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Widowhood and Tax Pressure

The Case of the Netherlands

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Master Thesis

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On the frontpage: cut out of the promotion poster of the movie *Enfin veuve* (English title: the merry widow).

PREFACE

Tilburg, August 3 2011

Hereby I would like to dedicate this thesis to my grandmother, Rini Aelmans. She always emphasized the importance of education and supported me throughout my years at Tilburg University.

When writing about life events in general, and widowhood in particular, it is important to keep in mind that these events do not only influence people's tax pressure, but people's lives in general. People can become a widow or widower at young age with young children, like my grandmother Rini. Most people however become a widow or widower at a later age, as is what happened to my other grandmother, Corry Munnikhof. When I decided for the life event widowhood, I did not realise that although this was a very relevant event from the perspective of my Master of Economics and Finance of Ageing, it is in fact not one of the happiest of topics.

Happy or not, the process of investigating a life event and its effect on tax pressure has proven to be very interesting. I am particularly grateful to Statistics Netherlands for providing me with this topic, the opportunity to use their rich dataset and for their support. I would like to thank my supervisors, Tineke de Jonge (Statistics Netherlands) and Arthur van Soest (Tilburg University) both for their detailed comments and readiness to help.

Last but not least, I would like to thank my family and friends for their useful comments and most of all for their support. Especially during my internship at Statistics Netherlands, after such long travels as from Heerlen to Tilburg , the warm awaiting dinners were most appreciated.

Ilse Munnikhof

CONTENTS

1 Introduction

One can imagine that life events such as marriage and having children but also divorce or children leaving home have a major impact on people's lives, affecting them both emotionally and financially. This thesis is involved with the financial impact of life events. It aims to reveal their effect on *tax pressure*[1], which is defined as net taxes paid relative to the gross income earned. Investigating the effect of life events on tax pressure is particularly interesting, because it does not only include changes in gross income caused by the event, but also changes in tax rebates and tax relief received. In this thesis, I focus on those changes in tax pressure that are not directly caused by changes in gross income, but rather by changes in taxes related to the life event.

The life event I selected to investigate is widowhood. Whereas this event is mostly experienced later in life, its effect on the financial position of households is of increasing importance to an ageing society. The specific life event widowhood will be discussed in the next section in more detail.

Life events are described by Kalmijn and Alessie (2008) as the *stage* effects of life course change in income: the changes in income that people experience after demographic events such as widowhood. In life course change, they distinguish both these *stage* but also *age* effects: changes in income that occur when people grow older. In this thesis I will focus on the *stage* effects of life course changes in tax pressure.

In identifying these stage effects (or the effect of a life event) on income, DiPrete and McManus (2000) specify several components:

- the direct financial impact of a life event
- tax and social welfare programs that modify this direct impact, and
- subsequent events that cause the original effect to intensify or decay.

For the life event widowhood and its effect on net tax pressure, this implies the following. I look at the effect of widowhood on net tax pressure, keeping gross income constant. The direct financial impact of widowhood would be on gross tax pressure. However, tax rebates and other benefits exists that could alter the effect of widowhood on net tax pressure. An example would be single

[1] Throughout this thesis I will use the concepts tax pressure and net tax pressure interchangeably. The difference between gross and net tax pressure is that for the latter one, taxes paid are including tax rebates/advantages received as well. When gross tax pressure is being discussed, this is clearly indicated.

parent tax rebate (Dutch: *alleenstaande ouderkorting*), for which an individual might become eligible after the life event widowhood, for he or she might become a single parent. Finally, subsequent life events that intensify or decay the effect of the prior event may exist. To investigate the effect of widowhood on tax pressure, we therefore have to control for remarriage, which is likely to be a counter-mobility event: an event that offsets the (possibly negative) effect of widowhood on net tax pressure.

Statistics Netherlands has assembled a large longitudinal dataset called the Income Panel Survey (Dutch: *Inkomens Panel Onderzoek* or IPO). This paper compares people who experience the life event widowhood to people who do not. I present information on individual change over a 4 year period. The panel design I used is an important improvement over cross-sectional results in which different age groups are compared at a single point in time.

The Dutch Income Panel (IPO) has been used before to analyse the effect of life events on income. The unique aspect of this thesis is that it uses newly designed tax data that have been added only to the last four years of IPO.

