

Changing Age and Household Patterns: Implications for Welfare Costs in Denmark 1982 – 2007

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Abstract

This paper studies the effects on tax revenues and welfare expenditures in Denmark caused by changes in age and household structures over the years 1982-2007. During that period, there has been a minor fall in the old-age dependency ratio, and a major increase in the number of people living alone, lone parents and cohabiting couples. Focusing on components of welfare services with noticeable differences in unit costs across age and household status, we find that changes in age structures have improved public finances by 1.6% of GDP whereas changing household structures have worsened public finances by almost 1% of GDP on the yearly budget. While the net fiscal effect of changing household structures is minor, the gross effects are substantial. In a future characterized by population ageing, public finances may be adversely affected by changes in both age and household structures, thus intensifying calls for welfare reforms.

Keywords: *Ageing populations, household structures, welfare programmes, public finances*

JEL codes: *H24, H31, H53, J11, J18*

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1. Introduction

Household structures are changing throughout Western economies (OECD, 2011). This is a development characterized by couples postponing childbearing, increasing shares of divorced and other lone mothers and fathers, more people in old-age living alone, etc. The observed emergence of new family patterns is concurrent with population ageing, driven by falling fertility rates and increasing longevity, as well as with larger volumes of migration (European Commission, 2011).

From a Nordic perspective, this demographic transition may be of particular relevance¹. Indeed, many of the central features of the Nordic welfare model are related to households and families: large public transfers to households, publicly provided health and eldercare services, large public spending on child care and education². Moreover, the revenue from certain excise taxes (e.g., on cars) might be sensitive to changes in family structures.

The Nordic model also facilitates extensive female participation in the labour market (Jaumotte, 2003). Indeed, high participation rates are widely regarded as being essential for the sustainability of the Nordic welfare system (Andersen, 2011). Since participation decisions depend, among other things, on the household situation, new family structures may have substantial indirect effects on the stance of fiscal sustainability. If so, changing household structures could have important implications for welfare policies.

Also the housing market would most likely be affected by changes in the household structure (Gram-Hansen et al., 2009). In fact, it seems reasonable to assume that the average number of persons per household is a critical determinant of future housing demand. Therefore, if young people decide to live alone longer, couple formation will be delayed and hence possibly their demand for private dwellings.

Against that background, and using Denmark as a case study, this paper studies some fiscal aspects of changes in age and household structures. Since the fiscal dimension of population ageing has already attracted a lot of attention (e.g., Welfare Commission, 2004; Andersen et al., 2008), this paper focuses on effects on tax revenues and welfare expenditures caused by changes in household structures. Our time perspective is backward-looking, covering the period 1982-2007³.

¹ Christiansen (2014) offers a survey of the main developments in household and family structures in the Nordic countries during the last decades, as well as putting the expected future changes in household structure in a historical context.

² In the academic literature, the concept of a Nordic (or Scandinavian) welfare model has become known from the work by Esping-Andersen (1990). In Esping-Andersen's definition the model is defined in terms of universal social rights, in the sense that eligibility to welfare arrangements applies equally to all individuals regardless of previous contributions and social status. The welfare model is characterized by a social safety net which offers income support to people unable to care for themselves and basic welfare services like education, health care etc. The welfare provisions are financed via various forms of tax revenue, and in this sense the system is collective.

³ In a companion paper (Jacobsen and Jensen, 2014), we look at the fiscal implications of changing household structures in a forward-looking perspective, based on a stochastic population forecast, where the population is divided into the same household position groups as in the present paper, for the period 2007-37.

The paper proceeds as follows: We first (in section 2) identify different types of households and report on several aspects of observed changes in the age and household composition of the population, including transition shares and cohort effects. We next (in section 3) present the fiscal data sources and then (in section 4) we outline our methodology for calculating the fiscal effects of demographic changes. This is followed (in section 5) by an attempt to quantify what those changes have implied for both tax revenues and welfare expenditures over the relevant time period. The article ends (in section 6) with concluding remarks and suggestions for future research.

2. Changes in age and household structures

2.1. A first look at the data

The following analysis utilizes a register dataset covering the entire Danish population for the period 1982-2007. The selection of time period is based on the available population data from Statistics Denmark. We use the register information about the population to determine the household position for the individuals in the Danish population. In general, the available population data in the Danish registers are of excellent quality, since they are based on computerized administrative databases and cover the entire population.

For each year during the status of an individual is known by 1 January. As a starting point, we take a brief look at changes in the age composition of the population, broken down on three age groups: young (0-19), working-age (20-64) and elderly (65+); and with the period divided into three decades: 1982-90, 1991-2000 and 2001-2007.

