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# Measuring housing costs and housing affordability using SOEP: An example applied to older households

Alberto Lozano Alcántara and Laura Romeu Gordo

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# Measuring housing costs and housing affordability using SOEP:

## An example applied to older households

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**Abstract:** This paper explores the methodological issues to take into account when using SOEP as a database for calculating a measure of housing costs and housing affordability. For this purpose, we focus on the evolution of housing costs for households headed by elderly people between 1998 and 2018. Our review yields two clear conclusions: (1) that SOEP represents a valuable source of data for calculating household housing costs; and (2) that it is important to take changes made in the SOEP questionnaires into account and to make the appropriate assumptions when one wishes to analyse how housing costs have evolved over time (or how they evolve over the life course). Besides, our results confirm previous studies (Romeu Gordo, Grabka, Lozano Alcántara, Engstler, & Vogel, 2019) by showing that housing costs tend to be higher for elderly tenants than for the homeowners and that this difference widened during the period between 1998 and 2018.

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## 1. Introduction

Housing usually represents the largest outgoing expended by any household for any category of consumer good (Hörstermann, 2016; Noll & Weick, 2006). The amount of money that a household needs to dedicate to covering its housing-related costs therefore strongly determines the amount the household has left over for non-housing consumption and/or savings.

Housing prices and rents have been increasing significantly in Germany over the last 20 years (Baldenius, Kohl, & Schularik, 2019; Bundesregierung, 2019; Kohl, Sagner, & Voigtländer, 2019). This trend has led to an increasing interest in analysis of how housing costs are evolving and of the affordability of housing (Dustmann, Fitzenberger, & Zimmermann, 2018; Kohl et al., 2019; Lebuhn, Holm, Junker, & Neitzel, 2017; Romeu Gordo et al., 2019; Sagner, Stockhausen, & Voigtländer, 2020).

When analysing the evolution of housing costs, a focus must be put on dissimilarities in the relevance of such costs to different people. Not all social groups and regions are affected equally by increasing housing costs, and the issue of whether housing costs run the risk of turning into an excessive financial burden for a household will also depend on how its income develops over time.

In the case of older households (which, for these purposes, we define as households for whom the reference person is aged 65 or older) – whose main source of income is likely to be pension benefits and a large percentage of which are made up of single-person households – the task of analysing who is in a position to afford housing in the context of increasing costs is an important step in preparing the ground work for the formation of social policy.

The German Socio-Economic Panel (SOEP) offers the information required to calculate housing costs on an annual basis over an extended period of time for a representative sample of German households. In addition to this, it also allows one to relate housing information to other relevant socio-economic information, thus permitting one to compare a variety of groups against one another. However, over the years, the questionnaire upon which the SOEP is based has been modified in ways that oblige one to discuss a number of methodological assumptions that need to be made when calculating housing costs. Besides, there is no one unique definition of housing costs agreed on in the literature. The figures will vary slightly

depending on the definition one chooses – on which items one decides to include in one’s housing cost calculations.

The objective of the present paper is to discuss these methodological issues, using SOEP as a database. We begin by discussing how housing costs have been calculated in existing literature. We then go on to show how such calculations may be made using SOEP data, as well as how changes made to the questionnaire and the inclusion of various housing cost components can affect the calculation of such costs for the older section of the population. Lastly, we present a number of different ways of measuring housing affordability using the SOEP data.

## **2. Literature overview**

The concept of housing costs refers to the total monthly expenses that a household is required to spend on its dwelling place. Depending on a variety of assumptions and on the data available to them, various scholars and statistical agencies have applied different methods in their efforts to operationalise housing costs.

In Germany, given the importance of the rental sector – 54% of the Germans live in rented homes (Statistisches Bundesamt, 2020) – and the fluctuations in rent prices that have occurred over the last few decades, many studies (Frick & Grimm, 2009; Kohl et al., 2019; Lebuhn et al., 2017) have focused on gross rent figures, excluding heating, as a measure of housing costs. But the decision not to consider heating costs implies the exclusion of an important component in the cost of housing. For example, in the year 2018 heating costs made up about the 24%<sup>2</sup> of the total housing costs for households headed by elderly people.

The statistical office of the European Union (Eurostat) applies a broader strategy when it comes to operationalising the data. In its work, Eurostat includes as housing costs total utility costs (water, electricity, gas and heating), rent (for tenants) and mortgage interest payments (for homeowners with an outstanding mortgage). In addition, they also include, where applicable, structural insurance premiums, services and charges (sewage services, refuse removal, etc.), taxes on the dwelling and expenditures relating to regular maintenance and repairs as components of the cost for homeowners. If the household receives any housing

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<sup>2</sup> Own calculations using SOEP.

allowances (in the case of rent-free households, for example), then these too are added into the figure for total housing costs<sup>3</sup> (Eurostat, 2020). Studies such as Belfield, Joyce, and Chandler (2015) in the UK and Dustmann et al. (2018) in Germany apply a similar computational strategy.

In contrast, OECD analysts among other scholars (Fahey, Nolan, & Maître, 2004; OECD, 2016; Stephens & Leishman, 2017) have adopted a different method, one that differs in particular in the way they operationalise homeowners' housing costs. By their lights, the housing costs of a homeowner with an outstanding mortgage should include not just mortgage interest payments, but also the cost of repaying the principal remaining on the sum borrowed. They argue that what interests them is the monthly income available to such householders after having paid all expenses related to housing (Fahey et al., 2004) and/or on how housing costs fluctuate over the course of one's life (Stephens & Leishman, 2017). Against this, proponents of excluding mortgage repayment costs maintain that repayment of principal "constitutes an accumulation of net wealth and is thus part of savings rather than consumption" (Dustmann et al., 2018, p. 12). Moreover, principal repayments depend on a number of other variables – for example, the set loan repayment period or the loan amount – making comparisons both within and between countries difficult. In this regard, Dara Turnbull, Housing Europe Research Coordinator, advocates calculating two measures of housing costs for homeowners with an outstanding mortgage: one including repayment of the principal and another excluding it. He warns that failing to consider principal repayments "gives an artificial picture of affordability, especially when comparing a country with a high percentage of mortgage holders to one with a low percentage" (Turnbull, 2020).

Since no standard definition has become established in the literature, the items one finally decides to include in calculations of housing costs will depend on the goals of the empirical study in question and on the availability of data. It is, however, important to discuss the items one chooses for the cost calculation and to be aware of the consequences that such choices will have on results.

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<sup>3</sup> According to Eurostat, the housing benefits should not be deducted from the total housing costs.

### **3. Housing situation of the 65+ population**

The population over 65 years represents 21% of Germany's total population (GeroStat, 2017). Housing is a particularly important issue for them. They spend more time at home than other age groups (Engstler, Menning, Hoffmann, & Tesch-Römer, 2004) and they have a strong emotional attachment to their dwelling and neighbourhood, where they have built their social support networks over the years, which in turn contribute substantially to their life satisfaction in old age (Oswald, Jopp, Rott, & Wahl, 2011; Seifert & König, 2019).

Table 1 presents some descriptive statistics extracted from SOEP on the housing situation of households headed by a person aged 65 or older in Germany. According to the SOEP data, only 43% of the households headed by an elderly person were homeowners in 1998. This percentage has been increasing over the last 20 years, so that by 2018 58% of the households headed by an elderly person owned their own house. The majority of elderly households are composed of just one person. To put a concrete figure on it, 57% of older households were one-person arrangements in 2018. This percentage has decreased slightly since 1998, when 62% of the 65+ households were composed of just one person. In relation to average dwelling size among older households, the statistics record an increase from 81 square metres in 1998 to 97 square metres in 2018. The upshot of this is that the average dwelling size per person has increased from 60 in 1998 to 72 square metres in 2018. This trend is also illustrated by the increase in the share of older households living in houses accommodating one to two families over the past two decades. While in 1998 44% of the older households lived in one-to-two-family houses, by 2018 this share had increased to 52%. In contrast, the share of older households living in multiple-family residential units has decreased from 53% in 1998 to 46% in 2018. The relatively large size of dwellings is to a large extent explained by the fact that older individuals remain in their own homes for a long time and little adjustment is made to adapt to changes in the household size. Their dwellings tend to be of a size appropriate for an earlier period during which more family members were living in them. In 2018, for example, elderly heads of household had lived in their home for an average of 31 years. As a result, dwellings they live in tend to be old. In 2018, the average age of the dwellings they lived in was 56 years.

Table 1. Housing situation of the older households

	All households (65+)		Tenant households (65+)		Homeowner households (65+)	
	1998	2018	1998	2018	1998	2018
<b>% homeowner households</b>	43%	58%			100%	100%
% outright homeowner households	37%	49%			86%	85%
% homeowner households with mortgage	6%	9%			14%	15%
<b>% tenant households</b>	57%	42%	100%	100%		
% private tenant households	52%	37%	91%	88%		
% free-rent households	5%	5%	9%	12%		
<b>By household structure:</b>						
% single-person households	62%	57%	73%	70%	47%	48%
% couple households	37%	42%	26%	30%	52%	51%
<b>By region:</b>						
% households living in urban area	69%	68%	75%	70%	63%	67%
% households living in rural area	31%	32%	25%	30%	37%	33%
<b>Dwelling size (m<sup>2</sup>)</b>	81	97	63	73	105	116
<b>Dwelling size per household member (m<sup>2</sup>)</b>	60	72	52	59	70	81
<b>Average age of dwelling</b>	44	56	42	55	46	56
<b>Length of occupancy (years)</b>	28	31	23	24	35	36
<b>By dwelling type:</b>						
% households living in 1- to 2-family houses	44%	52%	20%	22%	76%	74%
% households living in multiple occupancy building units	53%	46%	78%	76%	18%	23%

Source: SOEP v35. Years 1998 & 2018. N<sub>1998</sub>=1,338 & N<sub>2018</sub>=3,546. Note: The estimates here relate to the sample of households for whom we have information on all items. The shares by household structure and by dwelling type do not add up to 100% due to the exclusion of data on households headed by elderly people categorised as “other household combinations” and of those living in “farm houses or others” from the table. Own calculations, weighted.