This thesis has important policy implications. The results will be particularly interesting for policy makers since tax measures often aim at certain groups of people (pensioners, people with children, workers) and have specific goals such as poverty alleviation and income equity. Kalmijn and Alessie (2008) also point out that there is a sociological relevance of life events. If these events have an effect on income, this shows that an individual's income position depends not only on his or her individual investments in human capital and his or her achievements in the labour market, but also on the household in which he or she lives and the characteristics of the persons who are in that household. Whereas most life events are choices (such as marriage or having children), widowhood is not a choice. Therefore, it may be particularly useful for policy makers to know whether an involuntary life event such as widowhood has an effect on tax pressure.

This thesis is built up as follows. The following section discusses the literature written specifically on the life event widowhood. Section 3 describes the data and methods used. In section 4 the results are presented and section 5 concludes.

2 Hypotheses

This section describes the existing literature on the life event widowhood and its effect on the financial position of households. Furthermore, it describes the general expectation of the effect of the life event on tax pressure. Finally, the specific hypotheses for various subgroups are formulated.

2.1 Widowhood and income

There has been little research on the effect of widowhood on the financial position of households. Often divorce and widowhood are studied simultaneously. Older studies show that widows[2] are worse off than those living together, especially women (Zick & Smith, 1998). McGarry and Schoeni (2005) emphasize that the high medical expenditures associated with the death of the husband play an important role here. Although most medical expenditures are covered by the Dutch health care system, some exceptional costs are not. For example the costs of adjustments made to the house for the handicapped or travelling costs to visit a partner in the hospital are not covered by insurance, although they can be (partly) used as tax allowance (Dutch: *aftrekpost*).

Morgan (1981) finds that there is no effect of widowhood for women of middle age when one compares their income before and after widowhood using longitudinal data. These results are based on *per capita* income, thus: the household income divided by the number of household members. This implies a so-called *equivalence scale* of two for a household of two members. An equivalence scale is a factor that is used to adjust the household income to a *standardized income* which can be used to compare the incomes of individuals from different households. Using an equivalence factor of two by dividing the household income of two members by two as was done by Morgan (1981) is too strong an adjustment. It might cause the effect of widowhood to be underestimated since standardized income before widowhood is adjusted downwards too much. To illustrate, the CBS (Statistics Netherlands) equivalence scale for a two person household without kids equals 1.37 instead of the 2 used by Morgan (1981). This equivalence scale is lower than two to account for economies of scale that can be obtained since general costs such as housing and electricity can be shared.

[2] Throughout this thesis I will use the word 'widows' to indicate both widows and widowers.

Kalmijn and Alessie (2008) found that there is *no* effect of widowhood on standardized income, using the CBS equivalence scale. There are many (opposing) factors that influence income after widowhood. The rules of major pension funds (such as ABP and PGGM) typically pay out 70% of the occupational pension that the partner has accumulated to surviving spouses. Although this is lower than the amount the partner earned while still alive, the costs of living are usually also lower. This rate of 70% has been adjusted downwards since 2003 however. There are also collective survivor benefits (*de algemene Nabestaandenwet: ANW*) for widows under the age of 65, which typically amount to 70% of the minimum wage. The benefits are thus low and only a very small group[3] is eligible for benefits (De Jonge, 2008).

Kalmijn and de Vries (2008) find no negative effect of widowhood on standardized income for women and a small positive effect for men. They point out that this could be caused by the fact the Dutch first pillar state pension (AOW) for singles is more than half of the state pension for couples. Also the payout of a life insurance benefit might play a role.

Zick & Smith (1988) conclude that the inclusion of the remarrying widowed in their multivariate analysis did not significantly alter the overall explanatory power of the equations. They note that this outcome is not surprising, since remarriage is a rare event.