Table 1 reports these developments. The Danish population⁴ has grown by 6.4% over the entire period, and behind this aggregate growth is an increase in the population of working age of 11.5%, an increase in the number of elderly by 11.5% and a fall in the number of young people of 6.7%. In actual numbers, the growth in the number of elderly has been offset by the fall in the number of young people, and the growth in the total population is completely matched by an increase in the population of working-age. Hence, the total, young and old-age dependency ratios have all fallen.

It is noticeable that the most pronounced changes in the age structure took place in the 1980s, where the young population shrank by 13%, and the number of elderly rose by 7%, against the background of a virtually unchanged size of the total

⁴ These data are available from 1980 onwards. However, due to a data break that would make it impossible to compare household position before and after 2007, we use this year as the final year. In addition, the population structure and transitions between household positions are based on 5-year periods and 5-year age intervals, so this first year of the calculation within this structure has to be 1982 rather than 1980.

population. It is also worth pointing out that whereas there has been a growth in the total population throughout the most recent decade of 2.2%, the working-age population has shrunk, thus shifting the balance between dependents and providers in an unfavourable direction and leading to significant increases in the dependency ratios.

Table 1 Danish population, changes in age structures, 1982 – 2007

		Age			Total
		0-19	20-64	65+	
Number of persons	1982	1,432,304	2,938,798	748,052	5,119,154
Percentage change	1990	-12.9	5.1	7.0	0.3
compared to the	2000	1.2	6.1	-1.2	3.8
previous decade	2007	5.9	-0.1	5.6	2.2
Number of persons	2007	1,336,974	3,275,362	834,745	5,447,081

Turning next to changes in the household structures, we follow the practice set out in Alho and Keilman (2010) of dividing the population into 7 different possible household statuses based on the household position the individual has. Each individual is thus assigned to one and only one of the following groups: (A1) Married in a couple with or without children; (A2) Cohabiting with or without children; (A3) Lone parent; (A4) Children; (A5) Persons living alone; (A6) Others in private households, including adults who live with other adults, but are not forming a couple (roommates and similar); (A7) Persons living in institutions, including elderly living in care facilities and persons with mental or physical disability that requires them to receive around-the-clock care.

The changes over the period 1982-2007 are reported in Table 2. Due to lack of data reliability, we omit data on categories A6 and A7. It is remarkable that while the number of households registered as married and children, respectively, are both falling, the changes are relatively small and concentrated in the 1980s. Here the number of married households fell by 5% and the number of children fell by 12%, but since then the changes have been almost negligible.

A very different picture is found for those cohabiting, lone parents and persons living alone, where the registered numbers increase by approximately 60% for all three categories. Again, the main changes in these patterns occur in the 1980s. In fact, it is only for lone parents that the growth continues throughout the first decade of this century.

Table 2 Danish population, changes in household structures, 1981 – 2007

	Married	Cohabiting	Lone parent	Children	Living alone	Total
<i>A. Population (1982 = 100)</i>						
1990	94.8	136.9	126.2	88.4	122.8	100.3
2000	95.8	162.4	138.4	89.5	142.8	104.1
2007	96.6	163.1	157.4	92.7	156.3	106.4
<i>B. Population (percentage change compared to the previous decade)</i>						
1990	-5.2	36.9	26.2	-11.6	22.8	0.3
2000	1.1	18.6	9.7	1.3	16.2	3.8
2007	0.8	0.4	13.7	3.5	9.5	2.2

2.2. Transition probabilities

In this sub-section we compute the empirical transition probabilities (or shares) by gender, age group and household status. Specifically, these probabilities are given by the number of persons in status s in the following year ($t+1$) divided by the total number persons in the age-gender group at time t :

$$\Pr(s, r, t) = \frac{N(s, r, t + 1)}{\sum_p N(r, p, t)}$$

where $N(s, r, t)$ denotes the total number of individuals in household status s at time t who were in household status r at time $t-1$. Thus, the sum in the denominator equals all those who were in household status r at time t . A careful examination of the above expression reveals that these transition probabilities do not necessarily sum to one, because transitions to the states “dead” and “emigrated” are not included. When carrying out population projections it is of course important to take account of all possible states, but for the present purpose of analyzing changes in family structures it is not necessary to include these states. The probabilities have been computed for each year on the basis of the population on 1 January that year within the age group. Hence, the curves in the Figures are not based on analysis of a cohort, but rather on different cohorts for each year.

We present just one example of empirical transitions between some of the five household positions listed above. For other examples, the reader is referred to our earlier work (Jacobsen et al., 2011). In Denmark, as in many other advanced countries, the average age for persons entering into marriage has increased for the past decades. Over the period covered by this paper, the average age for persons entering into marriage has increased from 28.2 years to 34.2 years for males and from 25.4 years to

31.4 years for females⁵. Parallel to this development, the probability of being divorced has also increased.