The SOEP data reveal that the housing situation of older households can be extremely heterogeneous and it can be analysed to investigate what differences exist between groups within such households. Older people’s housing situations vary according to whether they live in the city or the countryside and whether they live in West or in Eastern Germany, among other factors. Their housing situation also differs substantially as a function of whether the household is a tenancy or owner-occupier arrangement, and it is this distinction that forms the focus of our empirical analysis. The data shows that tenant households are more likely to be single-person households, whereas homeowner households are more likely to consist of a couple. Regarding dwelling size, homeowner households tend on average to live in larger dwellings than tenants. In 2018, for instance, tenant households provided an average of 59

square metres per household member. This compares to homeowner households, in whose dwellings each household member enjoyed an average of 81 square metres of living space. Although average dwelling size increased in relation to the household size both among tenants and homeowners in the period between 1998 and 2018, that figure increased more strongly among the homeowner households (+16%) than among the tenant households (+13%). In fact, there seems to be a difference between these two groups in terms the type of dwelling in which they live. Whereas tenant households live mostly in apartments in multiple occupancy buildings (76% in 2018), homeowner households predominantly live in one- to two-family houses (74% in 2018). At the same time, the homeowner households headed by elderly people tend to have lived a longer time in their dwelling (36 years in 2018) than the equivalent tenant households (23 years in 2018). With these differences in mind, in the sections to follow we go on to discuss the various pathways available to researchers in operationalising housing costs and assessing housing affordability for the two groups using the SOEP data.

#### **4. Operationalisation of housing costs using SOEP data**

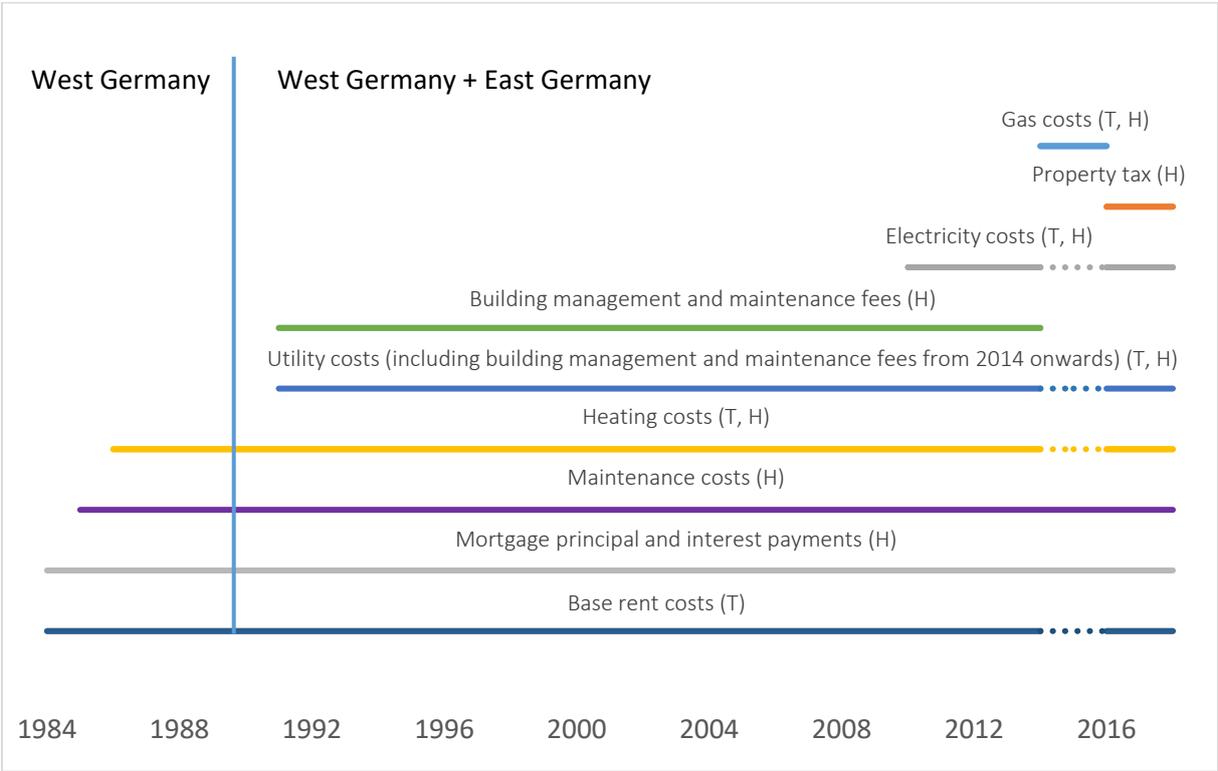
The German Socio-economic panel (SOEP) is a representative panel study of private households in Germany. It has surveyed all members of the sampled households aged 17 or older every year since 1984 in West Germany and since 1990 in East Germany. SOEP draws information from a wide range of domains of life (Goebel et al., 2019). The SOEP's household questionnaire asks for very detailed information on housing matters. Since the survey's beginnings, the SOEP has asked for extensive information on households' housing-related costs and housing characteristics. As a result of this detailed questioning, the SOEP provides information on the rental costs, utility costs<sup>4</sup> (from 1991 onwards), heating costs (in the case of tenants, from 1986 onwards only), maintenance costs (for homeowners only, from 1985 onwards), mortgage-related expenditures, gas costs (for 2014 only) and property tax (from 2016 onwards only). From 2010 onwards, it has also collected information on the electricity costs. In order to gain a convenient overview of what longitudinal housing cost information has been collected by the SOEP over the years, Figure 1 summarises all information collected in a single graphic. The years 2014 and 2015 are drawn with dashed lines to draw attention

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<sup>4</sup> Utility costs are the costs for water, garbage removal, street cleaning and other additional costs such as the fees for management and maintenance of the building.

to the fact that the questions on tenant households' housing costs in 2014 and the housing costs of all households in 2015 were phrased differently in relation to previous years. From 2016 onwards, these questions returned to the version used prior to 2014, in order to ensure comparability across all waves of the survey (SOEP Group, 2020). The graphic shows that, despite the changes made to the household questionnaire over time, the SOEP offers very comprehensive information upon which one may calculate a representative measure of the housing costs affecting German households.<sup>5</sup>

Figure 1. Information on housing costs included in the SOEP



Source: own graphic. Note: The “T” stands for “Tenants” and the “H” for “Homeowners”.

Our sample is composed of private households headed by someone aged 65 or older from 1998 to 2018. Nursing home residents and the household heads for whom information on their tenure status, age or income is missing are discarded from the sample. Households with missing values in some key housing cost components, such as the basic rent payments, or

<sup>5</sup> It is important to note that, whereas the homeowners are requested to give information on heating, utility, maintenance and electricity costs from the year prior to the interview year, the tenants are asked to provide information on their monthly costs at the moment of the interview. The housing costs of the homeowners thus lag behind those of tenants. In this paper we compare reported homeowners’ and tenants’ costs without taking this lag into account.

heating or utility costs are also excluded. As a result, the households from migration samples M3, M4 and M5 are not included, as some components on their housing costs were not surveyed (SOEP Group, 2020). In addition, given that the changes in the questionnaire in 2014 and 2015 affect the comparability of the estimates of housing costs (SOEP Group, 2020), 2014 figures for tenant households and 2015 figures for both tenant and homeowner households are entirely excluded from the present analysis.