2.2 Widowhood and tax pressure

The effect of widowhood on tax pressure in the Netherlands has to my best knowledge never been investigated for the Netherlands. Since I am interested in the effect of this life event on tax pressure, while controlling for gross income, the changes in *taxes* that are associated with a change in marital status from married to widowed are of particular interest. In general, fiscal partners (such as married couples) can decide whose gross income is used for tax allowances (Dutch: *aftrekposten*) that allow one to subtract the income from owning a house, material shareholding (Dutch: *aanmerkelijk belang*) or from saving/investing from the taxable income. The largest tax relief from this can be obtained by subtracting such tax allowances (from owning a house etc.) from the highest gross income (which falls accordingly in the highest progressive tax scale). After widowhood such a choice no longer exists and the tax allowances are subtracted from the widow's

[3] From 2021 on, only the disabled and those who care for children younger than 18 will be eligible, next to orphans.

income, irrespective of whether this used to be the highest income or not. This fiscal fact changes the tax pressure after widowhood only for those who were previously not *principal breadwinner*[4], since the tax relief that was formerly created by using the highest income is now lower because the widow's income belongs to a lower tax scale. The taxable income of the widow that is left after subtraction of the tax allowances is thus higher; she will pay more taxes and therefore have a higher tax pressure. This tax pressure increase is expected in the year *after* the transition, since the Dutch national tax office treats the transition year as if the marital status of the widow is still 'married'.

2.3 Conditional effects

When investigating life events, Kalmijn (2002) distinguishes between a general and a conditional transition effect. The general transition effect describes the mean change caused by a life event. The conditional transition effect concerns the question of how individual differences in life events depend on other characteristics of individuals. Kalmijn (2002) points out that especially investigating conditional transition effects is important and that this was relatively little investigated in the past. There are several characteristics based on which these conditional effects can be identified for widowhood.

We can distinguish between individuals with and without children, since certain benefits depend on having (under aged) children. For example, the single parent tax rebate is given to single parents with only children living in the household with a maximum age of 27. An additional benefit (called the additional single parent tax rebate or *aanvullende alleenstaande ouderkorting*) is available for single parents with at least one child aged under 16. Such benefits are expected to improve the situation after widowhood of households with (under aged) children as compared to households without. On the other hand, one of the tax allowances that can be divided over the fiscal partners' incomes is the child allowance. As was explained in section 2.2, this allowance can increase tax pressure in the year after the transition when a widow was previously not principal breadwinner since she can now no longer subtract the allowance from her husband's higher income. This is expected to increase tax pressure in the year following the transition.

[4] The principal breadwinner is defined as the household member earning the highest income within the household.

The fact that Dutch collective insurance legislation (ANW) distinguishes between early and late widowhood and since the latter one is the more common way of experiencing widowhood, suggest that a difference may exist between these two groups. Also the single parent tax rebate (Dutch: *alleenstaande ouderkorting*) may cause a difference between late and early widowhood, since it substantially lower for those aged over 65. Furthermore, older widows are simply less likely to *have* (young) children and receive those benefits, given their age. Given these distinctions between early and late widowhood in the Dutch tax system, I expect early widowhood to induce a smaller decrease in tax pressure than late widowhood.

Another conditional effect of widowhood would be gender. The difference between men and women concerning the effect of a life event (for example marriage and divorce) on their financial situation has been investigated many times in the past. Also for the life event widowhood a conditional gender effect may exist. Although this is changing, the majority of principal breadwinners (the household member that earns most) is still male. In the dataset available for this study for example (see also section 3.1), 87.2% of the principal breadwinners is male. Widowhood is likely to have a more negative effect on those who loose their spouse who had a higher income. Since women are often not the principal breadwinner, the effect of widowhood on gross income is expected to be more negative for women. This has often been concluded for the life event divorce as well, which could be argued to be a similar life event since it also concerns moving from the married to the unmarried status. However, in this thesis the focus is not on changes in gross income associated with widowhood, but rather changes in *taxes* that cause a change in net tax pressure. Since the Dutch tax system does not make a distinction between widows and widowers, I expect no difference in the effect of widowhood on net tax pressure between men and women, when controlling for changes in gross income.

Since the vast majority of men is still principal breadwinner however, we could still find a difference between men and women. Namely, I expect a conditional effect based on whether the household member was principal breadwinner prior to the event of widowhood, as was pointed out in section 2.2. For those who were already principal breadwinner, I expect no increase in tax pressure after the transition year since their income was previously already the highest and thus also after widowhood the greatest tax relief can still be obtained. However for those who were not principal breadwinner, the tax relief obtained from the tax allowances decreases and tax pressure is expected to increase in the year after the transition.

To summarise, in general an increase in tax pressure is expected after widowhood in the year after the transition for widows who were previously not principal breadwinner. For households with children this increase is expected to be larger than for households without. Furthermore, a decrease in tax pressure is expected for families with children during the transition year based on the single parent tax rebate. The additional single parent tax rebate is expected to improve the situation of households with younger children over that of households without or with older children. I expect no difference between men and women in tax pressure after widowhood.