Figure 1 shows the sum of transition probabilities from the state “married” to the states “living alone”, “cohabiting” or “lone parent”. The probability of exiting marriage to one of the other states has been increasing for both sexes and for all four age groups displayed in the figures. The most dramatic increase has occurred for males aged 25-29 where the empirical probability of exiting a marriage increased from 5 percent per year in 1982 to 9 percent per year in 2006. The remaining curves show smaller increases, but all exhibit upward trends during the period under consideration.

Figure 1 Transition probabilities from married to living alone, being in cohabitation or being alone parent.

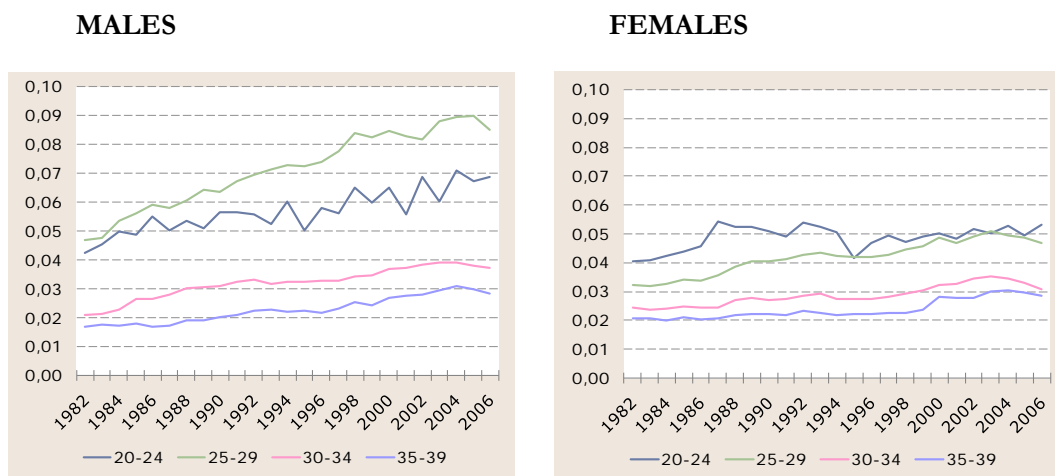


Figure 1 also shows that males are more likely to experience divorce than females in the same age group. This rather paradoxical feature is due to the fact that the male part is older than the female part in the average marriage. Thus, the number of 25-29 year old males that are married is significantly lower than the similar number for females, and therefore the denominator in the calculation of the transition probability is much lower. A similar fact is true, albeit to a smaller degree, for the other age groups shown. In sum, this figure of selected transition probabilities in Denmark, as well as our earlier presentation hereof in Jacobsen et al. (2011), show that most of these probabilities display trends. Knowledge about the magnitude of recent trends in transitions between different household positions is important, for example, when conducting population projections based on household status. If such projections are made under an assumption of constant probabilities during the projection period, the projection errors may be large in the distant future if transition shares are actually changing. Knowledge about recent trends may thus provide valuable information about the feasibility of population projections based on an assumption of constant transition

⁵ The average age difference in newlywed couples has been between 2 and 3 years in Denmark for decades. The data source for the information about the average age of entering into marriage is an aggregate table from Statistics Denmark, which can be found at <http://www.statistikbanken.dk/VIE1>.

probabilities. Also, changes in the shares shown here may be expected to have implications for public welfare expenditures and other economic effects, a theme to be addressed in Section 4.

3. Fiscal data

In this section we describe the fiscal and social data set used in the analysis. Again, we draw on register data provided by Statistics Denmark which, by international comparison, offer excellent opportunities for measuring the provision of public services, the receipt of public transfers and payment of taxes at the individual level⁶. Specifically, we utilize the fact that this unique information may be merged with demographic data that allow us to identify each individual in Denmark as being in one (and only one) of the seven household statuses referred to above. Following the aim of this paper, we select components of the public budget which are sensitive to changes in household structures.

3.1. Income taxes

This component comprises personal income taxes, labour market contributions (paid by employees) and special pension contributions. These are the only components from the public revenue side used in our analysis⁷. The Danish tax system includes a rule which enable married couples to transfer certain unused personal tax deductions to the other spouse. This transfer facility, which is not available to unmarried cohabiting couples, is especially important for married couples where one spouse earns a medium-to-high income and the other spouse has a low income. For example, this could be a couple consisting of a student and a full-time employed professional. For such a couple the difference in tax payments between being married and cohabiting was about DKK 10,000 under the rules that were in place in 2007⁸. The analysis below is based on the actual average income tax payments by age, gender and household status in 2007, as calculated from register information from Statistics Denmark.