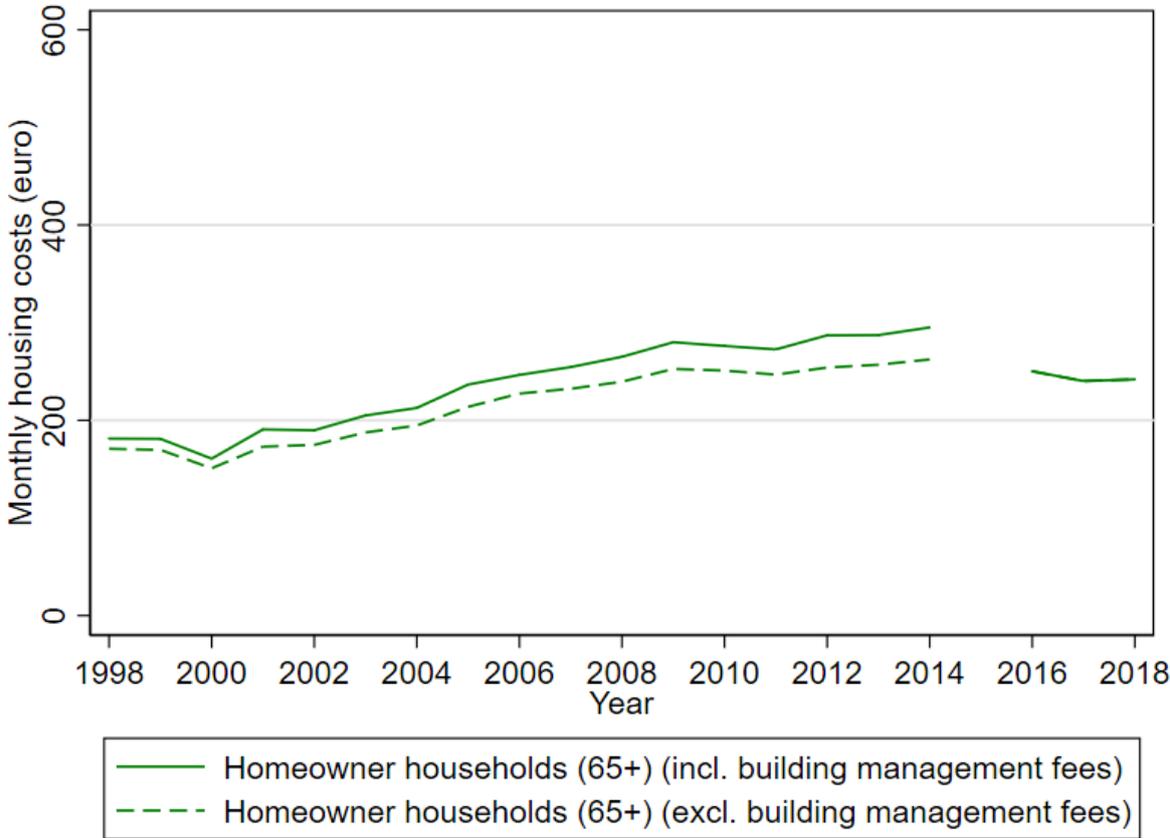
Following Eurostat's definition and keeping in mind the information available in the SOEP data, we aim to compute housing costs for tenants as the sum of the rental, utility, electricity and heating costs. According to the Eurostat definition, homeowners' housing costs should include utility, electricity, heating and maintenance costs as well as property tax, adding mortgage interest payment for households with a mortgage still outstanding. However, the information provided by the SOEP on some components of housing costs present us with a number of issues. We discuss these issues in the subsections to follow, commenting on how the various options in operationalising those costs affect the comparability of housing cost figures over the years for both the tenant and homeowner households headed by persons aged 65 years or older.

#### **4.1. Utility costs**

The SOEP household questionnaire has asked respondents about utility costs every year from 1991 on. Between 1991 and 2014, homeowners were asked about their costs in two separate questions: in the first of them, household heads were requested to provide figures for the cost of "water, garbage removal, street cleaning, etc." that they had incurred in the previous calendar year and in the second, they were asked whether they had to pay any fees for the management or maintenance of their building and, if so, to name the amount they paid per month. From 2015 onwards, the question on fees for the management or maintenance of the building was no longer explicitly asked. Instead, the first question was modified, probably so that it would implicitly include fees for the management or maintenance of the building. The newly modified question referred to costs for "water, garbage removal, street cleaning, and other additional costs not mentioned above." This change gives rise to the question as to whether total utility costs, including the sum of the costs given in the two questions asked between 1991 and 2014 may be considered comparable with the information provided in

answer to the modified question from 2015 onwards. In Figure 2, to check whether this is the case, we compare the evolution of the homeowner households' housing costs, first including building management fees (represented by the solid green line) and then excluding them (as shown by the dashed green line). What we observe is a sudden decrease in housing costs from 2014 onwards. This effect suggests that the new version of the questionnaire (used from 2015 on) seems not to fully account for fees that are not explicitly mentioned in the question. However, given that the information on fees for the management and maintenance of the building were provided over a long period of time, we decided nevertheless to include the building management and maintenance fees as a component of the homeowners' housing costs.

Figure 2: Homeowner household housing costs excluding/including building management and maintenance fees by year



Source: SOEP v35. Years 1998-2018, except 2014 for tenant households and 2015 for all households (n=32,658); Note: In addition to utility costs with and without building management fees, the measure for housing costs includes monthly heating costs as well as mortgage interest and principal repayments for all households with an outstanding mortgage. Own calculations, weighted.

#### 4.2. Mortgage principal and interest costs

In the SOEP household questionnaire, heads of household are asked about how much they pay in total in amortization and interest charges for their mortgages as a single figure. This means that it is not possible to obtain the information on how much they pay in interest alone. As mentioned above, there are arguments in favour of counting only interest payments as a component of housing costs, leaving out the cost of repaying mortgage principal (see Dustmann et al., 2018).

In order to estimate interest payments within the SOEP data, we follow a similar approach to that used by Dustmann et al. (2018), taking advantage of information available from an external data source: the Sample Survey of Income and Expenditure (or EVS, to use its German acronym). The EVS is a representative household-based survey for the population of Germany. It has been conducted since 1962/63 in West Germany and since 1993 in East Germany. It surveys information on income, expenditures, wealth and debt from a sample of around 60,000 households (EVS, 2020).

Using the data provided by the EVS, we calculate the average percentage of mortgage payments devoted to mortgage interest for the 65+ population. We then use the portion thus obtained to calculate the amount of interest paid by households on their mortgages by applying that percentage to the SOEP figures. Since we only have information from the EVS for the years 2003, 2008, 2013 and 2018, we interpolate the percentages for the intervening years.<sup>6</sup> For the period before 2003, we assume that the percentage of mortgage payment devoted to interests has remained constant, justifying our decision by the fact that mortgage interest rates were relatively stable during the affected period (see Deutsche Bundesbank, 2020).

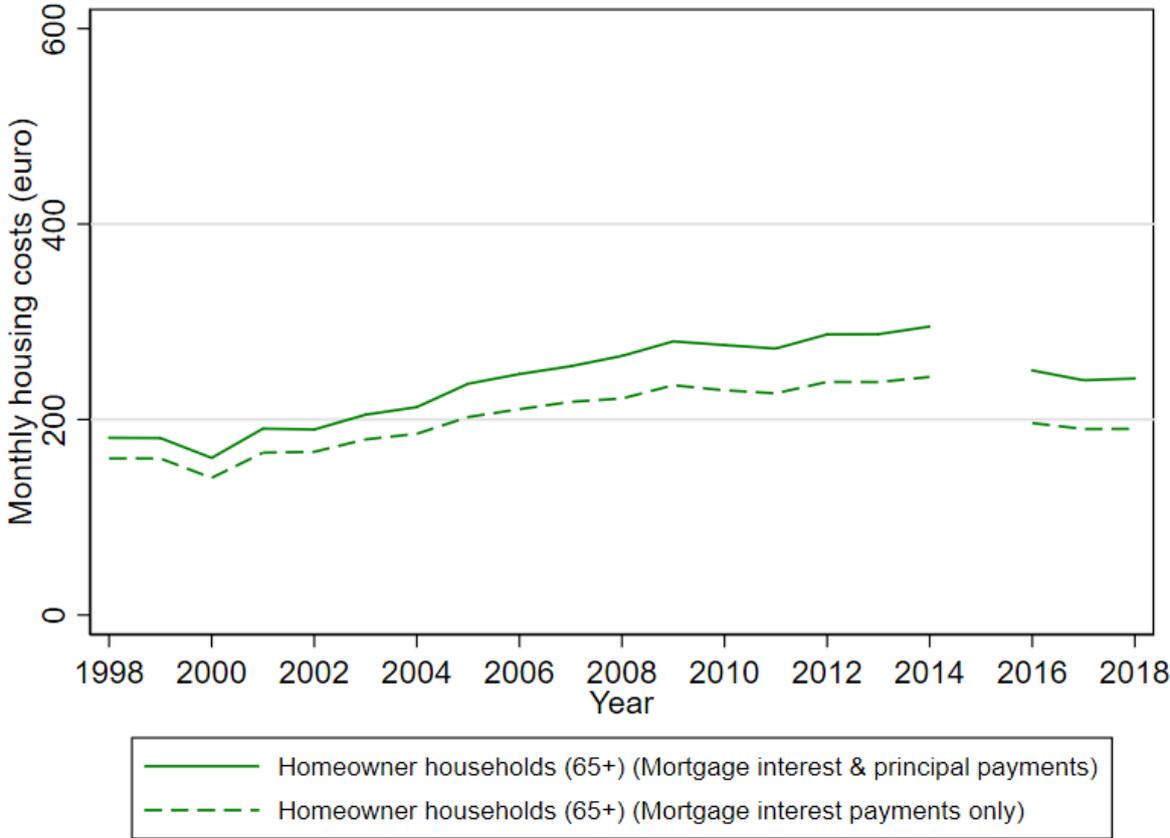
Figure 3 shows the evolution of monthly housing costs for homeowner households headed by someone aged 65 or over. The solid green line represents the homeowners' housing costs, including both interest and repayment of principal. Against this, the dashed green line indicates the housing costs as calculated excluding principal repayments. It is clear that the difference between the two measures increased between 2003 and 2018 as the interest ratio decreased over that same period. It is important to note that the normal homeownership life

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<sup>6</sup> For the interpolation we use the STATA function `ipolate`, which filled in the missing yearly values of the interest mortgage ratios by applying a linear interpolation.

cycle means that most homeowner households have already paid off their mortgage by the time they reach 65. Indeed, as shown in Table 1, the share of homeowner households headed by an elderly person subject to a mortgage over the period remains steady at about 15 percent. Based on the argument that mortgage principal payments is a form of saving rather than an expense, in the calculations that follow we decided to consider only the estimated amount of interest payment as a component of the housing costs, leaving out repayments.

Figure 3: Housing costs excluding/including mortgage principal payments by tenure status and year



Source: SOEP v35. Years 1998-2018, excluding 2014 for tenant households and 2015 for all households (n=32,658); Note: Homeowner housing costs include monthly heating and utility costs (including fees for building maintenance), mortgage interest payments (as shown in the dashed line) and (the solid line) mortgage principal repayments for households with an outstanding mortgage. Own calculations, weighted.