3 Data and Methods

The income panel survey (IPO) that was used in this study was collected by Statistics Netherlands. The panel contains additional information on household composition and demographic characteristics that stems from both tax information and the population register (*GBA: gemeentelijke basisadministratie*). Since 2006, additional information on tax components such as income and wealth tax, tax relief and tax rebates has been added to the panel. New members are being added to the panel each year. Although income information is available for all individuals within a household, only so-called "key persons" are followed over time. These key persons are randomly drawn from the Dutch population. Attrition occurs only as a result of emigration or death. In this case, births and immigrants are added to the sample to keep it representative.

3.1 Data

To analyse the effects of widowhood, I selected individuals who are married at the beginning of the panel (2006) or widowed that year, which were about 38,000 people. In the years after that, I only included people who either stayed married or widowed and who are present in all four years of the data. Individuals who experienced a divorce are excluded. There were 1097 events of widowhood. I only selected so-called key persons (the person of the household that is being followed over time) with positive income in private households. Public households such as those living in elderly homes were excluded. Households with unreliable values[5] for net tax pressure where dropped.

Table 1 shows the occurrence of widowhood, conditional on the characteristics described in section 2: gender, early or late widowhood, having (under aged) children and being principal breadwinner before the event of widowhood.

[5] 296 out of 152592 observations were dropped because they had a higher net tax pressure than 52%: this is the highest income tax scale in the Netherlands and therefore a tax pressure above this percentage seems unlikely. Since these observations are so rare and seem unreliable they were dropped from the sample.

Male	327	Female			770
Early	336	Late			761
No children	954	Children			143
		Under aged	71	Older	72
Principal breadwinner	438	No principal breadwinner			659

Table 1 Occurrence of the life event widowhood between 2006 and 2009

This figure shows the average number of widowed per conditional characteristic (e.g. by gender, early/late, children, earner status). Households with under aged children are defined here as having at least one child under 18. Households that are defined as having 'older' children have only children of 18 and older.

Table 2 shows the relative size of these conditional groups as compared to the whole sample. It also describes the average net tax pressure, gross tax pressure and gross income and their standard deviations to give an idea of the impact of a potential change in net tax pressure caused by the life event widowhood, as will be reported on in section 4. Households with outlier values for net tax pressure (with a net tax pressure of over 52%) were dropped. However, households can still have extreme values for gross tax pressure. The standard deviations (for men and women) that are found for gross tax pressure suggest that such extreme values are still present although I dropped the outliers for net tax pressure. The extreme outliers are likely to be caused by the fact that household income is a combination of the personal incomes of all the household members. For example, if one member has a positive income and the other a negative, their total gross income might be close to zero but they will still pay a positive amount on taxes. This causes such very high values for tax pressure. Since gross tax pressure is not used as an explanatory variable in this thesis I decided to keep households with large values for gross tax pressure, as long as they have reliable values for net tax pressure, since this is the variable of interest.

	Women		Men	
	Average	Std, Dev	Average	Std, Dev
Income				
Net tax pressure	15,91%	9,03%	16,13%	8,94%
Gross tax pressure	32,72%	48,96%	33,05%	87,97%
Gross income	71327,84	55210,19	72070,37	52912,91
Marital status				
Married	99,01%		99,58%	
Widowed	0,99%		0,42%	
Total	100,00%		100%	
Family status				
No children	49,35%		49,00%	
Underaged and older children	38,76%		38,35%	
Older children	11,89%		12,65%	
Total	100%		100%	
Earner status				
Principal breadwinner	77,84%		20,43%	
Other member	22,16%		79,57%	
Total	100%		100%	
Other				
Age (continuous, in analysis as dummies)	52	14	55	13
N	77424		75168	

Table 2: Descriptive information on most important variables

This table presents the averages and standard deviations of the most important variables of the analysis in the next section. In family status is based on the household members. Families with children who moved out before the start of the panel in 2006 are counted as ‘no children’. As in table 1, households with under aged children are defined as having at least one child under 18. Households with older children only have children of 18 and older.

