

Better off alone?
**A life-cycle approach to studying changed patterns of
consumption after widowhood during retirement**

Hessel Rooijakkers

Universiteit Leiden



Advisor:

Dr. Eduard Suari-Andreu

Second reader:

Dr. Jim Been

Faculty of Governance and Global Affairs

MSc Public Administration: Economics & Governance

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1. Introduction

Widowhood fundamentally changes the life of the left-behind spouse in many ways. Besides coping with the emotional effects of losing their partner, widow(er)s also have to bear the economic consequences of continuing life as a singleton. Prior expectations about income may not come true anymore and, as a result, the widow(er) will have to adapt their consumption behaviour. An increasing number of elderly people are faced with widowhood during retirement; in the Netherlands in 2018, nearly 50,000 pensioners lost their spouse, a number that has been on the rise for years (StatLine, 2019). If a spouse passes away while the couple is retired, the economic vulnerability of the left-behind partner is even greater, as there are fewer ways for the partner to influence their income; it is not possible for them to opt for an extra shift at work if they are already no longer employed. They are reliant upon savings and retirement-income provision schemes. Survivor pension schemes aim to allow these widow(er)s to maintain their standard of living. The Dutch pension system is an interesting example of such a retirement-income provision policy. It is consistently hailed as the best system worldwide, ensuring a stable provision of adequate pensions through a balanced mixture of public and private schemes (Folger, 2020). Domestically, however, the strain put on the pension system by an ageing population has sparked renewed debates about the sustainability of government pension expenditure and thus the future status of pensioners (Tamminga, 2019). This debate culminated in the signing of a pension reform agreement in 2019 (Pelgrim & Rijlaarsdam, 2019).

It is socially important and relevant to research the economic status of the elderly because they are particularly dependent on the government for their income. They are vulnerable to drops in income compared to other adults, as it is more difficult for them to supplement their retirement benefits through, for instance, the labour market. This reliance on pensions whose framework is determined by the government implies an academic responsibility to provide policy-makers with adequate information to be able to evaluate existing policy regimes and get a clear view of what factors influence, for example, the consumption habits of the elderly. This is a responsibility for academia and policymakers as it is difficult for the elderly to gain access to the right networks in which they can defend their own interests. By establishing a clearer perspective on the determinants of economic behaviour of the elderly, scholars can provide governmental departments the tools they need in order to improve their policies through targeted legislation on the basis of identified mechanisms in the population.

When studying the economic behaviour of the elderly, a frequently-used empirical tool is the life-cycle theory (LCT) first articulated by Modigliani and Brumber (1954). In its most basic iteration, it means individuals want to smoothen their consumption over time because of the

concavity of the utility function – every marginal euro spent in a given time period yields less utility than the previous euros (Banks, Blundell, & Tanner, 1998). According to LCT, consumption is not entirely equal over the lifetime, as individuals have time preference rates – on how much they value consumption right now *vis-à-vis* future consumption, taking into account interest rates and inflation – to factor in when saving or spending money. Consumption is not expected to respond to income changes which were anticipated by the consumer or which are temporary, as these do not alter calculations of lifetime income and consumption. Scholars such as Bernheim et al. (2001) and Scholz et al. (2006), however, find that as income decreases upon retirement, households also lower their consumption. This is known as the retirement-consumption puzzle; puzzling because in LCT, smooth consumption is expected. In order to explain this effect, the LCT can be expanded with changing preferences dependent on the household's situation, including factors such as retirement, education, or widowhood. It is argued that upon retirement, households reduce consumption because they value consumption differently.

Expanding this idea with the shock of unexpectedly losing a spouse engages two mechanisms of the extensive model of the LCT. Firstly, the occurrence of widowhood can change the survivor's preferences for consumption; consumption formerly enjoyed jointly – such as going to the cinema or visiting a museum together – might be less attractive for a widow(er). This could relate to loneliness induced by the passing away of the spouse. Secondly, the loss of a partner also means an unanticipated reduction in household income as the partner's pensions benefits – both public and private – are not replaced entirely in the Netherlands (SVB, n.d.; Buijs, 2018). The lowering of consumption as a result of an unanticipated income shock is an income effect. It should be born in mind here that less consumption – and thus income – is required for a single-person household than a two-person household. The death of a spouse implies that there is one less mouth to feed in the household. In order to find equivalent levels of consumption between different-sized households, an equivalence scale is usually applied. Dividing expenses by the square root of the number of household members is considered a good measure (Aguilar & Hurst, 2013; Fisher et al, 2008; Fisher & Marchand, 2014).

This paper contributes to the existing literature by applying this extensive LCT to the occurrence of widowhood amongst Dutch pensioners, examining its income and preferences effects. Furthermore, it expands upon the literature by differentiating between various categories of consumption and by applying multiple strategies at the same time. The paper answers the question: what are the effects of widowhood on the patterns of consumption of Dutch pensioners? The effects implied in this research question are the income effect and the changed preferences effect on consumption. The answer to the question is obtained by estimating several regressions

on the variation in consumption between households exposed to widowhood and those who are living as a married couple. Patterns of consumption means consumption is not just taken as a whole, but also divided into the categories of housing, insurance, food, and miscellaneous costs. The paper estimates regressions on the basis of consumption which is both equivalised and non-equivalised for household size. It also takes both the level and logarithmic values of the variables. The results of these different regressions are compared to each other to reveal the effect of widowhood on consumption through income changes and changed preferences. The income effect is slightly positive for women and more positive for men. The preferences effect found in the study indicates that spending on housing – mortgage, rent, utilities, home and garden maintenance – is the only category to remain stable when not equivalised for household size. All other spending decreases, even when equivalised for household size. Total equivalised spending remains stable for men and decreases slightly for women.

In order to understand the policy background in which this paper takes place, section 2 discusses the workings of the Dutch pension system. Then, section 3 delves deeper into the life-cycle theory and other empirical evidence on consumption during retirement and after widowhood. Section 4 provides information on the data set that is used in the analysis. Afterwards, section 5 lays out some descriptive statistics which advance the research by providing indications on subjects to be examined more closely. In section 6, the methodological approach for the paper is explained and justified. The results are shown and interpreted in section 7. Next, a discussion on the results in light of the theoretical expectations and on the limitations of the study can be found in section 8. Section 9 sums up the main findings and draws a conclusion to answer the research question. The list of references for this work is available in section 10 and the appendices can be found in section 11.

2. The Dutch pension system

It is important to establish the institutional context in which the study is conducted. In its taxonomy, the Organisation for Economic Cooperation and Development (OECD) identifies three main tiers of retirement-income provision (OECD, 2019, pp. 131-141). The first tier is a mandatory layer of social protection which pays no regard to prior earnings. This tier is usually in place to reach a minimum standard of living in retirement. In the Netherlands, the first tier is formed by the *Algemene Ouderdomswet* (General Old Age Pensions Act, AOW). It is a universal basic benefit on the basis of the number of years a person has resided in the Netherlands (OECD, 2015, pp. 310-312). It is adjusted yearly to the development of the minimum wage. Anyone who reaches retirement age is entitled to the same AOW benefits, using only residency as a qualifier. This provides a basic level of income to all pensioners. For an average-earning Dutch worker, the AOW guarantees a gross replacement rate of 29 per cent (OECD, 2019, p. 151).

The second tier of retirement-income provision measured by the OECD (2019, pp. 131-141) are mandatory, earnings-related schemes. They soften the reduction in income upon retirement by providing benefits based on a person's prior earnings. These schemes can be organised through government institutions or diverse private actors. The Dutch case here is rather peculiar (OECD, 2015, pp. 310-312). Its second tier of retirement-income provision is organised through various privately funded occupational pension schemes. While they are not legally mandatory, industrial-relation agreements ensure that 91 per cent of employees are covered, so one might consider them quasi-mandatory (OECD, 2015, pp. 310-312). There are hundreds of pension funds, some industry-wide and some company-specific, with differing policy choices. The overwhelming majority have defined benefits schemes based on the lifetime average earnings of participants. These ensure a gross replacement rate of 42 per cent for an average-earning worker (OECD, 2019, p. 151).

The first-tier 29 per cent and second-tier 42 per cent add up to a respectable gross replacement rate of 71 per cent for average-earning workers. The private, second-tier share is relatively large compared to other countries. This is also seen in pension wealth accounting for over half of Dutch families' wealth, where elsewhere in the eurozone it is normally less than a third of families' total wealth (DNB, 2009, p. 34). Due to favourable tax treatment, the gross 71 per cent replacement rate means a net replacement rate of 80 per cent for average-earning workers (OECD, 2019, p. 155). It should be noted that the replacement rates reported above are based on fictitious workers in stable jobs; the Netherlands has a relatively high number of flexible – temporary or self-employed – workers, 30 per cent compared to an average of 22 per cent in the EU (CBS, n.d.). This makes the use of micro data an all the more interesting approach to studying pensioners.

The third tier of pension-provision concerns further voluntary, earnings-related benefits (OECD, 2019, pp. 131-141). This covers a wide range of options, from private insurers' annuities to the use of personal wealth to substitute income after retirement. The broad scope of this definition means that even the *Centraal Bureau voor de Statistiek* (Statistics Netherlands, CBS) does not have complete data on the size of the pillar (Molenaar-Cow & Woestenburg, 2018, p. 8). The third pillar cannot be considered a form of universal protection against late-life poverty. It should be noted that there is little need for personal savings to cover health expenses, due to the almost complete coverage of the public health and long-term care insurance systems (Van Ooijen, Alessie, & Kalwij, 2015, p. 353). In the Netherlands, the third pillar is both highly heterogeneous and of relatively little importance in the provision of old-age income (Bruil, Schmitz, Gebraad, & Bhageloe-Datadin, 2015).

The important – first and second – tiers are impacted significantly by the death of a spouse. In the first tier, the AOW, the death of a partner will significantly alter benefits in most cases (SVB, n.d.). The benefits for an unmarried person living on their own – a common situation after widowhood – are around one-and-a-half times the size of the benefits for individuals living together or married. As the benefits are per person, a married couple receives more AOW benefits in total, while elderly single people receive more benefits per person. In the second tier, a widow(er) is entitled to a maximum of 70 per cent of their partner's retirement benefits (Buijs, 2018). This percentage is dependent of on a variety of factors such as age, other benefits, and prior income, so it is hard to come to broad generalisations. In most cases, the partner's pension is close to 70 per cent (Radar, n.d.). Both of these schemes are based on the assumption that single-person households require less consumption than two-person households – but more than half.

Other circumstances to take into account are the general surviving relatives act (ANW) and inheritance law in the Netherlands. Eligibility for the ANW requires widow(er)s to either be looking after underage children or be declared at least 45 per cent unfit for work. Furthermore, the benefits are stopped upon retirement and thus do not play a role in this research. Finally, private wealth of the deceased – in case there is no will – is split between the partner, who inherits half, and the children, who split the other half of the inheritance (Rijksoverheid, n.d.). Unless there are special circumstances, however, the left-behind partner keeps control of the entire inheritance until they pass away, and the property is given to the children. Married couples saving money for the longest-living partner can be considered an informal form of survivor pensions. This is a hard-to-measure effect in most cases.

3. Theoretical framework and empirical evidence

3.1. The life-cycle theory and widowhood

The life-cycle theory (LCT) is a useful tool for economists when discussing the preferred consumption levels of individuals over time (Banks, Blundell, & Tanner, 1998). The main idea behind it is that because of the concavity of the utility function – the declining marginal utility of consumption –, individuals are best off spreading their consumption equally across their lifetime. Thus, individuals will borrow money or dissave to further their consumption when their income is below average and vice versa. This does not mean that the optimal level of consumption remains constant over time, as the model is further complicated by the individual's preferences; individuals will choose different levels of consumption based on different levels of uncertainty over future incomes and future needs, levels of risk aversion, time preference rates, liquidity constraints, and bequest motives (Knoef, et al., 2016). An example of how these preferences work is if inflation is higher than interest, it might be advantageous to bring consumption forward through dissaving before the wealth decreases in value. An example of bequest motives is that a person who values the inheritance of their children very highly will be less likely to dissave – consuming substantial parts of their wealth – at retirement. Within this framework, widowhood can affect consumption through two mechanisms, an income and a changed preferences effect.