**4.3. Maintenance costs**

The SOEP draws information on expenditure for the dwelling’s maintenance for homeowner households only, as the maintenance costs of the tenants are assumed to be included in their rent payments. Up to 2015, the survey question referred only to “maintenance” costs but

from 2015 onwards the question was extended to include “modernisation” costs. As maintenance costs account for a large share of the homeowners’ housing costs, we checked the robustness of the data by comparing average maintenance costs for homeowner households headed by someone aged 65 years or older as obtained from the SOEP against average figures for elderly homeowner households from the EVS. Although the maintenance costs are surveyed differently and in much greater detail in the EVS<sup>7</sup>, average maintenance costs between the EVS and the SOEP turn out to be quite similar. For instance, the average yearly maintenance costs for homeowner households headed by someone aged 65 years or older in 2018 was 1,950 euros according to the EVS, while it amounted to 2,088 euros in the SOEP figures.

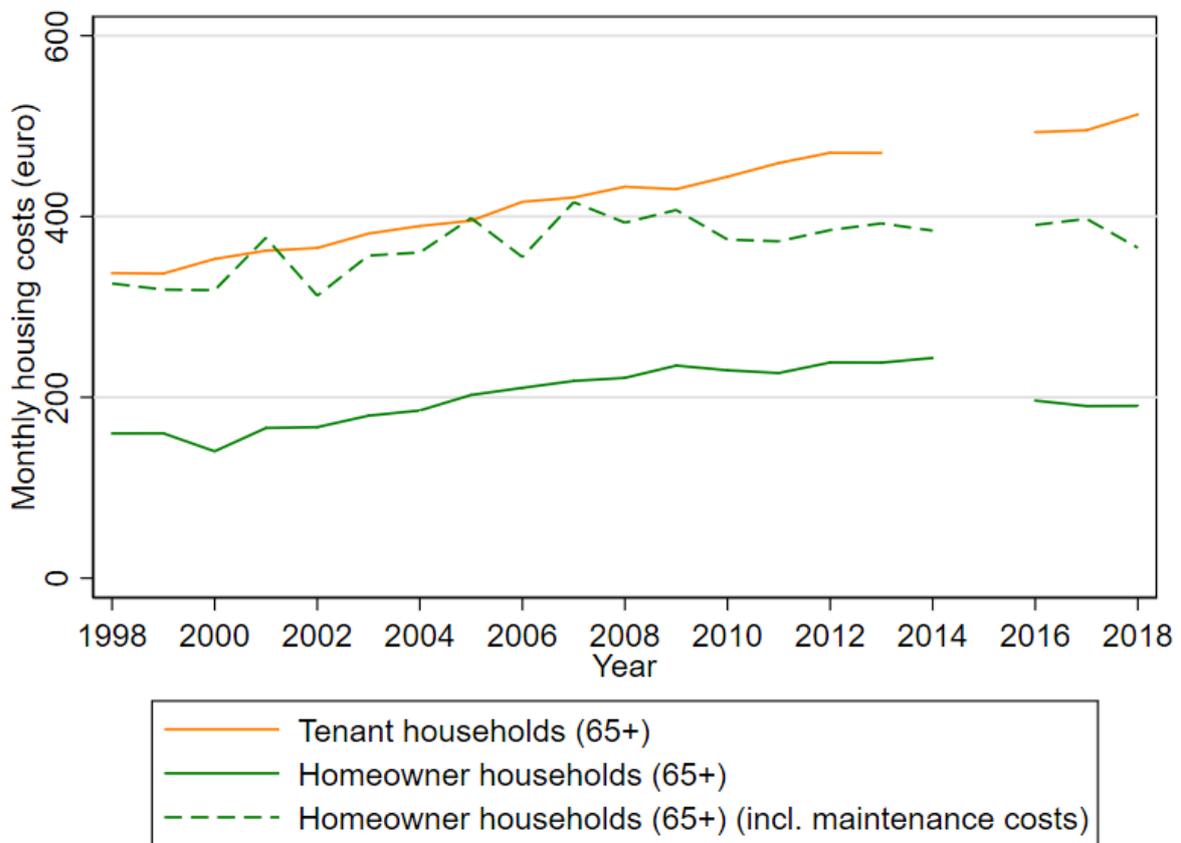
Table 2. Maintenance costs. Comparison between SOEP and EVS averages

		Yearly maintenance costs (euro)	
		EVS	SOEP
Homeowner households (65+)	2003	2,252	2,352
	2008	1,995	2,133
	2013	2,088	1,950
	2018	1,950	2,088

Figure 4 presents changes to housing costs for both tenants and homeowners. It includes two measures of housing costs for the homeowners: one including the maintenance costs (represented by dashed green line) and one excluding them (shown by the solid green line). The difference between the two measures reveals the importance of maintenance costs as a component of a homeowners’ housing costs. In 2018, they represented 52% of the homeowners’ monthly housing costs. The impact of the inclusion of the maintenance costs increases between 2014 and 2016, a phenomenon that may be explained by the change made to the question in order to account for “modernisation” costs. Taken as a whole, Figure 4 shows that the average difference in housing costs between tenant and homeowner households reduces substantially if we take maintenance and modernisation costs into account, thus showing that maintenance costs constitute a relevant component of housing costs that needs to be taken into account when comparing homeowners against tenants.

<sup>7</sup> The measure for maintenance costs in the EVS includes costs incurred for minor maintenance and repair work plus those for major maintenance and construction work.

Figure 4: Housing costs excluding/including maintenance costs by tenure status and year



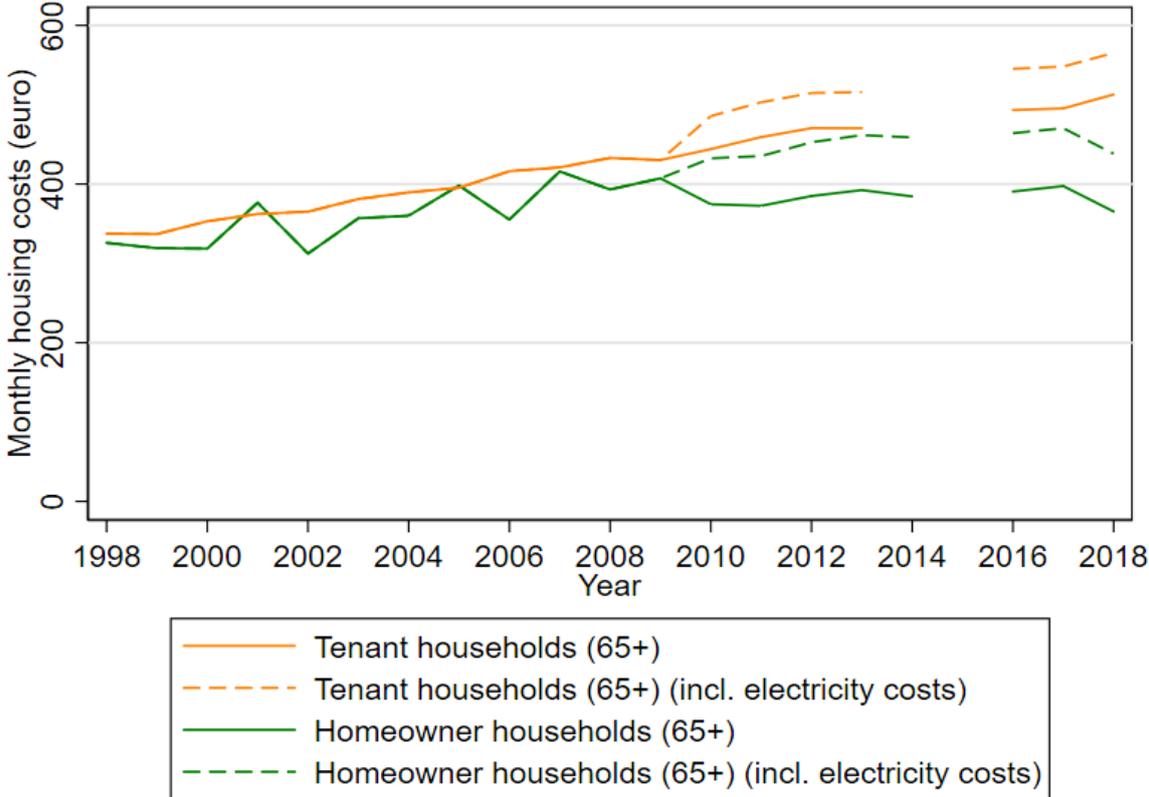
Source: SOEP v35. Years 1998-2018, excluding 2014 for tenant households and 2015 for all households (n=58,808 household-year observations); Note: Tenants' housing costs include monthly rent payments, heating and utility costs (the solid orange line). Homeowners' housing costs include monthly heating and utility costs (including building maintenance fees), estimated mortgage interest payments for households with an outstanding mortgage (the solid green line), and maintenance costs (the dashed green line). Own calculations, weighted.