Data are available from 2006 to 2009. The data on 2009 are preliminary. Since the IPO data are collected from the national tax office (Dutch: *belastingdienst*), individuals that are missing in IPO are those who did not file their taxes yet. Since this is a relatively small group (about 2% of the sample), I decided to include the data on 2009.

I analysed the IPO data with linear regression (in SPSS). The unit of analysis is person-years. I estimated pooled OLS, fixed effects and first differencing models. The dependent variable is net tax pressure. Figure 1 shows the net tax pressure distribution for the period 2006 – 2009.

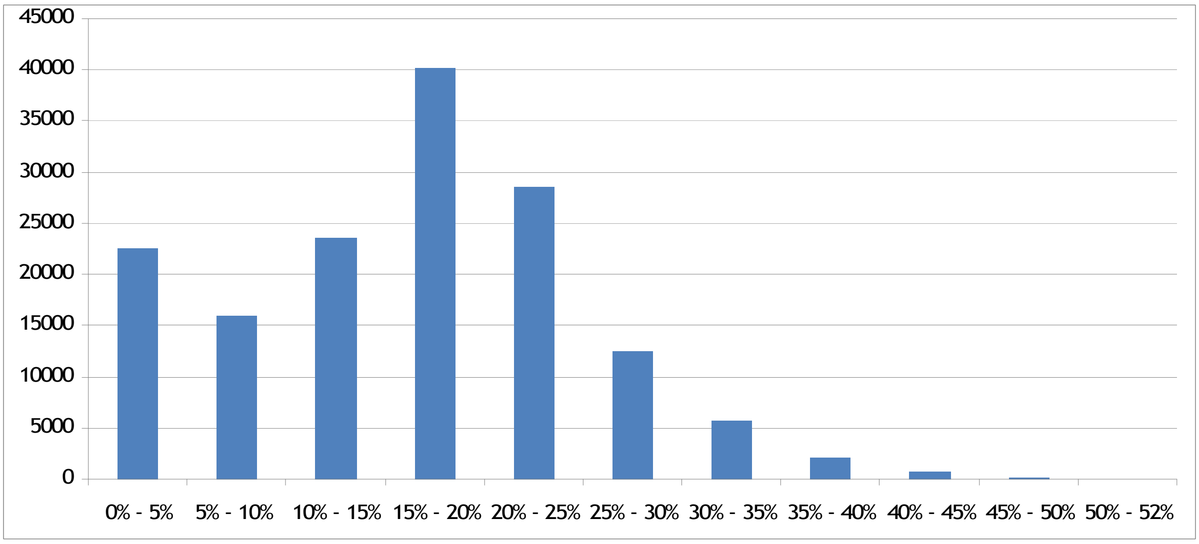

Figure 1: Net tax pressure distribution 2006 - 2009.

This figure shows the net tax pressure distribution per 5% tax pressure based on the net tax pressure of 152592 observations on 38148 households in the period of 2006 to 2009.

3.2 Models

I first estimated the effect of widowhood on net tax pressure by using a linear (pooled) ordinary least squares regression (Pooled OLS). This regression model does not use the fact that my sample is a panel and follows the same individuals over time, but *pools* all the observations and treats the four observations that are available per individual as four different individuals.

Secondly, I use fixed-effects (FE) regression models. The model could be regarded as a regression model that contains a dummy-variable that adjusts for the overall mean for each person. For widowhood, this implies that the fixed effects model measures to what extent this life event leads to a deviation from the overall mean *of that person*. This makes it unnecessary to control for time constant personal factors such as education or family background.

Another model we could use is random effects (RE). This model assumes that the unobserved effect a_i, has zero mean because it is uncorrelated with the explanatory variables in each period. Because fixed effects allows arbitrary correlation between a_i and x_{itj}, while random effects does not, FE is widely thought to be a more convincing tool for estimating ceteris paribus effects (Wooldridge, 2009).

Only if the key explanatory variable is constant over time, we cannot use FE to estimate its effect on the outcome variable. Since widowhood is not constant over time, FE can be used to estimate its effect on tax pressure.

Widowhood is likely to be correlated with individual preferences and abilities as captured by a_i. Although widowhood is not a choice variable, there are (unobserved) factors that both influence widowhood and tax pressure. For example, the highly educated are known to have a higher life expectancy than the lower educated, while higher education is also known to be associated with higher income and therefore tax pressure. Wooldridge (2009) emphasizes that the choice between FE and RE is mainly determined by whether it is plausible to assume that a_i is uncorrelated with all x_{itj}, which does not seem to be the case for widowhood, since there can be (unobserved) factors (such as education) that influence both widowhood and tax pressure.