⁶ In a previous study (Jacobsen et al., 2011) we carried out a similar study using a less extensive data set.

⁷ VAT and other indirect taxes and corporate taxes are all excluded from the analysis as we cannot connect these taxes to particular household positions from our data sources.

⁸ There has been a slight modification to the taxation laws from 2010, which means that the difference will be smaller in the future, but the main rule that unused personal deductions may be transferred across spouses remains valid.

3.2. Public Transfers

3.2.1. Old-age pensions and early retirement benefits

The old-age pension component is given by the sum of budget outlays allocated to old-age pension, disability pension and a so-called old-age check (supplementary benefit), all given to persons aged 65+. In the Danish old-age pension system, all pensioners are eligible to a basic benefit, and everybody aged 65+ can apply for various supplementary payments which are means-tested and depend on wealth, housing costs etc. Since living costs per person living as couples typically are lower than for individuals living alone, the average supplementary payment to couples is lower than the average payment to a person who lives alone which in turns also implies that the total average pension payment to individuals living as part of a couple is lower than for individuals with another household status. In addition, pensioners who are married to a salary earning non-pensioner can have their pension reduced according to specific rules. This reinforces the effect of lowering the average payment to couples relative to individuals living alone. Given the average payment to pensioners of the various groups, it is possible to compute the contribution of changes in household structure to the change in pension costs from 1982 to 2007.

The early retirement pension component is defined as the average receipt of early retirement pension for persons younger than 65 years. This pension is given to individuals who are not able to work and therefore have no possibility to enter the labour market. While there is no difference in the legal framework between persons living alone and persons living with a partner, the propensity to receive early retirement pension is significantly higher for persons living alone than for persons living with a partner.

For both old-age pensions and early retirement pensions, registers from Statistics Denmark provide the actual benefits received and thus enable us to calculate age-, gender- and household-type specific averages.

3.2.2. Cash benefits

This post includes all taxable social benefits for subsistence and living expenses and is therefore a transfer income paid to people who cannot provide for themselves and their families. The receipt of income support benefits is also dependent upon household status in Denmark. As married couples have a legal obligation to support one another, married persons receiving income support are likely to receive less than non-married persons, as those who are married can be provided for by their spouse. In addition, persons who have children are also eligible to increased benefits in order to support their child. In fact, when calculating the average payment per full-time recipient the group of lone parents and cohabiting couples receive on average about DKK 10,000 more per person. For this variable we have individual data in the

registers, and we can thus calculate the exact average social benefit assistance for each age, gender and household group.

3.2.3. Sickness benefit

Sickness benefit is a temporary pecuniary compensation for the loss of income from work, resulting from sickness absence. It is therefore a condition that the relevant person is associated with the labour market when an illness or accident occurs. In both cases, the welfare system will be responsible for the payment of the compensation. The rules for sickness benefit are related only to past employment history and not to household position, but the probability of receiving sickness benefits varies considerably between the various positions. The register data available contain the number of days receiving sickness benefit on an individual basis, and these numbers have been multiplied by a calculated unit cost to arrive at the average amount paid out.

3.3. Health care

General practice

General practice is measured as the number of services from general practitioners used per year. We multiply the number of services used by a calculated unit cost to arrive at the total public costs for each group.

Specialist practice

Special practice is measured by the services used per year at medical specialists multiplied by the unit cost. Looking at special practise and general practise separately is motivated by both the difference in unit cost (specialist care is more costly than general care) and by the fact that there may be demographic differences in the use of the two services.

Hospital admissions

Hospital admissions, measured by the number of hospitalized days related to births, healthy companion, diseases, hospital examinations and preventive measures multiplied by the unit cost of a single day of hospitalization.

For the three health care components there are no differences in rules for the different household positions, but there are different uses among individuals with different the household status as will be clear below.

3.4. Care for children

The item 'pre-school children' covers the various childcare services offered to children (aged 0-6 years), while the variable 'school children' covers the day-care facilities which are offered to the 6-18 years old after the school day has ended. Using register data we have access finding out whether a child participates in day-care services and merge this information with the household status.

Before proceeding to study the fiscal effects of changes in age and household structures, it would be useful to know the significance of the components listed in 3.1-3.4, individually and collectively, in a certain year. To answer whether they really constitute an important part of the government budget in Denmark, Table 3 shows the magnitude of each component, reported as a share of the total government budget in 2007.

The public expenditure components included in this study constituted 26% of the total public expenditures in 2007, whereas the income tax revenue made up 48% of total public revenues. Of the expenditures not included, a large part is collective public spending such as research, administration, infrastructure, defence, police etc. Public expenditures allocated to education are also kept under collective spending, even though a major part may be broken down at the individual level. However, we have assumed that education expenditures are less related to household status than the other types of expenditures included in the study. Hence, in rough terms, we cover a half on the revenue side and a quarter on the expenditure side.