#### 4.4. Electricity costs

The SOEP provides consistent information on the household electricity expenditures from 2010 onwards. Since there is a wide variation in electricity costs and since those variations are dependent on weather conditions, region and quality of insulation among other variables, it is difficult to impute values for electricity costs in the years prior to 2010. For this reason, we decided not to include electricity costs in our analysis for the period 1998 to 2018. Figure 5 shows the housing costs of homeowner and tenant households headed by someone aged 65 years or older with and without the inclusion of electricity costs. Over the 2010-2018 period, electricity costs were higher for homeowner households than for tenants. In 2018, elderly homeowner households spent 74 euros per month on average, compared against a

figure of 55 euros for tenant households. This tenure-related difference reduces when one looks at electricity costs as a function of the household size, as homeowner households tend to be larger than their tenant-occupied counterparts. In 2018, electricity costs per person living in the household amounted to 50 euros among the homeowner households headed by someone elderly, while it amounted to 44 euros per person among the equivalent tenant-occupied households. In addition, as Table 1 shows, homeowners tend to live in bigger dwellings than tenants. Accordingly, if one looks at electricity costs per square metre, it turns out that homeowner households pay less per month on average (0.7 euros per square metre) than tenants (0.8 euros per square metre). One can thus see that the size and the evolution of housing costs changes depending on whether one is looking in absolute terms or in relation to the relevant characteristics of each household or dwelling. We discuss this matter further in Section 5, as it is important to take it into account when analysing housing affordability.

Figure 5: Housing costs excluding/including electricity costs by tenure status and year



Source: SOEP v35. Years 1998-2018, excluding 2014 for tenant households and 2015 for all households (n=58,810 household-year observations); Note: Tenants' housing costs include monthly rent payments, heating and utility costs (the solid orange line) and electricity costs (the dashed orange line). Homeowners' housing costs include monthly heating and utility costs (including fees for building maintenance), maintenance costs, estimated mortgage interest payments for households with an outstanding mortgage (the solid green line) and electricity costs (the dashed green line). Own calculations, weighted.

#### **4.5. Property tax**

2016 was the first year in which the SOEP requested information on homeowner households' property tax. It is therefore impossible to include such expenditure within the homeowners' housing costs for most of the analysis period. For homeowner households headed by someone aged 65 years or older, annual property tax amounted to 324 euros in 2016, 331 euros in 2017 and 325 euros in 2018. If we were to take property tax into account, the average monthly housing costs of homeowner households headed by someone elderly would increase by 27 euros.

#### **4.6. Rent-free tenants**

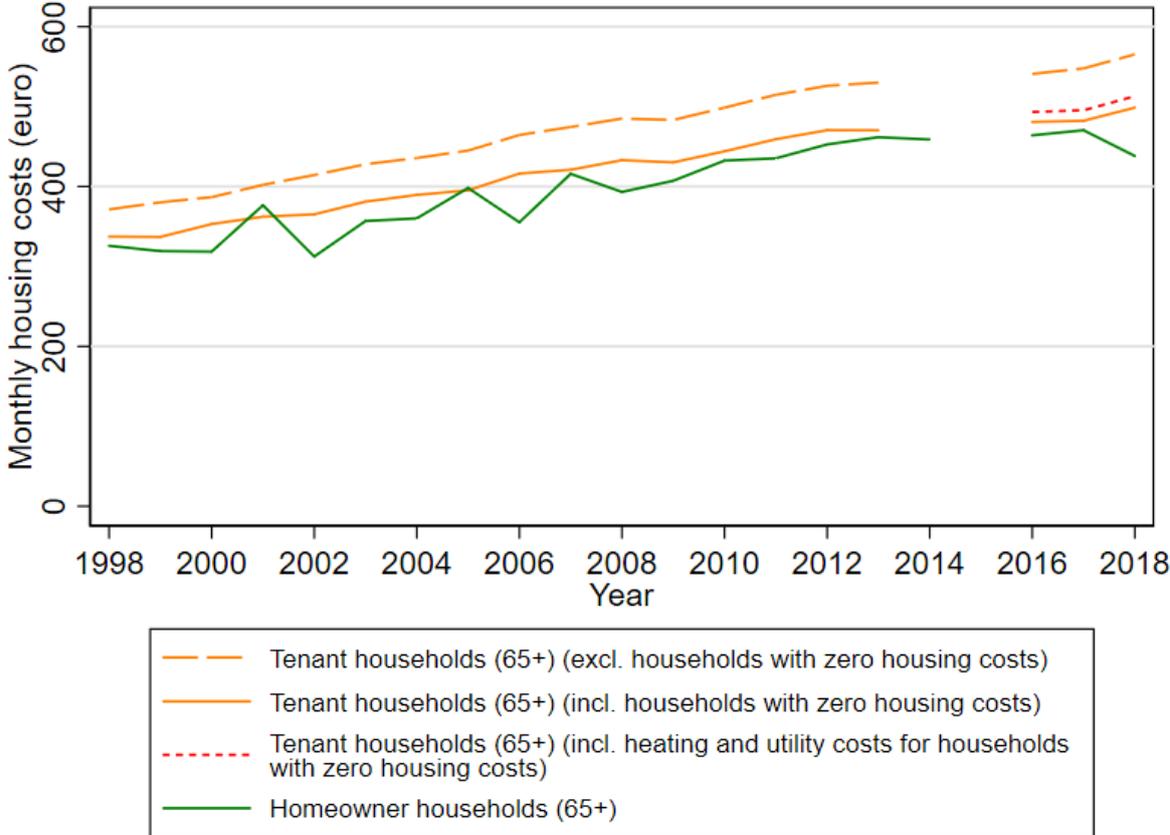
Around 11% of tenant households headed by an elderly person do not pay any rent.<sup>8</sup> Such households were not questioned in relation to their housing costs until 2014. Before that year, if respondents reported that they were not paying any basic rent, they were not asked about other housing costs. For that reason, around 11% of the tenant households were recorded as having zero housing costs before 2014. Since 2014, however, even if they report not having to pay any rent, they are asked about their heating and utility costs. As a result, the share of tenant households with zero housing costs fell to 3.5% from 2016 onwards. Figure 6 shows, firstly, how the inclusion or exclusion of households with zero housing costs affects the average measure of housing costs (compare the long-dashed line against the solid line) and, secondly, how the changes made to the survey in 2016 impact on the evolution of costs over the years (the solid line versus the short-dashed line). Firstly, one can clearly see how the average housing cost obviously becomes higher when one excludes tenant households with zero housing costs from the calculation for average housing cost. Secondly, one can observe that the inclusion of heating and utility costs for rent-free tenants from 2016 onwards does not cause any strong "artificial" rise in the average housing costs over the period.

For that reason, we decided to take into account such utility and heating costs from this group as housing costs. We also decided to take households with zero housing costs into account for coming analyses, as there appears to be a more or less constant share of households living in apartments that are not subject to any basic rent over the entire period studied.

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<sup>8</sup> Among this 11% of households with zero housing costs, 67% reported that they lived in an apartment let at a reduced price by the owner.

Figure 6. Tenant households' housing costs excluding/including rent-free tenants



Source: SOEP v35. Years 1998-2018, excluding 2014 for tenant households and 2015 for all households (n=58,810 household-year observations); Note: Tenants' housing costs include monthly rent payments, heating and utility costs. Homeowners' housing costs include monthly heating and utility costs (including building maintenance fees), maintenance costs, estimated mortgage interest payments for households with an outstanding mortgage. Own calculations, weighted.

**4.7. Operationalisation**

Following the Eurostat definition of housing costs and taking into account the restricted availability of longitudinal information (see sections 4.1 to 4.6) we operationalise housing costs for older households as follows:

Table 3. Operationalisation of housing costs

	<b>Housing costs included:</b>	<b>Housing costs not included:</b>
<b>Tenant households</b>	Basic rent payment, heating and utility costs	Electricity costs (see 4.4)
<b>Rent-free tenant household</b>	Heating and utility costs (from 2016 onwards only) (see 4.6)	Electricity costs (see 4.4), heating and utility costs (before 2016) (see 4.6)
<b>Mortgage-free homeowner household</b>	Heating costs, utility costs, building management and maintenance fees (see 4.1), and maintenance costs (see 4.3)	Electricity costs (see 4.4) and property tax (see 4.5)
<b>Homeowner household with mortgage</b>	Heating costs, utility costs, building management and maintenance fees (see 4.1), mortgage interest (see 4.2), and maintenance costs (see 4.3)	Mortgage principal repayments (see 4.2), electricity costs (see 4.4) and property tax (see 4.5)

Source: Own representation.

## 5. Measuring housing affordability for the 65+ population using SOEP data

The SOEP thus offers the information needed to compute a representative measure of housing costs. However, in order to be in a position to use the housing costs so calculated as a measure of housing affordability and to compare the impact of housing costs on the economy of different categories of household, one will have to take into account, among other factors, differences in household size, housing-related characteristics and household income.

A couple household may have higher housing costs than a single-person household, yet at the same time the couple will likely be able to share the costs of having a kitchen between them, while a single person living alone cannot. Likewise, it is perfectly possible that a household spending 500 euros per month on housing costs might be living in an objectively better dwelling than a household whose housing spend is 1,000 euros a month. In addition, 1,000 euros in housing costs will not mean the same thing for a household with a monthly income of 2,000 euros as it does for a household taking in 20,000 euros a month.