Income effects occur when unanticipated, permanent changes in income take place. In the framework of the LCT, changes in income which can be anticipated are not expected to alter consumption, as these were included in the individuals' calculation of their optimal level of consumption. The death of a spouse, however, is something which cannot always be anticipated years in advance. As explained in section 2, the death of a spouse lowers household income, as the household will receive a single (although slightly higher) AOW benefit rather than two slightly lower AOW benefits (SVB, n.d.) and a deceased person's second-tier pension benefits tend to be replaced up to around 70 per cent for widow(er)s (Buijs, 2018). Reacting to this unexpected lowering of household income, households are expected to reduce their consumption, as their expected lifetime earnings have decreased. The death of a spouse, however, also has the effect of reducing household size by one – in this paper, only cohabiting married couples and widow(er)s living alone are included. This means that in order to get a true comparison of the households' utility levels, an equivalence scale is necessary. As stated in the introduction, dividing by the square root of household members is considered a good measure (Aguiar & Hurst, 2013; Fisher et al, 2008; Fisher & Marchand, 2014). In the analysis, it is interesting to investigate the effect of widowhood through household income when equivalence scales are applied. This allows the paper

to test the effects of the policies laid out in section 2 through the life-cycle theory mechanism of an income effect on consumption.

Besides income, there is also an effect of changed preferences. In the most basic iteration of the life-cycle model, consumption is not expected to change as a result of anticipated changes of income, such as retirement, as they were taken into account when calculating lifetime consumption. In practice, however, scholars such as Bernheim et al. (2001) and Scholz et al. (2006) find that as individuals retire, they also lower their consumption. This is known as the retirement-consumption puzzle. In order to explain this effect, a closer look needs to be taken at the individual's preferences and how they are affected by their circumstances. The notion here is that as they retire, pensioners change their valuation of consumption. An example is that as pensioners have more time on their hands, their appreciation increases of foodstuffs which still require a lot of preparation rather than quick convenience meals. Similarly, when individuals are widowed, their valuation of consumption can change. Consumption which was previously enjoyed jointly – trips to the museum, going to the cinema together – could become less attractive for a widow(er), lowering overall consumption. This may be a sign of loneliness after widowhood. It is interesting to see what part of consumption change upon widowhood can be explained through income effects and what part can be explained through changed preferences of the widow(er).

3.2. Empirical evidence on the effect of widowhood on consumption

The role of preferences has also been identified in empirical studies. Looking at a smooth consumption over the lifetime, the replacement rate is often used as an indicator for the quality of pension systems (Knoef, et al., 2016). Given the life-cycle hypothesis, Boskin and Shoven (1987) argue that it is normal for the replacement rate to be lower than 100 per cent. Bernheim et al. (2001) found that the decline of income due to a replacement rate of under 100 per cent is highly correlated to a simultaneous decline in consumption at retirement. This indicates that rather than dissaving, the pensioners adapt their expenses to their expected levels of income. Scholz et al. (2006) found a similar effect of a reduction of consumption upon retirement. This goes against the most basic life-cycle theory in which individuals smooth consumption over time, but can be explained through the individuals' changed preferences. As the situation changes, individuals' preferences for consumption change too.

Besides these changed preferences, the effect of background characteristics on consumption is highly significant. Poterba et al. (2015, p. 32) find that people who go from two-person to single-person households experience a considerable decline in welfare. The scope of this decline is very different between different levels of education, well-educated individuals being

much less affected than their less well-educated counterparts (pp. 30-31). Besides, McGarry and Schoeni (2005) find that widows are more likely to be poor, but the poor are also more likely to be widowed. This overrepresentation of lower-income individuals within widow(er)s ought to be accounted for through covariates. Kalwij et al (2013) show that this positive correlation between wealth and life expectancy can also be found in the Netherlands. This means it is important to draw comparisons between individuals who come from a similar background, in which the death of their spouse is the only significant difference between the widow(er)s and the couples. This paper can check this effect of lower-educated households being particularly negatively impacted by widowhood in the analysis.

Other studies use quite different methods to emphasise the importance of gender (Browning et al., 2010; Cherchye et al., 2012; Rossi & Sierminska, 2015). Browning et al. (2010) use a different approach, developing a collective consumption model in order to properly compare the utility of married and widowed households. The underlying assumption of this framework is that a household cannot have preferences, individuals have preferences. Therefore, total consumption of a household should be seen as an expression of a compromise between the different preferences of members of the household. The model estimates preferences of household members in order to evaluate their total utility compared to single-member households. Cherchye et al. (2012) take this method and apply it to the Dutch case. They find that in general, the death of a spouse results in a substantial drop in material wellbeing for women, whereas for men, the death of a spouse generally has a positive effect on material wellbeing. Browning et al. (2010) attribute this effect to a common overrepresentation of the wife's preferences in couples which form a household. If the wife is widowed, she no longer has access to the same resources to fulfil her needs, whereas a widower would be able to redirect his resources to suit his needs better. Rossi and Sierminska (2015) make a similar point around the differences in preferences between men and women, finding that widows tend to have a higher propensity to save than widowers or couples, in which the man generally makes the main financial decisions. These results stress the importance of gender alongside the previously mentioned background variables in setting the preferences which determine the effect of widowhood on consumption.

4. Data

In order to find an answer to the research question, this paper makes use of the LISS (Longitudinal Internet Studies for the Social sciences) panel administered by CentERdata (Tilburg University, The Netherlands)¹. The LISS panel is a representative sample of Dutch individuals who participate in monthly internet surveys. The panel is based on a true probability sample of households drawn from the population register. A longitudinal study is fielded in the panel every year, covering a large variety of domains including work, education, income, housing, time use, political views, values, and personality. In the data collection, the researchers were aware that having an internet connection could constitute a threshold for many participants in the panel – the elderly in particular (Scherpenzeel & Das, 2010). In order to prevent that threshold from disrupting the representativeness of the data, those without internet access were provided different means of responding to the survey. The LISS collects data about individuals within households, all household members receive individual questionnaires, but many variables are measured on the household level.

The LISS panel data consists of a variety of questionnaires carried out over many different waves. This paper makes use of the data on background variables, on assets, on income, and on time use and consumption. The background data provides an overview on the respondents' general situation such as their age, income, household composition, civil status, and level of education and is available for every single panel member. The assets data provides an overview of the financial holdings of the panel member. The income data provides a more detailed overview of the members' sources of income. Finally, the time use and consumption data were most important for this paper, providing insight into the panel members' spending habits. Five waves of data are used, ranging from 2007 to 2017. An overview of the exact data modules which are used and linked is available in Appendix A.

As the research focuses on cohabiting retired married couples and retired widows, cases which fall outside of this definition are dropped. First, non-retired panel members are removed. Next, only cases in which a panel member either lived alone as a widow(er) or lived together with their spouse are selected to be kept. Then, only one observation is kept per household. Those who did not respond to the consumption survey were dropped. Finally, observations which reported monthly net income or consumption of under 0 or over 25,000 euros were dropped in order to balance the data. Figure 1 provides an overview of how the sample size is affected by these steps. Appendix A provides further detail on how a single observation was kept per household.

¹ More information about the LISS panel can be found at: www.lissdata.nl or in the paper of Scherpenzeel and Das (2010).

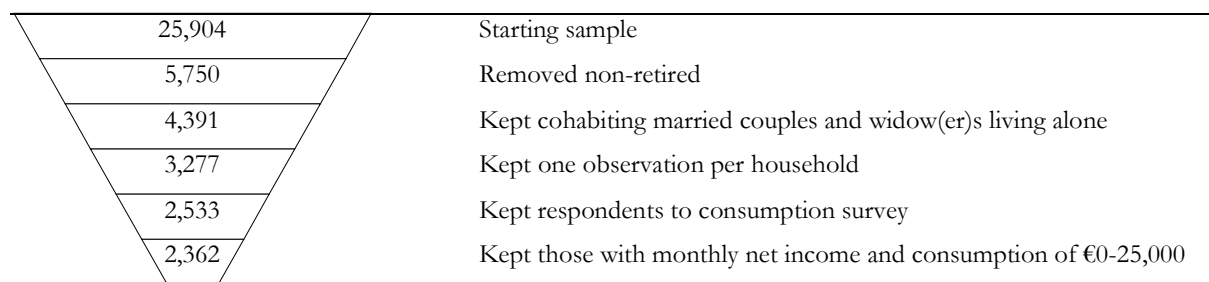


Figure 1 – Case selection: eliminating non-applicable observations

As the LISS is a longitudinal study, households submit data at multiple moments in time. The 2,362 observations used in this study belong to 1020 unique households. This means that on average, the data of a household is recorded in 2.3 waves (see Appendix A). As it would be interesting in this panel data to track the development of individual households, a check is performed on changes in civil status. Three instances of change were found, two of which concerning widows who entered a new marriage while being a part of the panel. The single case of a person being widowed does not allow for an individual fixed effects survey. Furthermore, a short investigation reveals a single occurrence of a same-sex (male) marriage, providing too few grounds for separate investigation of these cases.

5. Descriptive statistics

When making comparisons between households of different sizes, it is important to bear in mind the economies-of-scale benefits of living together in a larger household. In line with other literature on the retirement-consumption puzzle (Aguilar & Hurst, 2013; Fisher et al, 2008; Fisher & Marchand, 2014), an equivalence scale of the square root of the number of household members is applied to the consumption and income data. A household consisting of two people requires more – yet less than double – consumption in order to attain equivalent levels of utility to single-person households. $\sqrt{2}$ is considered an appropriate scale to account for this effect from a two-person to a single-person household. Throughout the paper, income and consumption data which has been adjusted by this equivalence scale is labelled *equivalised*, data which has not been adjusted is labelled *not equivalised*.

5.1. Background variables

Table 1 – Descriptive statistics: background variables

Variable	Married			Widowed		
	Mean	SD	Median	Mean	SD	Median
Age	71.8	5.379	71	75.1	6.731	74
Share of women*				69%		
Share of men*				31%		
Share low-educated**	36%			62%		
Share medium-educated**	28%			21%		
Share high-educated**	36%			17%		
Share of renters	24%			47%		
Share of homeowners	76%			53%		
Income, not equivalised***	2714	1172	2519	1766	824	1571
Income, equivalised***	1919	829	1781	1766	824	1571

*Only applies to widow(er)s as married couples are assumed to consist of both genders

Of highest-scoring household member. Low: primary school or intermediate secondary education (*vmbo*), medium: higher secondary education (*havo*), preparatory university education (*vwo*), or intermediate vocational education (*mbo*), high: higher vocational education (*hbo*) university (*wo*) *Net monthly household income (in €)

Taking into account the background variables on the population seen in table 1, it is first of all noticeable that widow(er)s are, on average, older (75.1) than married households (71.8). This can easily be explained; it becomes more likely that one of the spouses passes away as they both grow older. Furthermore, a clear majority of 69 per cent of widowed households consists of women. This can be explained by a life expectancy that is higher for women than it is for men in the Netherlands (Volksgezondheid en Zorg, n.d.) It is important to control for these factors as they have an impact on both the likelihood of widowhood and consumption. By controlling for background variables, the study can come closer to capturing the pure effect of widowhood.

Education is a powerful indicator of socioeconomic status. For the purposes of this study, education is measured along the categories of Statistics Netherlands, which classify primary school or intermediate secondary education (*vmbbo*) as low, higher secondary education (*havo*), preparatory university education (*vwo*), or intermediate vocational education (*mbbo*) as intermediate, and higher vocational education (*hbo*), or university (*wo*) as high levels of educations (CBS, 2019). The married households in the sample have, on average, enjoyed a higher level of education than the widowed households – as is visible in table 1. The level of education gives an insight into social class which, unlike, for example, homeownership and income, rarely changes after widowhood. It is, however, important to include it as a covariate in any data analysis attempting to capture the effect of widowhood, as widowers are not just more likely to be less well-off, but the less well-off are also more likely to be widowed (McGarry & Schoeni, 2005). By controlling for level of education, the study can include a factor which stably indicates a household’s standing in society.