Table 3 Selected components of the government Budget, 2007

Element	Share of expenditures or revenue
	----- Revenue -----
Income taxes	48.4%
	----- Expenditures -----
A. Public transfers	
Old-age pensions	8.9%
Early retirement benefits	4.2%
Cash benefits	0.9%
Sickness benefits	1.2%
B. Health care	
GP services	0.8%
Specialist practitioner	0.3%
Hospital admissions	6.6%
C. Care for children	
Pre-school	2.3%
After-school care	0.6%

In order to get an indication as to the sensitivity of fiscal variables to changes in the composition of households, Figure 2 shows the distribution of indexed revenue/expenditure per person across the different household positions in four of our included budget components.

Figure 2A reveals that there are substantial differences in income taxes paid by different household positions. Apart from the obvious fact that the taxes paid by

children are only minor, it is noteworthy that married individuals on average pay higher taxes than cohabiting or individuals living alone. Although this may partly be explained by the different age composition of the two groups there still is a marked difference.

Turning to Figure 2B, we find an even more pronounced difference in the receipt of social benefits across household positions. Indeed, lone parents and “others” receive almost twice the average in social benefit, whereas cohabiting, individuals living alone and married individuals receive approximately 60% of the average. Interestingly, married individuals receive more than cohabiting individuals on average.

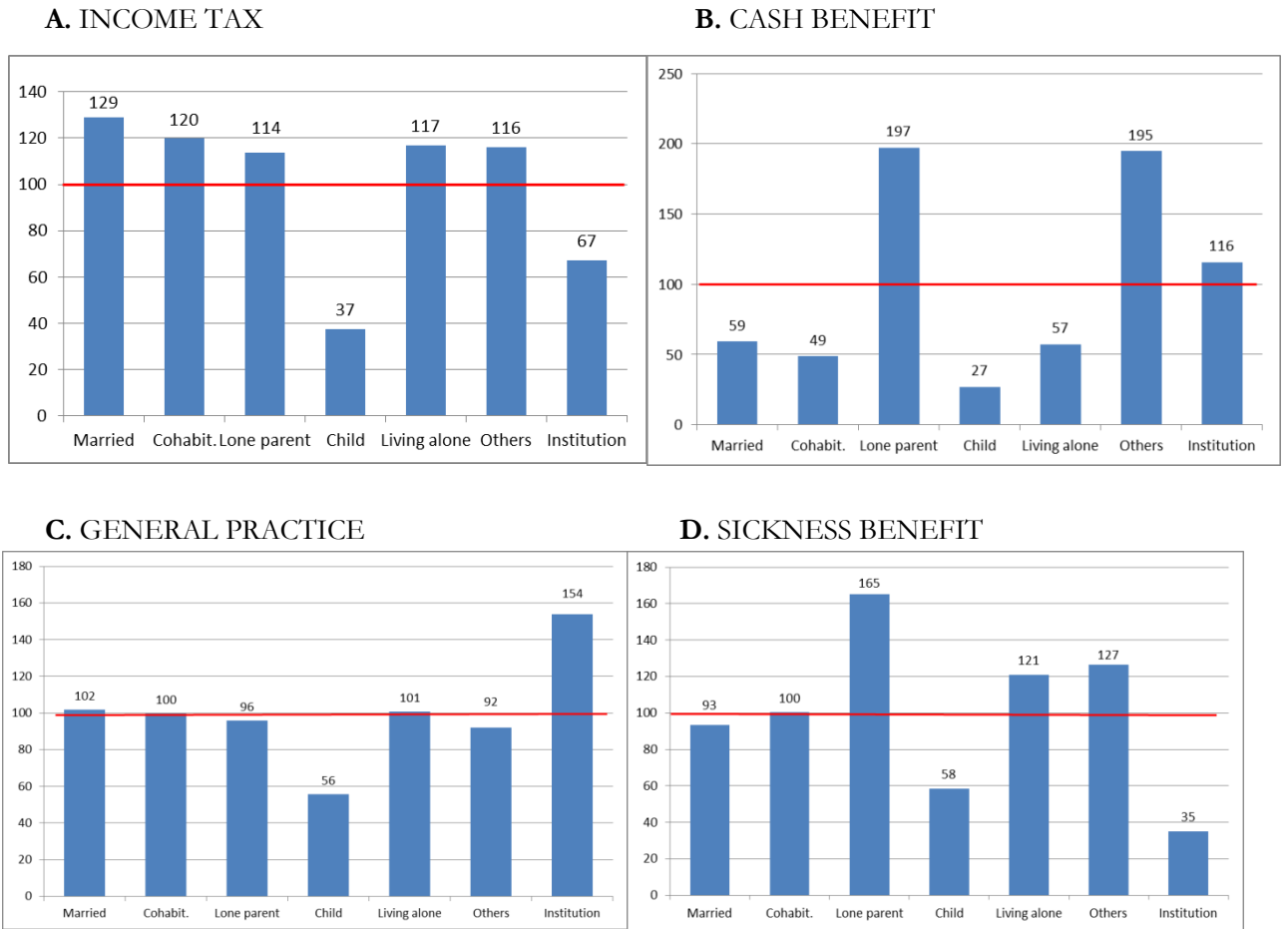
In Figure 2C it is obvious that individuals from institutions use general practitioners’ service considerably more than average. This is mainly due to the fact that most of the population who has this household status lives in elderly care facilities. While the other differences seem minor in comparison to the large use by persons in institutions there still is a 5-10 percent difference in the use of GPs among the four main adult groups.