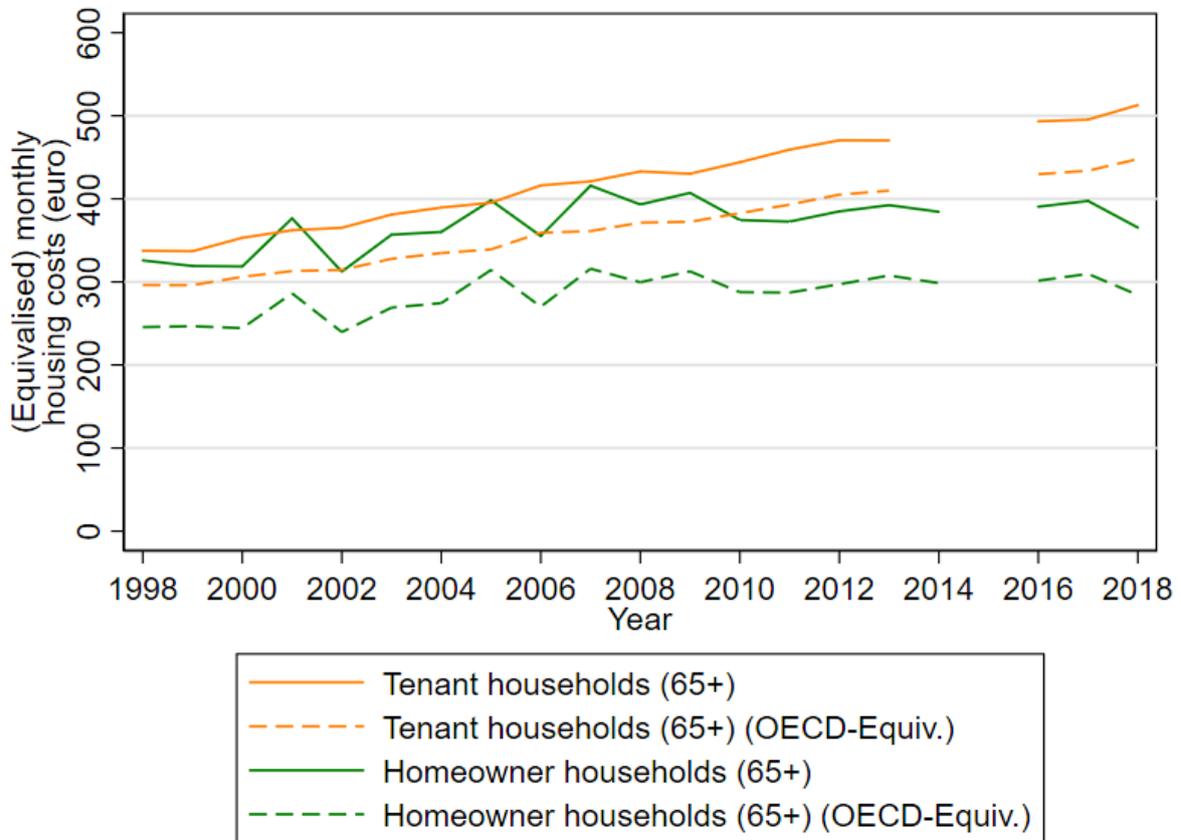
### 5.1. Equivalised housing costs

All measures related to the housing costs are drawn from the SOEP's household survey. So far we have compared how the various components of housing costs affect total housing cost by tenure status. In other words, we have been comparing tenant against homeowner households. Nevertheless, in order to better compare the housing costs of the two groups,

one needs to take into account the effect of economies of scale in consumption that takes place when a household is composed of more than one member. It therefore makes sense to adjust housing costs in relation to household size. One way of doing this would be simply to divide the housing costs by the number of members living in a household. We, however, use a slightly more complex equivalence scale, as developed by the OECD, which is commonly used when making international comparisons. Based on this scale, household housing costs are divided by 1 when the household is composed by just one household member with the scale increasing by 0.5 for every additional person aged 14 years or older in the household and by 0.3 for every additional person aged under 14 years (OECD, 2009).

In Figure 7, we present the measures of housing costs for both tenant households (indicated by the orange lines) and their homeowner counterparts (shown as green lines). They are first of all shown without making any adjustment for household size (indicated by solid lines) and then displayed after making that adjustment. Both measures indicate that the average housing costs are higher among the tenant households than among the homeowner households. Yet interestingly, the difference in housing costs by tenure status is larger when looked at via the equivalised measures, as the average household size among homeowner households is larger than for tenant households. Looking at the evolution of this figure over the years, the difference in housing costs between tenant households headed by an elderly person and their homeowner counterparts has widened since 1998, whether one looks at the equivalised or the non-equivalised coefficients. However, the difference in equivalised housing costs by tenure status has increased less (+113 euros) than the non-equivalised measure of housing costs (+136 euros) between 1998 and 2018. What this means is that, although the housing costs have increased more among the tenant households headed by the elderly than for elderly homeowners, household sizes may also have either increased more among tenant households or decreased more among homeowners during the period, underlining the importance of including household size in one's considerations to avoid over- or underestimating the changing differences in housing costs by tenure status over the years.

Figure 7: Housing costs equivalised and not equivalised by tenure status and year



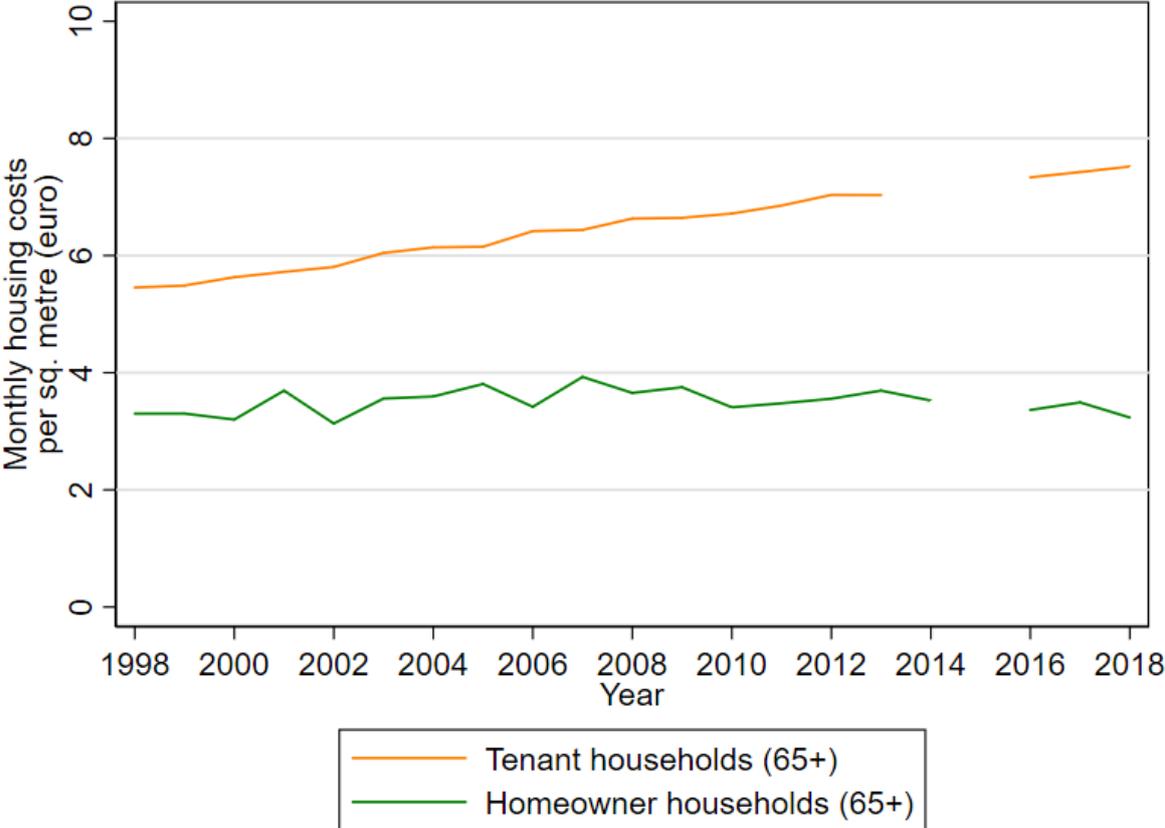
Source: SOEP v35. Years 1998-2018, except 2014 for tenant households and 2015 for all households (n=58,808 household-year observations); Note: Tenants' housing costs include monthly rent payments, heating and utility costs. Homeowners' housing costs include monthly heating and utility costs (including building maintenance fees), estimated mortgage interest payments for households with an outstanding mortgage, and maintenance costs. Housing costs are adjusted for household size (OECD-modified Equivalence Scale). Own calculations, weighted.

## 5.2. Housing costs per square metre (and equivalised square metres)

Another way of comparing the two groups is by taking into account some items of information related to the dwellings' quality, including their size in square metres. Figure 8 shows the evolution of monthly housing costs by square metre for both homeowner and tenant households headed by older people. It demonstrates that homeowner households paid lower housing costs per square metre in 2018 than in 1998, although in general terms housing costs per square metre have remained relatively steady. In contrast, tenant households' housing costs per square metre have increased constantly over the same period. This phenomenon can be explained by the fact that, as seen in Table 1, while average dwelling size for tenant

households headed by someone elderly increased from 63 to 73 square metres between 1998 and 2018, the increase was larger for the homeowners (from 104 to 116 square metres).

Figure 8: Housing costs per square metre by tenure status and year



Source: SOEP v35. Years 1998-2018, excluding 2014 for tenant households and 2015 for all households (n=58,808 household-year observations); Note: Tenants’ housing costs include monthly rent payments, heating and utility costs. Homeowners’ housing costs include monthly heating and utility costs (including building maintenance fees), estimated mortgage interest payments for households with an outstanding mortgage, and maintenance costs. Own calculations, weighted.