The correlation between background variables and widowhood and consumption is even more complex for homeownership and income. Widow(er)s are nearly twice as likely to live in a rental dwelling as married households. This is an important determinant for patterns of consumption as those who live in rental dwellings generally spend a much larger amount of money on their housing each month. Renting one’s home could be an indicator for poverty, which increases likelihood for widowhood. The reverse, however, could also be true, with widowhood as an incentive for pensioners to move into a new (rental) dwelling. Similarly, the lower – equivalised and not equivalised – net income for widow(er)s could indicate that less well-off pensioners are more likely to be widowed, but it could also indicate that widowhood causes income to drop. The study can capture the pure preferences effect of widowhood by controlling for income, but it can also capture both the income and preferences effects together by simulating a certain socioeconomic status for observations through the other background variables. The trouble here is that there will always be unobserved characteristics which cannot be included in data analysis.

5.2. Consumption variables

The LISS data distinguishes between several categories of household-level consumption: mortgage, rent, general utilities, home and garden maintenance, insurances, eating at home, transport, daytrips and holidays, alimony, debt, childcare, and other household expenditure (see Appendix B for more detailed descriptions). In order to make the data more manageable, these expenses are collapsed into four categories of consumption: housing, insurance, food, and miscellaneous expenditure. Housing involves all the costs made on living in and maintaining a residence: mortgage, rent, general utilities, and home and garden maintenance. Insurance spending

and food at home spending each warrant their own category, as they are significant sums of money that follow a distinct pattern. Finally, the miscellaneous category consists of transport, daytrips and holidays, alimony, debt, day care, and other household expenditure. It should be noted that only non-single-person households were asked about their expenses on daytrips and holidays. By merging the consumption data into categories, it becomes easier to draw comparisons. This was particularly necessary in the housing category, where homeowners and renters would otherwise have entirely different cost categories, with homeowners paying interest on their mortgage and renters paying rent.

Table 2 – Descriptive statistics: consumption by categories (in € per month)

Variable / Category	Married, not equivalised			Widowed			Married, equivalised		
	Mean	SD	Median	Mean	SD	Median	Mean	SD	Median
Mortgage*	313	484	200	202	356	0	222	342	141
Rent**	586	411	530	564	623	500	414	291	375
Utilities	251	153	230	215	228	180	178	108	163
Maintenance	63	166	30	60	144	30	44	118	21
Housing	697	570	626	657	677	578	493	403	443
Insurance	321	233	315	211	285	175	227	165	223
Food	434	466	400	245	293	200	307	329	283
Transport	152	140	112	96	288	55	107	99	79
Leisure***	240	579	150				170	410	106
Other	197	420	100	167	332	80	140	300	71
Misc.	589	767	450	259	506	150	416	542	318
Total	2041	1385	1800	1371	1470	1122	1443	979	1273

*Only measured if household owns residence ** Only measured if household rents residence

***only measured for married households

Table 2 shows the consumption statistics for married and widowed households. For married households, it shows both equivalised and not equivalised data. The data is included in both these forms because they offer differing, interesting insights. On housing, for example, married and widowed households spend a nearly equal amount of money when not equivalised for household size, an average of €697 and €657, respectively. This can be explained on two grounds. Firstly, costs associated with housing do not decrease as fewer people live in the house. Thus, single-person households spend a relatively large amount of money on housing. Alternatively, as seen in table 1, widowed households are more likely to be renting than married households are. Elderly renters pay more than elderly homeowners do, the former paying an average €820 and the

latter €627 per month. At the same time, costs for widowed homeowners are lower than they are for married homeowners. A large proportion – 51 per cent – of widowed homeowners report no interest payments on their mortgage, suggesting they have paid it off already. It is clear that spending on housing behaves in a peculiar way that requires a regression analysis to be truly explained. The descriptive statistics indicate that the equivalence scale could be less useful when comparing housing expenditure, as spending there is nearly equal between married and widowed households when not equivalised.

The insurance and food categories in table 2 are more in line with the expectation of an equivalence scale. When applying the scale of $\sqrt{2}$, they are nearly equal, although the widow(er)s spend slightly less than their married counterparts. It is interesting to investigate whether this difference persists in the regression analysis or whether it can be explained by covariates. In the miscellaneous category, on average, the widow(er)s spend a significantly lower amount of money, €259 compared to an equivalised €416 for married couples. A large part of this variation can be attributed to the leisure category, which measures daytrips and holidays taken with the household. The widow(er)s were not asked for these expenses specifically and, although it could have been compensated slightly in the *other* category of spending, there is a chance that some of the leisure-spending by widow(er)s was not recorded. Overall, the widowed and married households spend a fairly equivalent amount of money every month, widow(er)s spending slightly less than married couples. It is interesting to investigate whether that is the result of budgetary pressures – an income effect –, whether it is a result of changed preferences, whether it is a combination of both, or whether widowhood plays no statistically significant role in explaining the widow(er)s' slightly lower consumption.

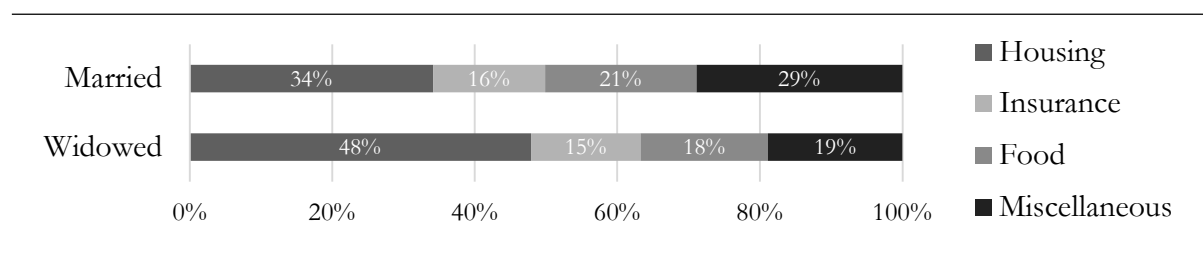


Figure 2 – Descriptive statistics: mean share of consumption categories

As the study focuses on spending in consumption categories and total consumption, it is relevant to gain a sense of how important these categories are in the total expenses of the pensioners. Figure 2 provides an overview of what share of consumption is spent on each category by married and widowed households. The share spent by married and widowed households on insurance and food – 16 and 15 per cent, and 21 and 18 per cent respectively – is rather equal.

Housing is the most important category, accounting for nearly half the consumption of widow(er)s and over a third of consumption of married couples. This is the case because – as seen in table 2 – married and widowed households spend nearly equal amounts on housing, while the total expenditure by widow(er)s is much lower than their married counterparts’, if not equivalised for household size. Besides, on average, married couples spend relatively more in the miscellaneous category. This is partially caused by the unrecorded leisure expenditure of widow(er)s, but also moves beyond that. Overall, it is clearly visible that housing is the most important category of consumption for all respondents, particularly so for widow(er)s. It would be interesting to, in the analysis, gain a better estimation of the effect of confounding variables on the size of consumption shares for widow(er)s and married couples.

6. Methodology

In order to obtain an answer to the research question, finding the effect of widowhood on the consumption patterns of Dutch pensioners, the paper performs a regression analysis on the micro-data found in the LISS archive. An ordinary least-squared (OLS) regression analysis is the best empirical approach as it allows the paper to check the effect of widowhood while controlling for different background variables. The regressions are estimated at household level, as equivalence scales provide a good manner to equalise the utility gained from consumption and married elderly households tend to operate as a unit, which means disentangling the consumption levels of both spouses would be counterproductive. Furthermore, as stated in section 4, the LISS panel provides rich, detailed information on consumption categories, but there is only one case of a person being widowed while being a part of the panel. This means a fixed-effects approach is impossible. Instead, the households' responses in different waves of the survey are considered separate observations. Standard errors are clustered at the household levels to help control for multiple measurements of the same household in different waves.

Several regressions are estimated in order to gauge the impact of the two mechanisms identified in the life-cycle theory in section 3.1. These predicted that widowhood would impact consumption through the income and through the changed preferences effects. The paper explores the effect of changed preferences by controlling for income. In another equation, the paper leaves out income as a factor in order to estimate the joint effect of income and changed preferences after widowhood. This also allows an insight into the effect of income, by comparing the joint effects to the effect of changed preferences alone. As explained in the descriptive statistics, equivalence scales are necessary to compare the utility of two households of different sizes. The paper uses both equivalised – divided by the square root of the number of household members – and non-equivalised data in its regressions. This allows it to make more detailed claims, for example, on how non-equivalised housing spending remains stable after widowhood regardless of household size. Furthermore, the paper takes into account both level and logarithmic measures of consumption in order to gauge both the absolute and percentual impacts of widowhood on consumption. When variables are transformed to a log value, cases in which the variable takes 0 are left out, causing up to 1.5 per cent of values to be missing in the log analysis. This is a low percentage and thus does not threaten the validity of the regression estimations.

The empirical strategy in the paper aims to measure the gendered effects of losing a spouse – in equation (1) – and to measure the differential impact of losing a spouse by level of education, identified by Poterba et al. (2015) – in equation (2). The baseline equation (1) differentiates on gender, as the major differences between the effect of widowhood on both genders and the fact

that most widowed persons are women would otherwise disturb measurement of the effects of widowhood. This yields the following regression equations:

$$\begin{aligned}
&Consumption_{IT} \\
&= \beta_0 + \gamma_1 Widow_{IT} + \gamma_2 Widower_{IT} \\
&+ \beta_1 Medium_educated_{IT} + \beta_2 High_educated_{IT} \\
&+ \beta_3 Age_{IT} + \beta_4 Age_squared_{IT} + \beta_5 Renter_{IT} + \beta_6 Income_{IT} \\
&+ \beta_7 Wave_2_T + \beta_8 Wave_3_T + \beta_9 Wave_4_T + \beta_{10} Wave_5_T + \varepsilon_{IT}
\end{aligned} \tag{1}$$

$$\begin{aligned}
&Consumption_{IT} \\
&= \beta_0 + \delta_1 Widowhood_{IT} \\
&+ \delta_2 Widowhood_{IT} \times Medium_educated_{IT} + \delta_3 Widowhood_{IT} \times High_educated_{IT} \\
&+ \beta_1 Medium_educated_{IT} + \beta_2 High_educated_{IT} \\
&+ \beta_3 Age_{IT} + \beta_4 Age_squared_{IT} + \beta_5 Renter_{IT} + \beta_6 Income_{IT} \\
&+ \beta_7 Wave_2_T + \beta_8 Wave_3_T + \beta_9 Wave_4_T + \beta_{10} Wave_5_T + \varepsilon_{IT}
\end{aligned} \tag{2}$$

$Consumption_{IT}$ is the monthly level of consumption by household I in wave T in euros. It is measured in one of five categories – housing, insurance, food, miscellaneous, and total – and can be equivalised or non-equivalised for household size. Furthermore, as stated previously, it is taken as a level or as a logarithmic value. β_0 is a constant value. In equation (1), γ_1 measures the impact of dummy variable $Widow_{IT}$, which is 1 for (female) widows and 0 for every other household. γ_2 measures the impact of dummy variable $Widower_{IT}$, which is 1 for (male) widowers and 0 for every other household. These two dummies measure the effect of widowhood by gender. This is essentially an interaction between widowhood and gender, which is only activated when the household is composed by a widowed person. Thus, the approach recognises the gendered effects of widowhood identified in the literature review without assigning a gender to married households, which are considered to consist of both genders². Next, the variable $Widowhood_{IT}$ is a dummy which takes 1 for widow(er)s and 0 for married households. $Medium_educated_{IT}$ and $High_educated_{IT}$ are dummies which take 1 for medium-educated and high-educated households, respectively. In equation (2), the interaction effects $Widowhood_{IT} \times Medium_educated_{IT}$ and $Widowhood_{IT} \times High_educated_{IT}$, measured by δ_2 and δ_3 respectively, measure whether Poterba et al.'s (2015, pp. 30-31) effect of more-educated widow(er)s being less affected by the loss of a spouse applies to this sample.