Finally, in Figure 2D we see that lone parents and persons from the “others”-groups receive significantly higher amounts of sickness benefits than married or cohabiting individuals.

In sum, Figure 2 shows that there are significant differences in the use of public services and public transfers as well as in the average income tax paid when we view the population across different household positions. Some differences can probably be explained almost entirely by the different age composition of the different household positions, but others reflect the differences in rules and in the labour market attachment of the different groups.

It should be stressed that, in general, a change in the composition of households may have implications for public expenditures not only because different rules apply for different households (e.g., in Denmark married couples can transfer unused tax deductions between spouses, but this is not possible for cohabiting couples), but also because different households may have different behaviour (e.g., in Denmark singles and lone parents have lower per capita income than couples because of a combination of lower labour supply and lower education). The point is that when reporting the household composition effect we are unable to disentangle the two effects. In other words, the reason why, for example, sickness benefits, costs for general practice and specialist practice vary across household types is that singles and lone parents make more heavy demands on those welfare services compared to couples.

We next turn to show how to compute both the age-gender effect and the household composition effect for the different public expenditure areas as well as for income tax revenues included in the study.

Figure 2 Indexed revenue/expenditure per person (Total Average = 100)

4. Methodology

In this section we present the methodology for calculating the effects of changes in both the age-gender composition and the household composition of the population. The method for calculating the effect of the changing household composition of the Danish population takes as its starting point the actual expenditures and revenue from the focus area listed above. Total expenditures in 2007 can be decomposed into⁹:

$$T^{2007} = \sum_a \sum_g \sum_h E^{2007}(a, g, h) \times n^{2007}(a, g, h)$$

⁹ In the text in this subsection the word “expenditures” may be replaced by the word “revenue” if the relevant variable is the income tax. Apart from this all calculations are similar to the ones carried out for the expenditure components.

In the above formula $E(a,g,h)$ expresses average expenditure per person within an age-gender-household status group, and $n(a,g,h)$ is the number of persons in the age-gender-household status. Adding up over all age groups, both genders and all seven household positions thus produce the total expenditure.

Now, define

$$n^y(a, g) = \sum_h n^y(a, g, h)$$

as the total number of persons in age group a and of gender g in the year y .¹⁰

We use the unit expenditures, for each of the variables listed above, in 2007 also for the calculation for 1982. This can be interpreted as an “as if”-calculation in the sense that the calculated total expenditures for 1982 represent the hypothetical expenditure level if the set of rules and the overall price and wage level were the same as in 2007.

Hence, we can calculate the hypothetical total expenditure in 1982 given the rules and price/wage-level from 2007 as

$$T^{1982} = \sum_a \sum_g \sum_h E^{2007}(a, g, h) \times n^{1982}(a, g, h)$$

For each age-gender-group we calculate the theoretical 1982-expenditure level:

$$e^{1982}(a, g) = \frac{\sum_h E^{2007}(a, g, h) \times n^{1982}(a, g, h)}{\sum_h n^{1982}(a, g, h)}$$

Now, we can calculate the expenditure level in 2007, if the household structure was as in 1982:

$$TH^{2007} = \sum_a \sum_g e^{1982}(a, g) \times n^{2007}(a, g)$$

Now, the total change in expenditures between 1982 and 2007 can be decomposed into a part due to changes in the age-gender composition of the population and a part due to a change in the household composition of the population. Therefore, we define the age-gender composition effect (ACE) as the change in expenditure due to the change in the age-gender composition of the population from 1982 to 2007:

¹⁰ As pointed out by the anonymous referee, the methodology used in this section has some similarities to the so-called standardization method which has a long tradition in social sciences and in epidemiology. See, for example, Hirschman and Tolnay (2006) for a review.