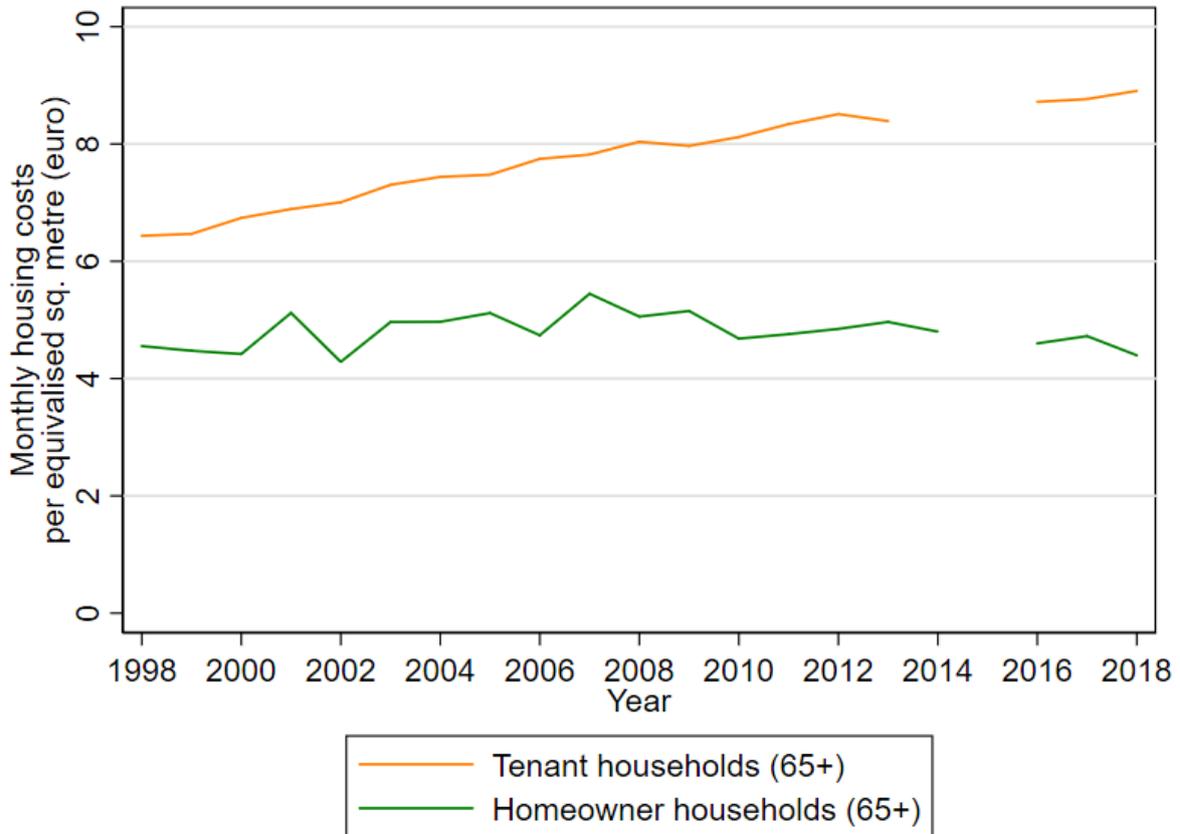
Bringing both aspects together – household size and dwelling size – Meyer-Ehlers developed a scale for “optimal living space supply” (Frick, 2004). Based on this scale, various scholars (Frick, 1995, 2004; Kohl et al., 2019; Weber, 2020) have calculated an equivalisation measure for the size of a household dwelling. According to this scale, the optimal living space needed by a household increases disproportionately with each additional household member. This disproportionality means that while a one-person household, for instance, would need a dwelling of 46 square metres, the optimal dwelling size of a 2-person household would not double, but would come in at the lower figure of 84 square metres. The scale is designed to

take into account the advantages of being able to share common spaces such as the kitchen or toilets.

In order to equalise a household's dwelling size, its size in square meters is divided by 1 when the household is composed of just one person, with the equivalence weighting increasing by 0.57, 0.26, 0.39, 0.21 for each additional household member up to five members and by 0.18 from the sixth member onwards. For instance, the dwelling size of a 6-person household is divided by an equivalence weighting of 2.61 ( $1.0 + 0.57 + 0.26 + 0.39 + 0.21 + 0.18$ ).

According to the SOEP data, the average equalised dwelling size for households headed by someone aged 65 years or older was 79 square metres in 2018. To put this in context, the same figure came to 66 square metres in 1998. Looked at by tenure status, equalised dwelling sizes were bigger among the homeowners (91 square metres in 2018) than among the tenants (63 square metres). Another thing worth noticing is that equalised dwelling size has increased slightly to a similar extent for both tenants (+15%) and homeowners (+14%). From this we can conclude that dwelling size per person is increasing for both groups, even taking into account the differing size needs of different sorts of household. After computing the equalised dwelling size, we went on to calculate housing costs per equalised square metres, simply dividing household housing costs by the equalised dwelling size. Thus, Figure 9 shows the evolution of the monthly housing costs per equalised square metre for both tenants and homeowners. As we have already observed in the previous graphic, we can also see here that average housing costs per equalised square metre has remained higher for tenants than for homeowners throughout the period studied, and that the difference between the two groups has widened, as the housing costs per equalised square metre have remained stable for homeowners while they have continually increased for tenants.

Figure 9: Housing costs per equivalised square metre by tenure status and year



Source: SOEP v35. Years 1998-2018, excluding 2014 for tenant households and 2015 for all households (n=58,808 household-year observations); Note: Tenants’ housing costs include monthly rent payments, heating and utility costs. Homeowners’ housing costs include monthly heating and utility costs (including building maintenance fees), estimated mortgage interest payments for households with an outstanding mortgage, and maintenance costs. Own calculations, weighted.

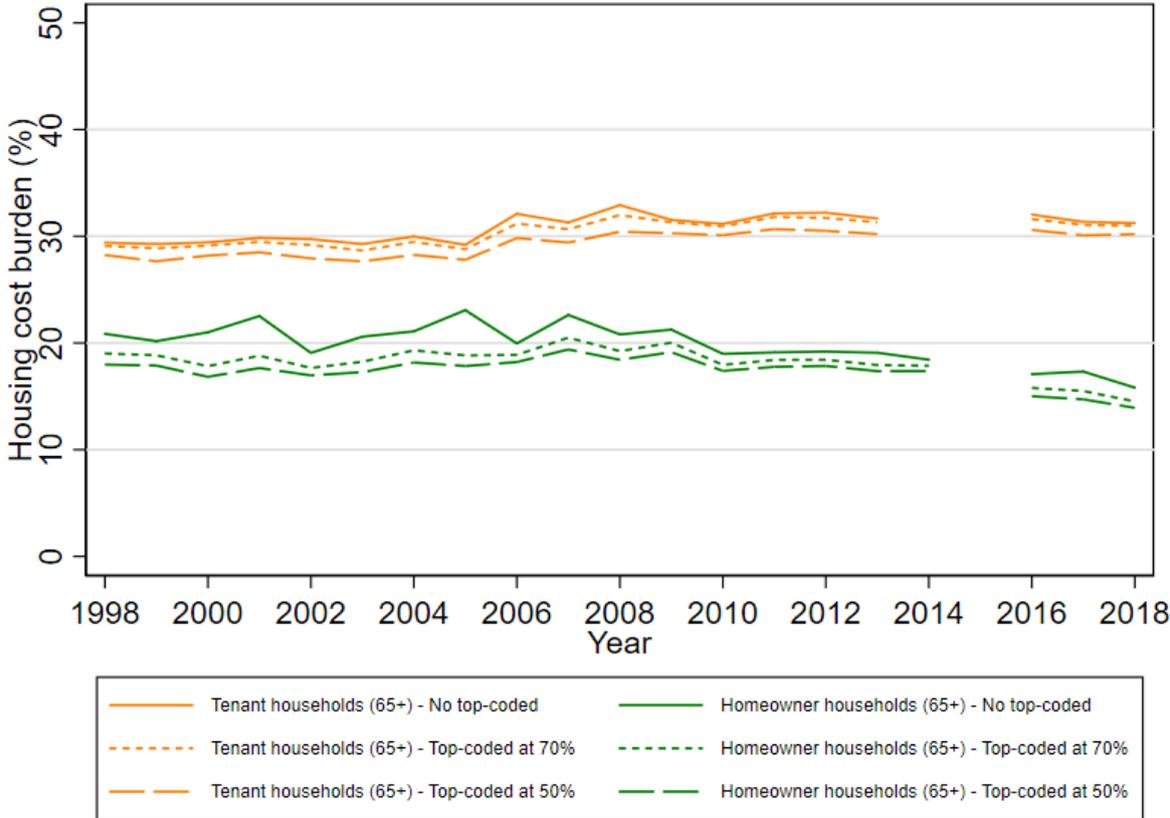
### 5.3. Housing cost burden

The SOEP gives information on household income, and thus allows one to calculate the ratio of housing cost over income: in other words, the household’s housing cost burden. This figure indicates the share of its income that a household must devote every month to paying its housing costs. According to Eurostat, a household is considered “overburdened” by housing costs when those costs represent a burden of 40% or higher (Eurostat, 2018).

Using the information on the net household income taken from the SOEP, it is possible to calculate the housing cost burden by dividing the monthly housing costs by the monthly net household income. In order to reduce the effect of outliers and any possible errors in the data, we decided to top-code the housing cost burden calculation. In Figure 10 we present

the effect of such restrictions on the average evolution of the housing cost burden by tenure status between 1998 and 2018. No big difference can be seen between the results using top-coding at 50% and at 70%. Given this observation, combined with the fact that only around 7% of households have a housing cost burden of over 50%, we decided to use the lower limit of 50% for future analyses. Independently of the top-coding cut-off points we applied, it can be seen that the differences between homeowner and tenant households and the evolution of the situation over the years remain similar. Tenant households devote, on average, a higher share of their income on paying the housing costs in comparison to the homeowner households over the entire analysis period. Aside from that, it can also be seen that the difference in average housing cost burden between the homeowner and tenant households has increased over the years, as housing cost burden has decreased among homeowner households and increased among tenants.