² As stated in section 4, evidence of a single same-sex couple was found, which does not warrant separate analysis.

The background variables operate the same way in both equations. β_1 and β_2 capture the effect of being medium or high-educated, respectively. Age_{IT} is the age of the respondent in years, the effect of which is measured by β_3 . Including the squared value of age – $Age_squared_{IT}$ – allows the paper to control for the non-linear effects of aging measured by β_4 . $Renter_{IT}$ is a dummy variable which takes 1 for renters and 0 for homeowners. This allows β_5 to measure the effect a renter status has on consumption, identified in section 5.2. Next, $Income_{IT}$ is the net household monthly income in euros, the effect of which is measured by β_6 . When $Consumption_{IT}$ is transformed from a log to a level variable or equivalised for the number of household members, the same treatment is applied to $Income_{IT}$. It is important to note that, as stated earlier in this section, regressions including and excluding $Income_{IT}$ are estimated to find the changed preferences effect and the combined income-preferences effect, respectively. $Wave_2_T$, $Wave_3_T$, $Wave_4_T$, and $Wave_5_T$ are dummy variables to account for the effects – measured by β_7 , β_8 , β_9 , and β_{10} , respectively – of living in the time T of wave 2, 3, 4, and 5. If all time dummies take the value 0, the households in wave 1 are measured. Finally, ε_{IT} captures the error effect of non-measured factors.

As became clear in the previous two paragraphs, equations (1) and (2) are used to estimate regressions in many different ways. An overview of all the ways in which they are used and where to find the complete results is available in table 3. The results of equation (1) are summarised in table 8 and the results of equation (2) are summarised in table 9, both available in Appendix C.

Table 3 – Methodology: overview of estimated regressions			
Results equation (1) found in:	Results equation (2) found in:	Preferences effect regression	Joint effect regression
Appendix D Table 10	Appendix E Table 14	- Level	- Level
		1 - Non-equivalised	2 - Non-equivalised
		- Controlled for income	- Not controlled for income
Appendix D Table 11	Appendix E Table 15	- Logarithmic	- Logarithmic
		3 - Non-equivalised	4 - Non-equivalised
		- Controlled for income	- Not controlled for income
Appendix D Table 12	Appendix E Table 16	- Level	- Level
		5 - Equivalised	6 - Equivalised
		- Controlled for income	- Not controlled for income
Appendix D Table 13	Appendix E Table 17	- Logarithmic	- Logarithmic
		7 - Equivalised	8 - Equivalised
		- Controlled for income	- Not controlled for income

7. Results

In this section, the most interesting results of the regressions are presented and discussed. An overview presenting all the coefficients for widowhood – by gender and interacted with the level of education – is available in Appendix C. More detailed overviews of the regression results – including covariates – are available in Appendix D and Appendix E. The equivalised, logarithmic regression results proved to be most valuable in measuring the effects of widowhood. Therefore, unless stated otherwise, the coefficients referenced in the text are taken from the regressions on equivalised, logarithmic data.

7.1. Effects of widowhood by gender

Table 4 – Results: effect of widowhood on consumption by gender. Equivalised data

Variables		Total	Housing	Insurance	Food	Misc.	
Level	Female	Preferences	19.10 (85.36)	153.4*** (44.49)	-8.675 (12.51)	-31.64* (17.62)	-94.00*** (31.12)
		Joint effect	18.95 (88.85)	153.3*** (46.65)	-8.679 (12.50)	-31.66* (17.88)	-94.06*** (31.42)
	Male	Preferences	11.10 (91.51)	145.1*** (38.39)	21.97 (28.81)	-60.45** (24.63)	-95.55** (37.56)
		Joint effect	125.4 (89.25)	188.9*** (37.90)	25.43 (28.76)	-41.89* (23.74)	-47.06 (36.62)
Logarithmic	Female	Preferences	-0.0792** (0.0332)	0.151*** (0.0501)	-0.0882** (0.0423)	-0.190*** (0.0501)	-0.467*** (0.0602)
		Joint effect	-0.0749** (0.0372)	0.157*** (0.0533)	-0.0877** (0.0422)	-0.185*** (0.0523)	-0.464*** (0.0656)
	Male	Preferences	-0.0286 (0.0372)	0.220*** (0.0566)	-0.0735 (0.0563)	-0.389*** (0.0689)	-0.315*** (0.0797)
		Joint effect	0.0591 (0.0399)	0.307*** (0.0573)	-0.0516 (0.0556)	-0.304*** (0.0689)	-0.168** (0.0832)

Standard errors clustered at the household level in parentheses *** p<0.01, ** p<0.05, * p<0.1

The results in table 4 show the equivalised, level and log effects of widowhood by gender. These results are shown as they provide a better insight into the utility of widow(er)s opposed to married couples. The coefficients show joint and preferences effects which are rather similar per gender. In general, the coefficients move in the same direction for both genders, although the effects are less positive or more negative for women. The significant coefficients are negative for both genders in all categories of spending except for housing. In total, the widowed women consume around 7.5 per cent less than married couples. No significant effect was found on widowed men's consumption, indicating that they spend an equivalent amount of money as a widower or as a husband. As explored later, this does not mean that spending remained equal per category, it means that the reduction of spending on the food and miscellaneous categories was offset by an increase in spending on housing.

Differences between the genders become even more interesting when looking into the income effects of widowhood. As the only difference between the joint and preferences coefficients is controlling for income, the difference between these two coefficients indicates the direction of the income effect. For women, in all significant cases, the preferences effect of widowhood is only slightly lower than the joint effect, indicating the income effect upon widowhood is barely there, yet positive – in table 4, the difference is always less than 1 percentage point. For men, the preferences effect of widowhood is a lot more negative than the joint effect in all significant cases – between 8 and 15 percentage points. This indicates a more positive income effect. That does not mean that the income increases upon widowhood, the non-equivalised effects in table 8 in Appendix C show negative income effects across the board. Instead, it means that while non-equivalised income is reduced for both genders, equivalised income of men is a fair amount higher after widowhood than before. Women experience a watered-down version of the same effect, their non-equivalised income effect is sharply negative and their equivalised income effect is slightly positive.

There is a great deal of variation between the effects of widowhood on different categories of consumption seen in table 4. Overall, the most significant results were found in the log regressions. This indicates that rather than moving up or down with an absolute number of euros, consumption tends to scale up and down – relative to consumption while married – after widowhood. Widows and widowers both have a decline in their equivalised spending on the food and miscellaneous categories and an increase in their housing spending. Widows also spend a bit less on their insurances and in total – 8.8 and 7.5 per cent less than married couples, respectively. The decline in miscellaneous spending is big for women in particular – 46 per cent for women and 17 per cent for men. The effect of spending on holidays and daytrips not being asked separately for single-person households – also mentioned in section 5.2 – can likely explain a large degree of this difference. In table 8, the food category also shows some concerning patterns; non-equivalised, widows and widowers spend 53 and 65 per cent less than their married counterparts respectively. When controlled for household size, this is still a decrease of 18.5 per cent for women and 30.4 per cent for men. This provides ample grounds for concern on the food consumption habits of widowed households; they might not be eating enough to stay healthy.

Housing, on the other hand, sees a major increase in spending by both widowers and widows compared to married couples, seen in table 4. Widows and widowers spend 16 and 31 per cent more on housing than their married counterparts, respectively. The coefficients for non-equivalised spending – found in table 8 in Appendix C – are mostly insignificant. That indicates that per household – regardless of the number of household members – spending on housing does

not increase or decrease. This could be caused by widow(er)s not moving houses after their spouse's death. It is a grounds for concern, as stable non-equivalised spending on housing on a budget that is decreased means there is less room for other consumption. While it could purely be a matter of consumption preferences, the equivalised increase in consumption in housing has policy implications which are discussed in the conclusion.

7.2. Effects of widowhood by level of education

Table 5 – Results: effect of widowhood on consumption by level of education. Equivalised data

Variables			Total	Housing	Insurance	Food	Misc.
Level	Medium-educated	Preferences	-237.8** (101.0)	-43.32 (57.79)	21.62 (28.28)	-73.49** (29.50)	-142.6*** (48.90)
		Joint effect	-158.7 (108.9)	-13.67 (61.01)	24.21 (29.31)	-60.63** (29.12)	-108.6** (48.72)
	High-educated	Preferences	93.01 (260.2)	174.9 (124.3)	23.82 (39.70)	-51.63 (50.89)	-54.11 (95.58)
		Joint effect	177.9 (265.6)	206.7 (130.2)	26.61 (38.95)	-37.83 (51.34)	-17.59 (95.91)
Logarithmic	Medium-educated	Preferences	-0.0358 (0.0576)	-0.0374 (0.0896)	0.131 (0.0841)	-0.118 (0.106)	-0.0800 (0.116)
		Joint effect	0.00790 (0.0656)	0.00457 (0.0965)	0.144* (0.0846)	-0.0841 (0.106)	-0.00339 (0.121)
	High-educated	Preferences	-0.0203 (0.0790)	0.0328 (0.126)	0.0987 (0.0887)	-0.0995 (0.0981)	-0.104 (0.130)
		Joint effect	0.0110 (0.0876)	0.0615 (0.133)	0.110 (0.0875)	-0.0767 (0.104)	-0.0511 (0.145)

Standard errors clustered at the household level in parentheses *** p<0.01, ** p<0.05, * p<0.1

The coefficients in table 5 show the interaction effect of widowhood and level of education on consumption. This measures the effect of widowhood on households which have enjoyed a medium or high level of education compared to low-educated households. The most salient results here are that there is little significant interaction effect between widowhood and level of education on consumption. While the estimates of the coefficients for level of education in general – visible in table 14 through table 17 in Appendix E – tend to be large and significant in determining the level of consumption of the elderly, a higher level of education does not appear to alter the effects of being widowed as a pensioner.

8. Discussion

8.1. Implications of results on literature

The effect of widowhood during retirement on the total amount of consumption was rather limited. For women, widowhood explained a decrease of around 7.5 per cent from married to widowed households. For men, no significant increase or decrease of total equivalised consumption was found. Across all categories of consumption measured, the preferences effect – not controlled for income – explained the largest part of variation between married and widowed households. This goes against the most basic version of the life-cycle theory, in which income is the cornerstone of explaining variation. It agrees with a more expanded version of the life-cycle theory, in which a household's preferences may be altered as its circumstances change. Besides, the preferences effect of women across all categories of consumption except food is always lower – more negative or less positive – than the preferences effect of men is. This corroborates Rossi and Sierminska (2015), who find that women have a higher propensity to save and thus a lower propensity to consume than men do. The lower preferences coefficients for widows – found in table 8 – indicate that they consume at a lower rate upon widowhood than men. Finally, widowhood had vastly different effects on different categories of consumption – in general, increasing housing consumption and lowering spending in other categories. This is also not predicted by the most basic life-cycle theory, but it can be explained by expanding the theory to include the effects of preferences changing dependent on the individual's situation.

There is hardly any significant interaction effect between the level of education and widowhood – shown in table 5 and table 9. While widowhood and level of education are both separately highly important in predicting a household's consumption levels – seen in table 14 through to table 17 –, the level of education does not alter the effects of widowhood. Low, medium, and high-educated pensioners experience the same effects of widowhood. This contrasts sharply with Poterba et al.'s (2015) finding that widowhood hits lower-educated individuals particularly hard. A significant difference here is that their study focused on the development of assets, which were largely ignored in this study. Furthermore, their study was conducted on an American population, where a less extensive welfare state makes those of lower socioeconomic status particularly vulnerable. For example, the process leading up to a spouse's death can be very costly in terms of hospital bills if a household does not have the right insurance, which is not a concern in the publicly-funded health system of the Netherlands (Van Ooijen, Alessie, & Kalwij, 2015, p. 355). The different focus of the study (assets/consumption) and the different institutional backgrounds (American/Dutch) can explain the different outcomes.