$$ACE = TH^{2007} - T^{1982}$$

And the household composition effect (HCE) as the change in the expenditure in 2007 due to changes in the household structure:

$$HCE = T^{2007} - TH^{2007}$$

In the remainder of the paper we attempt to quantify the extent to which changes in the age and household composition of the population have had an impact on public revenues and expenditures. For each budget component, the baseline assumption is that rules and use of public transfers are the same over time and are as in 2007.¹¹

5. Fiscal effects of changing age and household structures, 1982-2007

The effects on selected public sector expenditure and revenue elements due to age and household changes are reported in Table 4. The age-gender composition effect (ACE) and the household composition effect (HCE) have been calculated using the formulas outlined in the previous section.

The presentation is broken down into two main parts. The top panel contains the results concerning income tax revenue and the bottom panel contains the results for the various expenditure elements divided into three groups: Group A with four types of public transfer payments including old-age pensions, early retirement benefits, cash benefits and sickness benefits; Group B with the health care variables including GP services, specialist practitioner services and hospital admissions; and Group C with child care information on pre-school childcare and after school care for school children.

The numbers in the first column (denoted “Level 1982”) represent the calculated expenditures using the 2007 values of unit costs and using the 1982 population, as split into the seven household positions, 19 age groups and 2 genders. Columns two and three show the ACE and HCE effect, respectively. The last column shows the actual levels in year 2007.

On the revenue side, it is evident that there has been a large positive fiscal effect from changes in the age and gender composition of the population, whereas there has been a negative, albeit in numerical terms much smaller, effect from changes in the household composition. The large positive contribution from the age and

¹¹ However, within several policy areas this assumption does not hold. For example, income taxes have been lowered, and a new but not yet implemented tax reform will also change the income tax system. Also, the official retirement age will be indexed to longevity after 2020, thereby presumably lowering the overall pension expenditures. Neither of those reforms is expected to have a particular impact on the difference between different household positions, so the overall conclusions of this paper remain valid.

gender effect is due mainly to the continued increase in women's labour force participation for most of the period. The negative household composition effect on the other hand is mainly due to the fact that persons living alone and lone parents on average have a smaller income than married individuals.

Table 4 Age and household composition changes 1982-2007 in selected areas of the public budget, DKK Bn. (2007-level)

	Level 1982, 2007-prices	ACE	HCE	Level 2007, actual
		----- Revenue -----		
Income taxes	358.7	52.3	-8.6	402.3
		----- Expenditures -----		
A. Public transfers				
Old-age pensions	68.8	8.1	0.2	77.1
Early retirement benefits	25.7	6.6	4.0	36.3
Cash benefits	7.2	0.1	0.7	8.0
Sickness benefits	8.8	0.9	0.6	10.3
B. Health care				
GP services	6.3	0.6	0.0	7.0
Specialist practitioner	2.4	0.2	0.0	2.6
Hospital admissions	48.6	7.1	1.7	57.3
C. Care for children				
Pre-school	18.6	1.7	0.0	20.3
After-school care	5.7	-0.3	0.0	5.4

Turning to the expenditure side, we find that the net ACE of the nine elements included is DKK 25.0bn, and the net HCE amounts to DKK 7.2bn over the period 1982-2007. The expenditures for public transfers (group A in the bottom panel of Table 4) have increased by approximately DKK 16bn due to the age and gender composition of the population and by approximately DKK 5bn due to changes in the household composition of the population. The age composition effect is driven mainly by increased expenditures on old-age pensions and early retirement benefits, whereas the household composition effect is primarily due to increased expenditures on early retirement benefits, with only small effects stemming from the other three types of public transfers. The main reason behind this is that persons living alone are much more likely to receive early retirement than the other household positions.

Turning to group B, we see that only hospital admissions have shown a significant change due to demographic factors over the period 1982-2007 and this effect is mainly attributable to changes in the age and gender composition, and only to a smaller extent due to household composition changes.

Finally, the results for group C show a small positive age composition effect for pre-school children, while there is a small saving on after-school care due to the

age composition. This mainly reflects that, while the total number of children actually declined by 1 per cent from 1982 to 2007, the number of pre-school children increased whereas the number of school-aged children actually fell.

Overall, we find that due to the fall in the total, young and old-age dependency ratios, the changes in age structures have improved public finances by 1.6% of GDP from 1982 to 2007.