Figure 10: Housing cost burden by tenure status and year

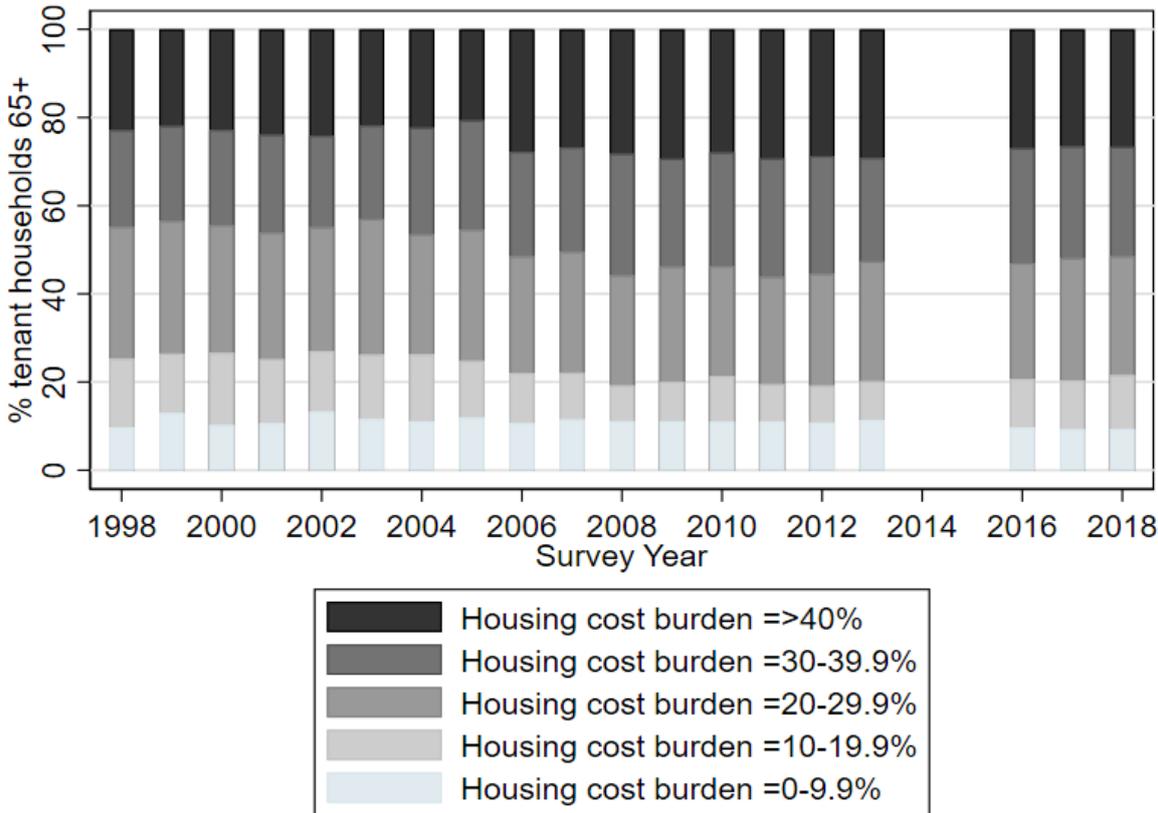


Source: SOEP v35. Years 1998-2018, excluding 2014 for tenant households and 2015 for all households (n=58,808 household-year observations); Note: Tenants’ housing costs include monthly rent payments, heating and utility costs. Homeowners’ housing costs include monthly heating and utility costs (including building maintenance fees), estimated mortgage interest payments for households with an outstanding mortgage, and maintenance costs. Own calculations, weighted.

In order to get a better insight into quite how heterogeneous housing cost burden turns out to be, Figures 11 and 12 show the distribution of the various levels of housing cost burden by tenure status for the period 1998 to 2018. The illustrations show that, while around 50% of the tenant households headed by an elderly person dedicate more than 30% of their income to housing in 2018, the same was the case fewer than 20% of the equivalent homeowner households. In fact, around 80% of homeowner households spent less than 20% of their monthly income on housing versus only 20% of tenant households spending so little.

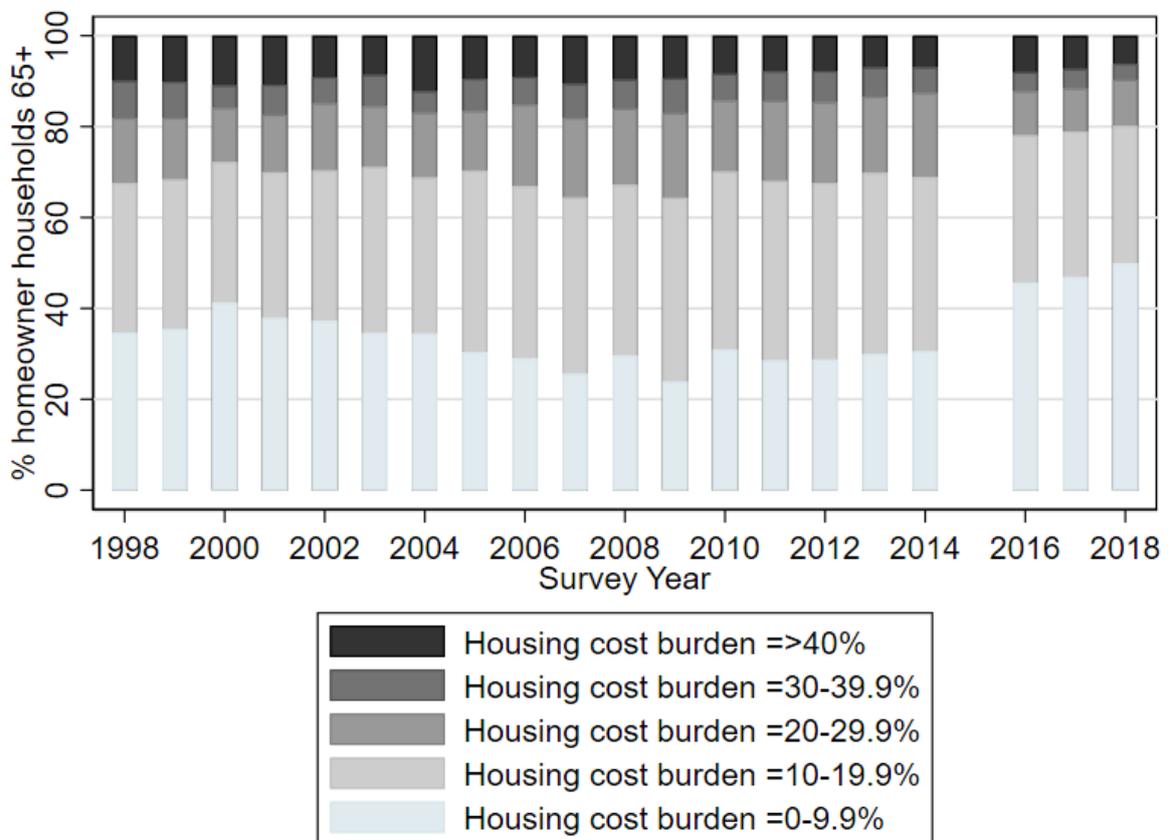
In conclusion, not only does average housing cost burden weigh more heavily on tenants, but their less comfortable situation is further underlined by the fact that fully half of tenant households are defined as being financially overburdened by their housing costs (i.e. spending more than 30% of their monthly income on such costs).

Figure 11: Tenant households' (65+) housing cost burden groups by year



Source: SOEP v35. Years 1998-2018, excluding 2014 for tenant households and 2015 for all households (n=26,150 household-year observations); Note: Tenants' housing costs include monthly rent payments, heating and utility costs. Homeowners' housing costs include monthly heating and utility costs (including building maintenance fees), estimated mortgage interest payments for households with an outstanding mortgage, and maintenance costs. To control for outliers, the housing cost burden was top-coded at 50%. Own calculations, weighted.

Figure 12: Homeowner households' (65+) housing cost burden groups by year



Source: SOEP v35. Years 1998-2018, excluding 2014 for tenant households and 2015 for all households (n=32,657 household-year observations); Note: Tenants' housing costs include monthly rent payments, heating and utility costs. Homeowners' housing costs include monthly heating and utility costs (including building maintenance fees), estimated mortgage interest payments for households with mortgage, and maintenance costs. To control for outliers, the housing cost burden was top-coded at 50%. Own calculations, weighted.

## 6. Discussion

This paper has been dedicated to a review of the housing cost items collected (and not collected) in the SOEP household questionnaire, and of how the information available on the topic has changed over time. In order to show the opportunities posed by the existence of this information for use in studies covering longer periods of time, we have calculated a number of housing cost metrics as they apply to older households.

This review has yielded two clear conclusions: (1) that SOEP represents a valuable source of data for calculating household housing costs; and (2) that it is important to take changes made in the SOEP questionnaires into account and to make the appropriate assumptions when one

wishes to analyse how housing costs have evolved over time (or how they evolve over the life course).

Our example – the evolution of housing costs for households headed by elderly people – demonstrates the sort of assumptions that need to be made, as well as showing how decisions about such assumptions might affect the results of a study. Based on the operationalisation method that we settled on, we were able to conclude that housing costs tend to be higher for elderly tenants than for the homeowners. Moreover, our results also show that this difference widened during the period between 1998 and 2018. These conclusions were confirmed even after accounting for differences between the two groups both in terms of numbers of household members and of dwelling sizes. Finally, after taking into account household incomes, we felt able to conclude that tenant households in Germany headed by elderly persons face a heavier financial burden in relation to housing than is the case for elderly homeowners.

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