8.2. Limitations

The research, like any regression analysis, is subject to empirical risks (Rawlings, Pantula, & Dickey, 1998). In this research, the probability of there being an omitted variable bias is the most salient. Omitted variable biases occur when an unobserved variable influences both the dependent and independent variables. An example of a factor which might have had such an effect is health. Unhealthy households are more likely to experience widowhood and low levels of health have a big impact on how money is spent each month. The study tries to account for these effects by establishing a socioeconomic profile of respondents through various factors such as education, homeownership, and income. It cannot, however, be ruled out that other factors such as ethnicity or religion could play a role in determining both chances of widowhood and patterns of consumption. A way to control for most non-changing background variables through a fixed-effects approach is discussed in the suggestions for further work in section 9.

Additionally, the way the life-cycle theory is applied could be subjected to criticism in two ways. Firstly, monthly net household income is taken as a substitute for lifetime income. This assumes that there are no expected changes in the income for the household. Although retirement income tends to be very stable, special conditions may mean certain households can have expectations of an increase or decrease of income in the future. Secondly, the way in which widowhood is treated as a shock does not leave room for cases in which the death of a spouse can be anticipated and thus accounted for in calculations of optimal levels of consumption. There is no way, using the LISS data, to distinguish between anticipated and unanticipated deaths of partners. Related to this, there is no way using the current method to distinguish between those who were widowed recently and those who lost their partner a long time ago. If a person loses their spouse at 25 years old, for example, if they do not remarry, their civil status will remain widowed. The largest proportion of people who lose their spouse – in 2015, nearly 80 per cent (StatLine, 2019) – have reached retirement age, so while most cases were probably widowed during retirement, some cases of pre-retirement widowhood were likely included in the regression.

9. Conclusion

This thesis set out to find the effects of widowhood on the patterns of consumptions of Dutch pensioners. This is important as the elderly are particularly vulnerable to income shocks, having fewer means of adjusting their income and being more dependent on government income provision than younger generations. Additionally, the occurrence of widowhood on consumption patterns, as a shock, can enrich current literature on the life-cycle hypothesis and the retirement-consumption puzzle. The effects of widowhood on household consumption are examined in combination of manners, these different approaches strengthen the empirical validity of the results. First of all, consumption is split into several categories and taken as a whole in order to leave room for differential effects of widowhood on differing aspects of consumption while not ignoring the total impact. Second, these categories are analysed in forms equivalised and non-equivalised for the number of household members through the application of an equivalence scale. This allows the study to signal times when household consumption in a category – i.e. housing – does not change upon widowhood. Third, these values are taken in level and logarithmic terms. This further deepens the analytical potential of the results by highlighting that consumption scales with other variables rather than increasing or decreasing with a set amount. Finally, the inclusion and exclusion of income as a control variable allows the study to capture the joint effect of preferences and income together as well as only capturing the preferences effect. The difference between these two indicate the direction of the income effect. These approaches are applied to equations, which controlled for a number of variables besides widowhood, such as education and housing situation. This allows the study to compare married and widowed households in otherwise similar socioeconomic circumstances.

The study finds that widowhood has a significant effect on consumption for both men and women through a preferences and an income effect predicted by the life-cycle theory. Equivalised, the income effect is positive for men and neutral to slightly positive for women on all categories of consumption. This speaks to the excellent level of protection offered to widow(er)s in terms of income provision in the Dutch pension system; in their income, men in particular seem to be better off after widowhood. The changed preferences of widowed pensioners appear to be more important in determining patterns of consumption. A notable factor here is that spending on housing seems to remain constant regardless of household size. This means widow(er)s spend a much larger share of their income, which is lower than a married couple's, on their residence. On the other categories – insurance, food, and miscellaneous – the widowed households spend less than their married counterparts. The drop in food spending – equivalised, 30 per cent for men and 19 per cent for women – is particularly worrisome. A government investigation into dietary habits

of widow(er)s to ensure good nutrition might be advisable. The interaction effect between level of education and widowhood is negligible, there is hardly any systematic difference in the effect of widowhood on consumption between low, medium, and high-educated Dutch pensioners.

The results of this study could be expanded upon and tested in a variety of ways by other researchers. As mentioned in the limitations in section 8.2, a fixed-effects approach could help account for individual characteristics which are fixed over time. Rather than comparing married households to widowed households, a fixed-effects approach would track the effects of households' transition into widowhood. The lack of availability of data in the case of this paper meant such an approach was not possible, but it would be interesting to see how the identified effects behave in a fixed-effects setting. Furthermore, future studies could place more emphasis on the importance of wealth and bequests on determining consumption after widowhood. Wealth and bequests are complicated phenomena that fall outside of the scope of this paper, but investigating their mechanisms in light of the preferences and income effects identified here would be interesting and valuable. The main asset of this paper, which could serve as an example to other scholars, is the incorporation of four different approaches – level and log, equivalised and non-equivalised, the splitting-up of the consumption into categories, and the isolation of the preferences and joint effect through the inclusion and exclusion of net household income as a covariate. The results on the differentiated effects on different categories of consumption would be particularly interesting to look into in further research.

The results of this study could warrant real policy considerations. Consumption as a whole appears to be functioning quite well. Broken down into categories, however, there are chances for the government to incorporate its other policy goals in pension policy while simultaneously stimulating an active lifestyle among the elderly – which would reduce the loneliness felt by many after widowhood. It was found that the widow(er)s are spending a disproportionate amount of money on housing. Combining that fact with the current situation, in which younger generations are having major trouble purchasing their first house (Hulsman & De Voogt, 2020), yields an opportunity. The government could investigate enticing elderly widow(er)s to move into a new type of residence where there is more focus on social interactions. This can be achieved by helping widow(er)s seeking to liquidate their housing assets or by making the new type of residences more attractive to live in. If widow(er)s move there, they could replace the lost housing utility by spending money on non-housing consumption. The increased availability of the widow(er)s' former homes would relieve pressure on the housing market for younger generations. This proposal is, of course, dependent on many other factors, but the analysis has yielded results which support the investigation of a policy that could potentially help pensioners as well as younger generations.

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11. Appendices

Appendix A – Data

Table 6 – Selected data modules

Wave	Background	Income*	Assets*	Time use and consumption
1	June 2008	June 2009	June 2008	September 2009
2	June 2010	June 2010	June 2010	September 2010
3	June 2012	June 2012	June 2012	October 2012
4	October 2014	June 2015	October 2014	March 2015
5	July 2016	June 2017	July 2016	July 2017

*Only the background and time use & consumption data were deemed essential; cases in which the income or assets data were missing were not dropped

Concerning the removal of double registrations of a single household in a single wave, in general, the observation of the identified *head of household* were kept. Before deleting the *wedded partner's* data, it was used to fill any gaps in the *head of household's* responses. For variables such as education, the highest score was kept, as that is the most likely to reflect the household's social standing.

More information on the number of observations per household: 351 households are measured once, 284 twice, 184 three times, 114 four times, and 87 five times. This makes for a total of 2,362 observations taken from 1020 households, averaging 2.3 observations per household. Every wave has an average 472.4 observations, 302 are in the first wave, 452 in the second, 520 in the third, 589 in the fourth, and 499 in the fifth. The first wave is substantially smaller than the others and the fourth is slightly bigger.

Appendix B – List of variables

Table 7 – Variable definitions

Category	Variable name	Variable description*
Housing	Mortgage	Mortgage: interest plus amortization (what matters is the gross amount, so before tax deduction)
	Rent	Rent (NOT including costs of gas and electricity)
	General utilities	General utilities (heating, electricity, water, telephone, Internet, etc., but NO insurances)
	Maintenance	Expenditure on cleaning the house or maintaining the garden
Insurance	Insurances	Insurances (home insurance, car insurance, health insurance, etc.)
Food	Food at home	Eating at home (food, drinks, candy, etc.)
Misc.	Transport	Transport and means of transport (public transport; own car: gasoline/diesel and maintenance, but NOT insurances or the purchase of e.g. a car or [motor] bike)
	Leisure	Daytrips and holidays with the whole family or part of the family (flight tickets, hotel, restaurant bills for the family, etc.)
	Day-care	Children's day-care (day care centre, out-of-school supervision, guest parents, homework guidance, etc.)
	Alimony	Alimony and financial support for children not (or no longer) living at home
	Debt	Debts and loans (but NOT the mortgage)
	Other	Other household expenditure (but no expenditure meant only for yourself or another specific person in your household)

*as stated in the LISS questionnaire

Appendix C – Results: overview of coefficients of widowhood

Table 8 – Results: effect of widowhood on consumption by gender

			Variables	Total	Housing	Insurance	Food	Misc.	
Non-equivalised	Level	Female	Preferences	-304.2*** (88.27)	34.10 (48.75)	-93.05*** (13.28)	-110.4*** (20.30)	-134.9*** (34.22)	
			Joint effect	-538.4*** (92.35)	-49.45 (47.99)	-99.84*** (13.30)	-149.1*** (19.95)	-240.0*** (33.77)	
		Male	Preferences	-321.4*** (94.00)	26.13 (40.37)	-63.21** (29.10)	-142.0*** (26.43)	-142.3*** (39.58)	
			Joint effect	-443.0*** (94.83)	-17.25 (39.49)	-66.74** (29.22)	-162.1*** (26.14)	-196.9*** (40.19)	
	Logarithmic	Female	Preferences	-0.269*** (0.0357)	-0.0422 (0.0544)	-0.390*** (0.0452)	-0.391*** (0.0522)	-0.549*** (0.0638)	
			Joint effect	-0.421*** (0.0372)	-0.190*** (0.0533)	-0.434*** (0.0422)	-0.531*** (0.0523)	-0.810*** (0.0656)	
		Male	Preferences	-0.219*** (0.0375)	0.0274 (0.0561)	-0.375*** (0.0559)	-0.590*** (0.0704)	-0.397*** (0.0818)	
			Joint effect	-0.287*** (0.0399)	-0.0392 (0.0573)	-0.398*** (0.0556)	-0.650*** (0.0689)	-0.514*** (0.0832)	
	Equivalised	Level	Female	Preferences	19.10 (85.36)	153.4*** (44.49)	-8.675 (12.51)	-31.64* (17.62)	-94.00*** (31.12)
				Joint effect	18.95 (88.85)	153.3*** (46.65)	-8.679 (12.50)	-31.66* (17.88)	-94.06*** (31.42)
			Male	Preferences	11.10 (91.51)	145.1*** (38.39)	21.97 (28.81)	-60.45** (24.63)	-95.55** (37.56)
				Joint effect	125.4 (89.25)	188.9*** (37.90)	25.43 (28.76)	-41.89* (23.74)	-47.06 (36.62)
Logarithmic		Female	Preferences	-0.0792** (0.0332)	0.151*** (0.0501)	-0.0882** (0.0423)	-0.190*** (0.0501)	-0.467*** (0.0602)	
			Joint effect	-0.0749** (0.0372)	0.157*** (0.0533)	-0.0877** (0.0422)	-0.185*** (0.0523)	-0.464*** (0.0656)	
		Male	Preferences	-0.0286 (0.0372)	0.220*** (0.0566)	-0.0735 (0.0563)	-0.389*** (0.0689)	-0.315*** (0.0797)	
			Joint effect	0.0591 (0.0399)	0.307*** (0.0573)	-0.0516 (0.0556)	-0.304*** (0.0689)	-0.168** (0.0832)	

Standard errors clustered at the household level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 9 – Results: effect of widowhood on consumption by level of education