In Table 5 we report the relative size of the age composition effects and the household composition effects for 1982-2007 with all numbers indexed to the 1982-level. While confirming the results already discussed above, some additional interesting points arise:

Table 5 Age and household composition changes 1982-2007 in selected areas of the public budget (2007 = 100)

	Level 1982 (2007-prices)	ACE	HCE	Level 2007, actual
		----- Revenue -----		
Income taxes	100.0	14.6	-2.4	112.2
		----- Expenditures -----		
A. Public transfers				
Old-age pensions	100.0	11.8	0.2	112.0
Early retirement benefits	100.0	25.5	15.6	141.1
Cash benefits	100.0	1.1	10.1	111.2
Sickness benefits	100.0	13.2	4.5	117.6
B. Health care				
GP services	100.0	10.0	0.1	110.1
Specialist practitioner	100.0	9.7	1.6	111.4
Hospital admissions	100.0	14.7	3.4	118.1
C. Care for children				
Pre-school	100.0	9.2	0.0	109.2
After-school care	100.0	-5.5	0.1	94.6

First, of all the revenue and expenditure components analyzed, early retirement benefits exhibit the largest relative age composition effect and the largest household composition effect. This reflects a combination of two population changes: the population in 2007 had a significantly higher share of persons aged 50-60 and a higher share of persons living alone – two groups which comprise a much higher share of early retirees.

Second, for all but one component the ACE is of larger relative importance than the HCE, although the latter in most cases is far from negligible. The single exception is cash benefits where the household composition effect is 10%, but the age composition effect only 1%. These numbers are primarily driven by the increase in the share of individuals living alone and lone parents, as these two groups are not only more likely to be recipients of cash benefits, but they are also subject to more generous rules, because they are lone providers for the family.

Third, for most cases the age composition effect and the household composition effect have the same sign – with income taxes and after school care being the two exemptions.

Fourth, it is found that income taxes and old-age pensions both exhibit large age composition effects. In the case of income taxes the reason is the ageing of the working-age population, as older and more experienced workers earn more and pay higher taxes. The large demographic effect for old-age pension expenditures stem from an increase in the number of persons in the retirement age. The size of the ACE for sickness benefit and hospital admissions was 13-14% over the period 1982-2007. This is also due to the overall ageing of the population, as an older population on average gets sick more often and thus is given sickness benefits and is admitted more often to hospitals. GP services and Specialized Practitioner services had small household composition effects. This is not entirely surprising, since there are no rules favouring one group over another, and the likelihood of being ill is only marginally related to household status.

Finally, it should be emphasized that the criteria for selection into specific household positions are entirely demographic, in line with the approach suggested by Alho and Keilman (2010). Thereby, we sidestep an important discussion about causality. For example, bad health may lead to low chances to getting married and hence higher chances of living without a partner (i.e., living alone). However, the approach adopted in this paper assumes implicitly that causality runs from household position to health to health expenditures.

6. Concluding remarks

In recent years, a lot of research activity has been devoted to study the economic effects of changes in the age structure of the population. For example, it is now well documented that ageing populations, as driven by lower fertility and mortality rates, may pose a serious threat to the viability of public finances.

This paper takes a different approach, by focusing on how and to what extent changing household structures may affect the government budget. Specifically, an attempt has been made to quantify the impact of increases in the number of persons living alone, lone parents and cohabiting couples on different categories of taxes and public welfare services in Denmark over the period 1982-2007.

Our main finding is that the net fiscal impact of changing household structures amounts to a worsening of the fiscal stance by roughly 1% of GDP on the yearly budget. This may be regarded as a minor yet non-negligible effect.

For reasons of comparison, we also study the observed changes in the age structure of the Danish population. Here we find that the growth in the number of elderly has been offset by the fall in the number of young people, and the growth in the total population is completely matched by an increase in the population of

working-age. Hence, the total, young and old-age dependency ratios have all fallen. This explains a somewhat surprising finding, namely that changes in age structures have improved public finances by 1.6% of GDP from 1982 to 2007.

If instead addressed within a forward-looking setting, there is good reason to expect that changing age and household structures will exert a joint pressure on public finances. In fact, rather dramatic increases in the old-age dependency ratio are expected to occur over the coming decades, and if the trends in transitions between different household positions found in this paper continue in the future, a severe weakening of public finances is likely to occur (Jacobsen and Jensen, 2014)

Regardless of the fact that demographic projections are associated with much uncertainty (Alho, Jensen and Lassila, 2008), these prospects may well trigger demands for welfare reforms. In addition to measures already launched to address the fiscal effects of population ageing, steps may be taken toward a more individualized system for pension rights, where benefits depend less on household status (Hatland, 2001). Also, as a growing share of one-person households is likely to be associated with an increased risk of poverty (Quintano and D'Agostino, 2006; Palmer, 2006), social policies may be reformulated in order to address the concerns about poverty.

Finally, it would be important to examine to what extent changes in household composition would matter for other macroeconomic variables, such as housing demand, labour supply, composition of private consumption etc.? These are topics for our future research agenda.

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