6, the improvements in the single ratios have run nearly in parallel, meaning that the relative reduction has been a little more pronounced in the highest decile numbers. The last effect seems partly due to a rapid increase in the use of ARM mortgages, which have become more common in the higher income deciles.

Figure 6.
Development in the values of the net interest expenditure/income ratios in the 2nd, 5th, and 8th, deciles as presented in Table 15.



14. Conclusion.

In terms of methodology, it can be concluded that the use of distributional data for individual families to analyse financial soundness in the owner-occupation sector and its effect on the financial stability of financial institutions and markets seems rather fruitful. Moreover, the data give much insight into the capital and payment structures of the owner-occupation sector.

With regard to financial soundness, the analysis has focused on owner-occupiers between 30 and 39 years of age as a proxy group for first-time-buyers. The conclusions can be summarized as follows:

- a. The net liability/housing wealth ratios for owner-occupiers – their solvency – have remained practically unchanged through the years 1987-2005 despite the strong housing price increase since 1993. Negative equity (i.e. technical insolvency) seems to be unchanged at 40 % for the age group, when housing wealth is defined by the publicly assessed property value in the ratio. In total, 20 % of the owner-occupiers have negative equity. This fact does not seem to create financial problems. More or less, owner-occupiers’ use of debt seems independent of the cycle.
- b. The owner-occupiers’ housing wealth as well as their net liabilities, compared to their income, have reached “all-time high” levels. Easily, income becomes the only source to repay the debt during a recession, where it is difficult to take out new loans.
- c. The changes in the net interest expenditure/income ratios have been rather comfortable during the period. However, the improvements are weak, when the changes in the taxation – the reduced value of the right to deduct interest expenditures – are included in the analysis. Moreover, the fact that part of the improvement is due to half of the mortgages having been changed from fix interest rate to interest-adjusted rate mortgages needs to be taken into account.

Actually, the prices for houses, flats and summer houses started to drop in the last quarter of 2006 and may be expected to drop further. Of course, the open question is how much and for how long such a downward housing price correction could continue on its own steam. Still, to create a new

housing crisis and/or financial crisis, it looks as if some sort of a “trigger factor” or “shock” has to come into effect. At present, no such “trigger factor” seems to operate in the high employment and otherwise “healthy” Danish economy.

However, the conclusion on the financial soundness among Danish owner-occupiers must be that, in general, they have not improved their protection against negative equity and therefore, their protection against a breakdown in the housing market to a satisfactory degree since 1993, i.e. since the last “owner-occupation crisis”.

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Appendix A:

Statistics sources and data.

The data in the study are derived from tax statistics. In these statistics, Danish owner-occupier families' wealth and capital structure rely on the tax authorities' assessments of these families. The Danish tax authorities have a relatively precise knowledge of the families' incomes and interests (capital income), and of their assets and liabilities. The data have been made available for this study by "Lovmodelsekretariatet" under the Ministry of Finance and with the help of the Ministry of Economic and Business Affairs.

The study's data come from a random sample of about 1/30 or approximately 40,000 owner-occupier families within the specific year. The results are multiplied by a factor of about 30, which varies a little from year to year. The numbers ensure the reliability of the results. Self-employed families are not included in the statistics.

Mortgage and commercial banks report the interest and capital values of all securities (bonds, equities and others), deposits and loans directly to the tax authorities. The capital values for securities, deposits and loans in financial institutions are calculated for the year according to prices on 31 December. Assets and liabilities are thus calculated at market values. These data are precise.

Net liabilities are per definition gross financial liabilities minus gross financial assets. Net interest expenditures equal interest expenditures minus interest income.

The owner-occupier family's housing wealth includes the total value of properties owned solely for the purpose of meeting the family's own housing needs in single family houses, owner-occupied flats, the owner's own flat in a residential multi-storey building, farmhouses and summer cottages and may comprise more than one dwelling, for example, both a house and a summer cottage. The definition of an owner-occupied dwelling relies on the owner's taxation of imputed rent, and, after 2000, on paying property value tax. A dwelling the family owns and rents out (possibly to children), is not taxed with property value tax and is therefore not counted as owner-occupied.

In 1987-1996, i.e. the first part of the study period, Danes were liable to wealth tax. Besides property value, financial assets and liabilities, the wealth included money (cash), cars, boats, furniture, diamonds, etc. In most cases, the value of these assets was relatively low compared to the owner-occupied properties and financial assets and liabilities, why the rather imprecise self-assessments of these physical assets had no important consequences for the wealth statistics.

The wealth tax was abolished after 1996, personal wealth is no longer self-assessed and pure wealth statistics are no longer produced. Still, the tax authorities assess property values in order to charge land tax and property value tax (before 2000, the tax on imputed rents on the owner-occupied dwellings). Banks still report interest, deposits and loans to the tax authorities. However, since 1997 the values of cash, cars, furniture and similar family assets are no longer assessed.

The wealth statistics used since 1997 are based on the reported assets and liabilities and comprise the owner-occupiers' most important assets: publicly assessed property values, deposits in financial institutions, securities (bonds, equities), and liabilities: debt in mortgage and commercial banks. Only few, less important types of financial assets, with the cash balance and cars as the most important, are not included. The wealth measure used gives a relatively precise estimate of the owners' wealth and capital structure. The following analyses confirm this view as the different methods can only be tracked in few cases.

Institutional savings for pension schemes have never been included in the wealth taxation, and these savings are therefore not registered in the personal tax assessments and in the data here. In aggregate, the institutional savings for pension purposes have approximately the same value as the owner-occupied dwellings. However, the significance of ignoring the pension savings is reduced on some counts. First, taxation of income used as

pension savings is postponed until the savings are paid out as pension, and therefore, the after-tax value of the savings are only around half as valuable for the pensioners. Second, these savings are illiquid as they cannot be withdrawn without heavy taxation. Third, the largest pension savings are found among persons and families who have been saving for many years, but these families have in general a lower debt.

The incomes in the study are derived from the tax statistics and are calculated with same precision as the taxable incomes. The incomes are defined in accordance with the Danish tax rules and as the sum of “personal income” and “positive net capital income”. Until 2000 the imputed rent of own dwelling is included in the owner-occupiers’ positive net capital incomes.

The family is the statistical unit in the study. From 1991 on, the so-called D-family concept containing singles, married couples and couples living together, has been used. The definition of couples living together without common children is: only two persons at the same address, over 16 years of age, of different sexes, and with an age difference below 15 years. For the years 1987-1990 another similar family concept has been used, where two adults of different sexes must have common children to be considered a family unit.