Variables			Total	Housing	Insurance	Food	Misc.	
Non-equalised	Level	Medium-educated	Preferences	-292.2**	-35.34	21.70	-93.15***	-185.4***
				(118.8)	(63.31)	(29.48)	(35.33)	(62.06)
		Joint effect	-242.9*	-17.67	23.22	-85.11**	-163.3***	
				(128.0)	(66.54)	(30.08)	(35.31)	(62.99)
		High-educated	Preferences	7.661	183.8	6.759	-78.52	-104.4
				(263.6)	(128.2)	(40.90)	(54.57)	(98.58)
	Logarithmic	Joint effect	-22.00	173.2	5.845	-83.35	-117.7	
				(271.7)	(133.0)	(40.84)	(55.31)	(99.59)
		Medium-educated	Preferences	-0.0358	-0.0374	0.131	-0.118	-0.0800
				(0.0576)	(0.0896)	(0.0841)	(0.106)	(0.116)
		Joint effect	0.00790	0.00457	0.144*	-0.0841	-0.00339	
				(0.0656)	(0.0965)	(0.0846)	(0.106)	(0.121)
Equalised	Level	High-educated	Preferences	-0.0203	0.0328	0.0987	-0.0995	-0.104
				(0.0790)	(0.126)	(0.0887)	(0.0981)	(0.130)
		Joint effect	0.0110	0.0615	0.110	-0.0767	-0.0511	
				(0.0876)	(0.133)	(0.0875)	(0.104)	(0.145)
		Medium-educated	Preferences	-237.8**	-43.32	21.62	-73.49**	-142.6***
				(101.0)	(57.79)	(28.28)	(29.50)	(48.90)
	Logarithmic	Joint effect	-158.7	-13.67	24.21	-60.63**	-108.6**	
				(108.9)	(61.01)	(29.31)	(29.12)	(48.72)
		High-educated	Preferences	93.01	174.9	23.82	-51.63	-54.11
				(260.2)	(124.3)	(39.70)	(50.89)	(95.58)
		Joint effect	177.9	206.7	26.61	-37.83	-17.59	
				(265.6)	(130.2)	(38.95)	(51.34)	(95.91)
Logarithmic	Medium-educated	Preferences	-0.0358	-0.0374	0.131	-0.118	-0.0800	
			(0.0576)	(0.0896)	(0.0841)	(0.106)	(0.116)	
	Joint effect	0.00790	0.00457	0.144*	-0.0841	-0.00339		
			(0.0656)	(0.0965)	(0.0846)	(0.106)	(0.121)	
	High-educated	Preferences	-0.0203	0.0328	0.0987	-0.0995	-0.104	
			(0.0790)	(0.126)	(0.0887)	(0.0981)	(0.130)	
	Joint effect	0.0110	0.0615	0.110	-0.0767	-0.0511		
			(0.0876)	(0.133)	(0.0875)	(0.104)	(0.145)	

Standard errors clustered at the household level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Appendix D – Results: complete regression results by gender

Table 10 – Results: effect on consumption by gender. Level, non-equivalised data

Variables	Controlled for income					Not controlled for income				
	Total	Housing	Insurance	Food	Misc.	Total	Housing	Insurance	Food	Misc.
Widow	-304.2*** (88.27)	34.10 (48.75)	-93.05*** (13.28)	-110.4*** (20.30)	-134.9*** (34.22)	-538.4*** (92.35)	-49.45 (47.99)	-99.84*** (13.30)	-149.1*** (19.95)	-240.0*** (33.77)
Widower	-321.4*** (94.00)	26.13 (40.37)	-63.21** (29.10)	-142.0*** (26.43)	-142.3*** (39.58)	-443.0*** (94.83)	-17.25 (39.49)	-66.74** (29.22)	-162.1*** (26.14)	-196.9*** (40.19)
Medium-educated	137.1* (73.43)	27.57 (34.55)	-0.391 (10.78)	35.55* (20.97)	74.33* (39.36)	217.8*** (77.56)	56.36 (34.91)	1.949 (10.98)	48.92** (21.59)	110.5*** (41.93)
High-educated	326.4*** (101.8)	87.59* (48.76)	52.66*** (17.71)	66.34** (27.51)	119.8*** (42.09)	679.1*** (95.44)	213.5*** (45.64)	62.89*** (16.54)	124.8*** (25.39)	278.0*** (39.11)
Age	92.55 (86.34)	-7.709 (40.35)	47.23*** (14.22)	25.28 (20.81)	27.75 (51.89)	38.19 (90.58)	-27.10 (41.16)	45.65*** (14.31)	16.28 (20.74)	3.366 (53.83)
Age ²	-0.678 (0.562)	0.0150 (0.266)	-0.308*** (0.0930)	-0.168 (0.134)	-0.217 (0.335)	-0.328 (0.588)	0.140 (0.271)	-0.298*** (0.0938)	-0.110 (0.133)	-0.0604 (0.347)
Renter	249.5*** (78.13)	319.8*** (34.08)	-27.45** (12.53)	-5.170 (20.73)	-37.72 (32.07)	107.7 (81.53)	269.2*** (36.00)	-31.56** (12.86)	-28.65 (20.26)	-101.3*** (33.15)
Net income	0.328*** (0.0381)	0.117*** (0.0192)	0.00950* (0.00556)	0.0543*** (0.0112)	0.147*** (0.0186)					
Wave 2	-312.1*** (91.78)	-77.17** (37.87)	-21.03 (14.52)	-62.53*** (22.75)	-151.3*** (44.75)	-134.4 (92.19)	-13.78 (37.88)	-15.88 (14.28)	-33.12 (21.66)	-71.63 (44.82)
Wave 3	-205.3** (95.53)	-43.37 (39.80)	4.505 (14.86)	-49.53* (27.57)	-116.9*** (42.91)	-4.186 (95.94)	28.38 (39.61)	10.34 (14.77)	-16.23 (26.82)	-26.67 (42.38)
Wave 4	-117.2 (115.9)	7.746 (46.24)	22.05 (19.40)	-60.78** (26.80)	-86.22 (57.49)	78.88 (117.9)	77.71* (45.93)	27.73 (18.57)	-28.31 (26.39)	1.752 (59.35)
Wave 5	-292.3*** (105.9)	-69.69 (48.97)	14.72 (17.50)	-50.55 (34.01)	-186.8*** (46.15)	-82.72 (104.2)	5.087 (48.36)	20.80 (16.30)	-15.84 (31.88)	-92.76** (45.40)
Constant	-1,998 (3,283)	777.6 (1,525)	-1,517*** (538.9)	-643.3 (810.1)	-615.3 (1,976)	692.1 (3,452)	1,738 (1,554)	-1,439*** (541.8)	-197.8 (801.6)	591.6 (2,060)

Standard errors clustered at the household level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 11 – Results: effect on consumption by gender. Log, non-equivalised data

Variables	Controlled for income					Not controlled for income				
	Total	Housing	Insurance	Food	Misc.	Total	Housing	Insurance	Food	Misc.
Widow	-0.269*** (0.0357)	-0.0422 (0.0544)	-0.390*** (0.0452)	-0.391*** (0.0522)	-0.549*** (0.0638)	-0.421*** (0.0372)	-0.190*** (0.0533)	-0.434*** (0.0422)	-0.531*** (0.0523)	-0.810*** (0.0656)
Widower	-0.219*** (0.0375)	0.0274 (0.0561)	-0.375*** (0.0559)	-0.590*** (0.0704)	-0.397*** (0.0818)	-0.287*** (0.0399)	-0.0392 (0.0573)	-0.398*** (0.0556)	-0.650*** (0.0689)	-0.514*** (0.0832)
Medium-educated	0.0373 (0.0272)	-0.00319 (0.0401)	0.0426 (0.0378)	0.0368 (0.0419)	0.0566 (0.0539)	0.102*** (0.0299)	0.0575 (0.0416)	0.0612 (0.0375)	0.0971** (0.0435)	0.166*** (0.0573)
High-educated	0.135*** (0.0305)	0.0695 (0.0480)	0.157*** (0.0414)	0.0975** (0.0436)	0.194*** (0.0551)	0.325*** (0.0311)	0.254*** (0.0470)	0.210*** (0.0378)	0.273*** (0.0423)	0.515*** (0.0530)
Age	0.0442 (0.0345)	-0.0230 (0.0519)	0.0632 (0.0422)	-0.00585 (0.0510)	0.101* (0.0571)	0.0238 (0.0368)	-0.0453 (0.0520)	0.0577 (0.0423)	-0.0234 (0.0519)	0.0634 (0.0622)
Age ²	-0.000346 (0.000231)	8.32e-05 (0.000347)	-0.000401 (0.000277)	1.04e-05 (0.000339)	-0.000765** (0.000380)	-0.000216 (0.000246)	0.000226 (0.000346)	-0.000368 (0.000278)	0.000122 (0.000345)	-0.000524 (0.000414)
Renter	0.161*** (0.0245)	0.592*** (0.0315)	-0.130*** (0.0385)	-0.0459 (0.0424)	-0.265*** (0.0540)	0.0762*** (0.0275)	0.508*** (0.0337)	-0.153*** (0.0377)	-0.126*** (0.0427)	-0.407*** (0.0575)
ln(Net income)	0.451*** (0.0335)	0.443*** (0.0517)	0.129*** (0.0450)	0.419*** (0.0511)	0.764*** (0.0633)					
Wave 2	-0.112*** (0.0340)	-0.0807** (0.0372)	-0.0675 (0.0471)	-0.163*** (0.0486)	-0.260*** (0.0651)	0.0138 (0.0326)	0.0450 (0.0340)	-0.0297 (0.0439)	-0.0500 (0.0446)	-0.0422 (0.0619)
Wave 3	-0.0817** (0.0345)	-0.0410 (0.0399)	-0.0176 (0.0478)	-0.184*** (0.0500)	-0.249*** (0.0649)	0.0583* (0.0339)	0.0992*** (0.0376)	0.0243 (0.0448)	-0.0569 (0.0466)	-0.00583 (0.0619)
Wave 4	-0.0777** (0.0371)	-0.0167 (0.0433)	0.00748 (0.0476)	-0.191*** (0.0497)	-0.285*** (0.0653)	0.0615* (0.0359)	0.124*** (0.0404)	0.0476 (0.0441)	-0.0655 (0.0464)	-0.0432 (0.0623)
Wave 5	-0.129*** (0.0374)	-0.123*** (0.0451)	0.0151 (0.0508)	-0.196*** (0.0525)	-0.356*** (0.0684)	0.0137 (0.0362)	0.0214 (0.0419)	0.0596 (0.0469)	-0.0679 (0.0494)	-0.111* (0.0652)
Constant	2.588* (1.326)	4.010** (2.006)	2.120 (1.657)	3.101 (1.983)	-3.018 (2.232)	6.724*** (1.371)	8.154*** (1.938)	3.287** (1.596)	6.888*** (1.938)	4.089* (2.325)

Standard errors clustered at the household level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 12 – Results: effect on consumption by gender. Level equivalised data

Variables	Controlled for income					Not controlled for income				
	Total	Housing	Insurance	Food	Misc.	Total	Housing	Insurance	Food	Misc.
Widow	19.10 (85.36)	153.4*** (44.49)	-8.675 (12.51)	-31.64* (17.62)	-94.00*** (31.12)	18.95 (88.85)	153.3*** (46.65)	-8.679 (12.50)	-31.66* (17.88)	-94.06*** (31.42)
Widower	11.10 (91.51)	145.1*** (38.39)	21.97 (28.81)	-60.45** (24.63)	-95.55** (37.56)	125.4 (89.25)	188.9*** (37.90)	25.43 (28.76)	-41.89* (23.74)	-47.06 (36.62)
Medium-educated	95.04* (55.76)	17.52 (26.88)	1.178 (9.299)	24.05 (15.58)	52.29* (28.79)	164.1*** (58.88)	43.96 (27.38)	3.268 (9.719)	35.26** (16.06)	81.59*** (30.57)
High-educated	263.6*** (85.85)	75.00* (40.16)	39.76*** (14.95)	50.20** (21.19)	98.61*** (33.71)	526.6*** (82.64)	175.8*** (39.19)	47.72*** (13.55)	92.91*** (19.97)	210.2*** (32.34)
Age	72.98 (67.55)	-1.890 (34.67)	39.97*** (11.77)	16.62 (15.84)	18.28 (37.84)	35.11 (70.46)	-16.39 (34.98)	38.82*** (11.80)	10.47 (15.79)	2.215 (39.01)
Age2	-0.542 (0.441)	-0.0188 (0.230)	-0.263*** (0.0774)	-0.112 (0.102)	-0.148 (0.245)	-0.297 (0.459)	0.0748 (0.232)	-0.256*** (0.0778)	-0.0724 (0.102)	-0.0444 (0.252)
Renter	209.5*** (68.49)	266.5*** (29.67)	-25.60** (11.05)	-2.290 (16.72)	-29.11 (26.76)	101.2 (70.60)	225.0*** (31.49)	-28.88** (11.38)	-19.87 (16.32)	-75.04*** (27.25)
Net income	0.317*** (0.0383)	0.121*** (0.0241)	0.00959 (0.00652)	0.0514*** (0.0103)	0.134*** (0.0175)					
Wave 2	-220.6*** (72.99)	-50.35* (28.85)	-17.10 (11.59)	-48.17** (19.54)	-105.0*** (34.72)	-99.60 (73.15)	-4.008 (28.29)	-13.44 (11.50)	-28.52 (18.97)	-53.63 (34.76)
Wave 3	-149.1** (75.79)	-28.11 (30.63)	2.223 (12.19)	-39.82* (22.35)	-83.40** (33.31)	-11.78 (76.05)	24.49 (29.46)	6.379 (11.86)	-17.52 (21.90)	-25.13 (33.23)
Wave 4	-62.18 (94.83)	21.32 (37.94)	19.49 (16.00)	-44.50* (22.70)	-58.50 (44.31)	70.76 (96.17)	72.25* (36.83)	23.52 (15.35)	-22.91 (22.60)	-2.089 (45.56)
Wave 5	-200.2** (84.87)	-40.80 (38.81)	11.98 (14.78)	-38.02 (26.27)	-133.3*** (35.51)	-56.02 (82.60)	14.43 (36.69)	16.34 (13.49)	-14.61 (24.97)	-72.17** (35.08)
Constant	-1,634 (2,557)	417.4 (1,307)	-1,312*** (444.3)	-391.4 (612.2)	-348.5 (1,441)	219.4 (2,675)	1,128 (1,314)	-1,256*** (444.3)	-90.37 (607.8)	438.1 (1,491)

Standard errors clustered at the household level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 13 – Results: effect on consumption by gender. Log, equivalised data

Variables	Controlled for income					Not controlled for income				
	Total	Housing	Insurance	Food	Misc.	Total	Housing	Insurance	Food	Misc.
Widow	-0.0792** (0.0332)	0.151*** (0.0501)	-0.0882** (0.0423)	-0.190*** (0.0501)	-0.467*** (0.0602)	-0.0749** (0.0372)	0.157*** (0.0533)	-0.0877** (0.0422)	-0.185*** (0.0523)	-0.464*** (0.0656)
Widower	-0.0286 (0.0372)	0.220*** (0.0566)	-0.0735 (0.0563)	-0.389*** (0.0689)	-0.315*** (0.0797)	0.0591 (0.0399)	0.307*** (0.0573)	-0.0516 (0.0556)	-0.304*** (0.0689)	-0.168** (0.0832)
Medium-educated	0.0373 (0.0272)	-0.00319 (0.0401)	0.0426 (0.0378)	0.0368 (0.0419)	0.0566 (0.0539)	0.102*** (0.0299)	0.0575 (0.0416)	0.0612 (0.0375)	0.0971** (0.0435)	0.166*** (0.0573)
High-educated	0.135*** (0.0305)	0.0695 (0.0480)	0.157*** (0.0414)	0.0975** (0.0436)	0.194*** (0.0551)	0.325*** (0.0311)	0.254*** (0.0470)	0.210*** (0.0378)	0.273*** (0.0423)	0.515*** (0.0530)
Age	0.0442 (0.0345)	-0.0230 (0.0519)	0.0632 (0.0422)	-0.00585 (0.0510)	0.101* (0.0571)	0.0238 (0.0368)	-0.0453 (0.0520)	0.0577 (0.0423)	-0.0234 (0.0519)	0.0635 (0.0622)
Age2	-0.000346 (0.000231)	8.32e-05 (0.000347)	-0.000401 (0.000277)	1.04e-05 (0.000339)	-0.000765** (0.000380)	-0.000216 (0.000246)	0.000226 (0.000346)	-0.000368 (0.000278)	0.000122 (0.000345)	-0.000524 (0.000414)
Renter	0.161*** (0.0245)	0.592*** (0.0315)	-0.130*** (0.0385)	-0.0459 (0.0424)	-0.265*** (0.0540)	0.0762*** (0.0275)	0.508*** (0.0337)	-0.153*** (0.0377)	-0.126*** (0.0427)	-0.407*** (0.0575)
ln(Net income)	0.451*** (0.0335)	0.443*** (0.0517)	0.129*** (0.0450)	0.419*** (0.0511)	0.764*** (0.0633)					
Wave 2	-0.112*** (0.0340)	-0.0807** (0.0372)	-0.0675 (0.0471)	-0.163*** (0.0486)	-0.260*** (0.0651)	0.0138 (0.0326)	0.0450 (0.0340)	-0.0297 (0.0439)	-0.0500 (0.0446)	-0.0422 (0.0619)
Wave 3	-0.0817** (0.0345)	-0.0410 (0.0399)	-0.0176 (0.0478)	-0.184*** (0.0500)	-0.249*** (0.0649)	0.0583* (0.0339)	0.0992*** (0.0376)	0.0243 (0.0448)	-0.0569 (0.0466)	-0.00583 (0.0619)
Wave 4	-0.0777** (0.0371)	-0.0167 (0.0433)	0.00748 (0.0476)	-0.191*** (0.0497)	-0.285*** (0.0653)	0.0615* (0.0359)	0.124*** (0.0404)	0.0476 (0.0441)	-0.0655 (0.0464)	-0.0432 (0.0623)
Wave 5	-0.129*** (0.0374)	-0.123*** (0.0451)	0.0151 (0.0508)	-0.196*** (0.0525)	-0.356*** (0.0684)	0.0137 (0.0362)	0.0214 (0.0419)	0.0596 (0.0469)	-0.0679 (0.0494)	-0.111* (0.0652)
Constant	2.397* (1.323)	3.817* (2.001)	1.818 (1.653)	2.899 (1.978)	-3.100 (2.225)	6.378*** (1.371)	7.807*** (1.938)	2.941* (1.596)	6.541*** (1.938)	3.742 (2.325)

Standard errors clustered at the household level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Appendix E – Results: complete regression results by level of education

Table 14 – Results: effect on consumption by level of education. Level, non-equivalised data

Variables	Controlled for income					Not controlled for income				
	Total	Housing	Insurance	Food	Misc.	Total	Housing	Insurance	Food	Misc.
Widowhood	-238.6*** (71.97)	1.507 (38.39)	-90.10*** (16.28)	-80.94*** (17.80)	-69.10** (28.22)	-444.5*** (72.99)	-72.19* (39.03)	-96.44*** (16.17)	-114.5*** (16.92)	-161.3*** (26.87)
Widowhood × Medium-educated	-292.2** (118.8)	-35.34 (63.31)	21.70 (29.48)	-93.15*** (35.33)	-185.4*** (62.06)	-242.9* (128.0)	-17.67 (66.54)	23.22 (30.08)	-85.11** (35.31)	-163.3*** (62.99)
Widowhood × High-educated	7.661 (263.6)	183.8 (128.2)	6.759 (40.90)	-78.52 (54.57)	-104.4 (98.58)	-22.00 (271.7)	173.2 (133.0)	5.845 (40.84)	-83.35 (55.31)	-117.7 (99.59)
Medium-educated	216.9** (91.36)	29.37 (41.61)	-5.245 (10.18)	63.09** (27.11)	129.7** (52.37)	291.7*** (97.40)	56.15 (42.09)	-2.939 (10.16)	75.28*** (27.97)	163.2*** (55.74)
High-educated	337.8*** (91.16)	47.38 (49.52)	50.46*** (18.07)	88.08*** (30.29)	151.9*** (40.65)	700.8*** (87.38)	177.4*** (43.70)	61.65*** (17.39)	147.3*** (28.47)	314.6*** (39.31)
Age	102.0 (86.34)	-5.313 (41.85)	46.61*** (14.14)	27.70 (21.09)	33.00 (50.77)	45.31 (90.70)	-25.61 (42.69)	44.87*** (14.23)	18.46 (21.06)	7.599 (52.80)
Age ²	-0.741 (0.562)	-0.00121 (0.277)	-0.304*** (0.0925)	-0.184 (0.135)	-0.252 (0.328)	-0.374 (0.589)	0.130 (0.282)	-0.292*** (0.0932)	-0.124 (0.135)	-0.0876 (0.341)
Renter	241.7*** (76.96)	318.9*** (33.33)	-26.07** (12.26)	-8.451 (20.51)	-42.65 (31.82)	102.5 (80.68)	269.1*** (35.35)	-30.36** (12.64)	-31.14 (20.07)	-105.0*** (33.09)
Net income	0.329*** (0.0380)	0.118*** (0.0188)	0.0102* (0.00547)	0.0537*** (0.0111)	0.148*** (0.0187)					
Wave 2	-313.3*** (91.86)	-76.16** (37.89)	-20.72 (14.61)	-63.62*** (22.66)	-152.8*** (44.70)	-132.7 (91.99)	-11.47 (38.00)	-15.15 (14.39)	-34.17 (21.42)	-71.87 (44.65)
Wave 3	-204.6** (95.63)	-41.82 (39.73)	4.452 (14.90)	-49.89* (27.49)	-117.3*** (42.88)	-1.462 (95.63)	30.90 (39.66)	10.71 (14.75)	-16.78 (26.58)	-26.29 (42.19)
Wave 4	-115.0 (116.1)	9.107 (46.16)	22.10 (19.48)	-60.73** (26.76)	-85.47 (57.55)	83.72 (117.9)	80.26* (45.87)	28.22 (18.72)	-28.34 (26.26)	3.576 (59.41)
Wave 5	-293.3*** (106.3)	-68.49 (48.97)	14.95 (17.65)	-51.54 (33.89)	-188.2*** (46.20)	-80.58 (104.4)	7.658 (48.56)	21.50 (16.49)	-16.87 (31.66)	-92.87** (45.30)
Constant	-2,383 (3,287)	700.1 (1,579)	-1,496*** (537.4)	-745.9 (823.8)	-840.6 (1,933)	388.7 (3,460)	1,692 (1,610)	-1,411*** (539.6)	-294.2 (816.6)	401.2 (2,020)

Standard errors clustered at the household level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 15 – Results: effect on consumption by level of education. Log, non-equivalised data

Variables	Controlled for income					Not controlled for income				
	Total	Housing	Insurance	Food	Misc.	Total	Housing	Insurance	Food	Misc.
Widowhood	-0.239*** (0.0354)	-0.0160 (0.0470)	-0.440*** (0.0526)	-0.407*** (0.0618)	-0.453*** (0.0748)	-0.384*** (0.0377)	-0.157*** (0.0487)	-0.482*** (0.0505)	-0.531*** (0.0602)	-0.705*** (0.0760)
Widowhood × Medium-educated	-0.0358 (0.0576)	-0.0374 (0.0896)	0.131 (0.0841)	-0.118 (0.106)	-0.0800 (0.116)	0.00790 (0.0656)	0.00457 (0.0965)	0.144* (0.0846)	-0.0841 (0.106)	-0.00339 (0.121)
Widowhood × High-educated	-0.0203 (0.0790)	0.0328 (0.126)	0.0987 (0.0887)	-0.0995 (0.0981)	-0.104 (0.130)	0.0110 (0.0876)	0.0615 (0.133)	0.110 (0.0875)	-0.0767 (0.104)	-0.0511 (0.145)
Medium-educated	0.0499 (0.0315)	0.00857 (0.0454)	0.00355 (0.0447)	0.0651 (0.0461)	0.0880 (0.0627)	0.106*** (0.0348)	0.0620 (0.0471)	0.0188 (0.0444)	0.117** (0.0478)	0.184*** (0.0684)
High-educated	0.140*** (0.0314)	0.0636 (0.0515)	0.130*** (0.0463)	0.124*** (0.0466)	0.219*** (0.0550)	0.327*** (0.0323)	0.246*** (0.0493)	0.180*** (0.0436)	0.290*** (0.0454)	0.537*** (0.0559)
Age	0.0453 (0.0347)	-0.0216 (0.0526)	0.0597 (0.0422)	-0.00215 (0.0508)	0.103* (0.0576)	0.0232 (0.0374)	-0.0455 (0.0531)	0.0539 (0.0423)	-0.0206 (0.0520)	0.0615 (0.0629)
Age ²	-0.000353 (0.000232)	7.50e-05 (0.000352)	-0.000379 (0.000277)	-1.65e-05 (0.000338)	-0.000773** (0.000384)	-0.000211 (0.000250)	0.000229 (0.000354)	-0.000342 (0.000278)	0.000102 (0.000346)	-0.000508 (0.000420)
Renter	0.162*** (0.0244)	0.594*** (0.0316)	-0.127*** (0.0381)	-0.0556 (0.0426)	-0.261*** (0.0532)	0.0786*** (0.0276)	0.511*** (0.0340)	-0.149*** (0.0374)	-0.130*** (0.0427)	-0.402*** (0.0573)
ln(Net income)	0.458*** (0.0331)	0.451*** (0.0502)	0.126*** (0.0444)	0.403*** (0.0523)	0.784*** (0.0641)					
Wave 2	-0.112*** (0.0341)	-0.0812** (0.0370)	-0.0654 (0.0474)	-0.164*** (0.0489)	-0.265*** (0.0656)	0.0166 (0.0327)	0.0484 (0.0341)	-0.0282 (0.0441)	-0.0531 (0.0446)	-0.0383 (0.0623)
Wave 3	-0.0829** (0.0346)	-0.0418 (0.0397)	-0.0163 (0.0479)	-0.183*** (0.0504)	-0.255*** (0.0653)	0.0603* (0.0340)	0.102*** (0.0377)	0.0247 (0.0448)	-0.0589 (0.0466)	-0.00386 (0.0622)
Wave 4	-0.0783** (0.0371)	-0.0168 (0.0430)	0.00800 (0.0477)	-0.191*** (0.0499)	-0.289*** (0.0657)	0.0644* (0.0359)	0.128*** (0.0405)	0.0473 (0.0441)	-0.0678 (0.0463)	-0.0385 (0.0626)
Wave 5	-0.130*** (0.0375)	-0.123*** (0.0449)	0.0174 (0.0511)	-0.197*** (0.0527)	-0.361*** (0.0692)	0.0165 (0.0364)	0.0251 (0.0421)	0.0613 (0.0470)	-0.0711 (0.0492)	-0.107 (0.0657)
Constant	2.490* (1.337)	3.892* (2.024)	2.294 (1.660)	3.083 (1.990)	-3.253 (2.251)	6.733*** (1.394)	8.152*** (1.976)	3.453** (1.595)	6.781*** (1.944)	4.123* (2.352)

Standard errors clustered at the household level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 16 – Results: effect on consumption by level of education. Level, equivalised data

Variables	Controlled for income					Not controlled for income				
	Total	Housing	Insurance	Food	Misc.	Total	Housing	Insurance	Food	Misc.
Widowhood	54.71 (64.71)	124.2*** (34.24)	-9.597 (15.31)	-11.61 (14.85)	-48.26** (22.43)	52.88 (67.49)	123.5*** (35.14)	-9.657 (15.34)	-11.91 (15.02)	-49.04** (23.75)
Widowhood × Medium-educated	-237.8** (101.0)	-43.32 (57.79)	21.62 (28.28)	-73.49** (29.50)	-142.6*** (48.90)	-158.7 (108.9)	-13.67 (61.01)	24.21 (29.31)	-60.63** (29.12)	-108.6** (48.72)
Widowhood × High-educated	93.01 (260.2)	174.9 (124.3)	23.82 (39.70)	-51.63 (50.89)	-54.11 (95.58)	177.9 (265.6)	206.7 (130.2)	26.61 (38.95)	-37.83 (51.34)	-17.59 (95.91)
Medium-educated	156.9** (64.91)	22.67 (29.66)	-4.317 (7.256)	44.97** (19.22)	93.60** (37.25)	207.1*** (69.00)	41.48 (29.98)	-2.670 (7.251)	53.12*** (19.79)	115.2*** (39.42)
High-educated	254.3*** (65.73)	40.11 (36.70)	33.82** (13.31)	64.24*** (21.25)	116.2*** (28.71)	500.0*** (62.42)	132.2*** (31.20)	41.88*** (12.39)	104.1*** (20.21)	221.8*** (27.93)
Age	81.11 (68.47)	0.269 (36.44)	39.45*** (11.74)	18.71 (16.02)	22.68 (37.07)	40.78 (71.64)	-14.84 (36.94)	38.13*** (11.72)	12.16 (16.04)	5.338 (38.34)
Age2	-0.596 (0.448)	-0.0335 (0.242)	-0.259*** (0.0772)	-0.126 (0.103)	-0.177 (0.240)	-0.334 (0.468)	0.0646 (0.246)	-0.251*** (0.0772)	-0.0836 (0.103)	-0.0644 (0.248)
Renter	203.0*** (66.23)	264.2*** (28.61)	-24.22** (10.61)	-4.687 (16.38)	-32.25 (26.15)	98.33 (69.73)	224.9*** (30.81)	-27.66** (11.13)	-21.69 (16.19)	-77.27*** (27.13)
Net income	0.318*** (0.0385)	0.119*** (0.0226)	0.0104 (0.00667)	0.0517*** (0.0102)	0.137*** (0.0175)					
Wave 2	-220.4*** (73.54)	-48.03* (28.80)	-16.58 (11.76)	-49.34** (19.61)	-106.5*** (34.84)	-95.73 (73.00)	-1.312 (28.39)	-12.49 (11.62)	-29.09 (18.76)	-52.83 (34.62)
Wave 3	-147.2* (76.45)	-25.04 (30.43)	2.406 (12.29)	-40.43* (22.40)	-84.14** (33.53)	-7.207 (75.81)	27.42 (29.51)	6.997 (11.84)	-17.69 (21.70)	-23.93 (33.09)
Wave 4	-59.16 (96.03)	24.23 (37.95)	19.75 (16.09)	-44.82* (22.92)	-58.33 (44.67)	76.70 (96.16)	75.14** (36.73)	24.21 (15.53)	-22.75 (22.46)	0.0946 (45.58)
Wave 5	-199.6** (86.18)	-38.02 (38.92)	12.44 (15.13)	-39.17 (26.29)	-134.8*** (35.85)	-51.62 (82.66)	17.42 (36.80)	17.30 (13.67)	-15.13 (24.80)	-71.21** (34.97)
Constant	-1,955 (2,598)	352.1 (1,370)	-1,293*** (444.6)	-478.7 (622.2)	-535.5 (1,412)	-4.238 (2,721)	1,083 (1,385)	-1,229*** (442.0)	-161.9 (619.3)	303.5 (1,466)

Standard errors clustered at the household level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 17 – Results: effect on consumption by level of education. Log, equivalised data

Variables	Controlled for income					Not controlled for income				
	Total	Housing	Insurance	Food	Misc.	Total	Housing	Insurance	Food	Misc.
Widowhood	-0.0507 (0.0335)	0.174*** (0.0455)	-0.137*** (0.0505)	-0.201*** (0.0596)	-0.378*** (0.0696)	-0.0373 (0.0377)	0.190*** (0.0487)	-0.135*** (0.0505)	-0.185*** (0.0602)	-0.358*** (0.0760)
Widowhood × Medium-educated	-0.0358 (0.0576)	-0.0374 (0.0896)	0.131 (0.0841)	-0.118 (0.106)	-0.0800 (0.116)	0.00790 (0.0656)	0.00457 (0.0965)	0.144* (0.0846)	-0.0841 (0.106)	-0.00339 (0.121)
Widowhood × High-educated	-0.0203 (0.0790)	0.0328 (0.126)	0.0987 (0.0887)	-0.0995 (0.0981)	-0.104 (0.130)	0.0110 (0.0876)	0.0615 (0.133)	0.110 (0.0875)	-0.0767 (0.104)	-0.0511 (0.145)
Medium-educated	0.0499 (0.0315)	0.00857 (0.0454)	0.00355 (0.0447)	0.0651 (0.0461)	0.0880 (0.0627)	0.106*** (0.0348)	0.0620 (0.0471)	0.0188 (0.0444)	0.117** (0.0478)	0.184*** (0.0684)
High-educated	0.140*** (0.0314)	0.0636 (0.0515)	0.130*** (0.0463)	0.124*** (0.0466)	0.219*** (0.0550)	0.327*** (0.0323)	0.246*** (0.0493)	0.180*** (0.0436)	0.290*** (0.0454)	0.537*** (0.0559)
Age	0.0453 (0.0347)	-0.0216 (0.0526)	0.0597 (0.0422)	-0.00215 (0.0508)	0.103* (0.0576)	0.0232 (0.0374)	-0.0455 (0.0531)	0.0539 (0.0423)	-0.0206 (0.0520)	0.0615 (0.0629)
Age2	-0.000353 (0.000232)	7.50e-05 (0.000352)	-0.000379 (0.000277)	-1.65e-05 (0.000338)	-0.000773** (0.000384)	-0.000211 (0.000250)	0.000229 (0.000354)	-0.000342 (0.000278)	0.000102 (0.000346)	-0.000508 (0.000420)
Renter	0.162*** (0.0244)	0.594*** (0.0316)	-0.127*** (0.0381)	-0.0556 (0.0426)	-0.261*** (0.0532)	0.0786*** (0.0276)	0.511*** (0.0340)	-0.149*** (0.0374)	-0.130*** (0.0427)	-0.402*** (0.0573)
ln(Net income)	0.458*** (0.0331)	0.451*** (0.0502)	0.126*** (0.0444)	0.403*** (0.0523)	0.784*** (0.0641)					
Wave 2	-0.112*** (0.0341)	-0.0812** (0.0370)	-0.0654 (0.0474)	-0.164*** (0.0489)	-0.265*** (0.0656)	0.0166 (0.0327)	0.0484 (0.0341)	-0.0282 (0.0441)	-0.0531 (0.0446)	-0.0383 (0.0623)
Wave 3	-0.0829** (0.0346)	-0.0418 (0.0397)	-0.0163 (0.0479)	-0.183*** (0.0504)	-0.255*** (0.0653)	0.0603* (0.0340)	0.102*** (0.0377)	0.0247 (0.0448)	-0.0589 (0.0466)	-0.00386 (0.0622)
Wave 4	-0.0783** (0.0371)	-0.0168 (0.0430)	0.00800 (0.0477)	-0.191*** (0.0499)	-0.289*** (0.0657)	0.0644* (0.0359)	0.128*** (0.0405)	0.0473 (0.0441)	-0.0678 (0.0463)	-0.0385 (0.0626)
Wave 5	-0.130*** (0.0375)	-0.123*** (0.0449)	0.0174 (0.0511)	-0.197*** (0.0527)	-0.361*** (0.0692)	0.0165 (0.0364)	0.0251 (0.0421)	0.0613 (0.0470)	-0.0711 (0.0492)	-0.107 (0.0657)
Constant	2.302* (1.334)	3.702* (2.020)	1.991 (1.655)	2.877 (1.984)	-3.328 (2.245)	6.386*** (1.394)	7.805*** (1.976)	3.106* (1.595)	6.434*** (1.944)	3.776 (2.352)

Standard errors clustered at the household level in parentheses *** p<0.01, ** p<0.05, * p<0.1