It is still fairly common to see researchers apply both random effects and fixed effects and then formally test for statistically significant differences in the coefficient on the time varying explanatory variables. However, I decided not to apply random effects given the considerations described above.

To still be able to check for the robustness of my results, I instead estimated the effect of widowhood by first differencing (FD). This model subtracts last year's observation from this year's observation, and runs a regression using those (first) differences.

For a four year panel, such as is available for this study, fixed effects (FE) and first differencing (FD) estimators are not the same, although both are unbiased and consistent under the same assumptions. For large N and small T, the choice between FE and FD hinges on the relative efficiency of the estimators, and this is determined by the serial correlation in the idiosyncratic errors, u_{it}. In this research N equals approximately 40.000 and T equals 4.

When the u_{it} are serially uncorrelated, fixed effects is more efficient than first differencing. If u_{it} follows a random walk – which means there is very substantial, positive serial correlation – then the difference Δu_{it} is serially uncorrelated, and first differencing is probably better. In many cases, u_{it} may perhaps not follow as much as a random walk. Then, one cannot easily compare the efficiency of FE and FD estimators.

Wooldridge (2009, chapter 14) recommends to test whether the differenced errors Δu_{it} are serially uncorrelated. If this is the case, FD can be used. If there is substantial negative serial correlation in the Δu_{it} (i.e. close to -.5), FE is probably better. In this thesis I tried both because if the results are not sensitive to the model chosen, they will be more reliable.

3.3 Estimating the effect of widowhood

In this section I describe how I estimated the relationship between the life event widowhood and net tax pressure. Net tax pressure was computed as net taxes paid divided by gross household income.

3.3.1 Widowhood

Because the life event widowhood can take place anywhere during the calendar year and we only have information on the tax pressure per calendar year, I made the distinction that Kalmijn and Alessie (2008) make between the transition year (the year in which the life event widowhood takes place) and the year after the transition (which will fully reflect the new marital status). To do this, I included a dummy for experiencing widowhood and being in the transition year (*widowhood*), and a dummy for experiencing widowhood and being in the year after the transition (*lagged widowhood*). I did not investigate the effect of later years because my panel only includes four years.

In this thesis I am interested in the effect of live events, which in the case of widowhood implies that the emphasis is on the *transition* from being married to being widowed. In other words, I chose to investigate the effect of the transition into being widowed, not in the general state of widowhood.

3.3.2 Controlling for gross income

As mentioned before, I chose to focus on those changes in tax pressure associated with widowhood that are not directly caused by changes in gross income, but rather by changes in tax related to the life event widowhood. By controlling for gross household income when investigating the effect of widowhood on tax pressure, we can reveal those changes in tax pressure that are not directly related to (gross) income shocks related to widowhood. In that sense, I am able to illustrate the true effect of widowhood on tax pressure, while keeping gross household income constant.

I do not control for *standardized* gross income by using an equivalence scale, but rather for gross *household* income. Using standardized gross income would alter the interpretation of the relationship between widowhood and tax pressure when controlling for gross income. I made the decision to use gross household income as a control variable and interpret the relationship using this definition.

Additionally, I included gross income squared in the equation, to account for the nonlinear relationship between gross income and tax pressure that is likely to exist: tax pressure will only increase with gross income up to a certain point (probably to the highest labour income tax scale of the Netherlands, which is 52%).

3.3.3 Controlling for age and cohort

As mentioned in section 1, Kalmijn and Alessie (2008) distinguished between 'stage' and 'age' effects. When we want to investigate the effect of live events, we are interested in 'stage' effects: the effect of demographic events on the tax pressure of households. Therefore, we have to control for 'age' effects (changes in income that occur when people grow older), to prevent overestimating the 'stage' effects. One can do this by including dummy variables for age.

Cohort effects are controlled for by using panel data: the same cohorts are followed over time and thus the effects that will be found are not correlated with birth cohort. However, a panel study is still subject to period effects (i.e., the effects of calendar year).

3.3.4 Controlling for (calendar) year

Income and tax pressure might be subject to macroeconomic conditions such as inflation and (unanticipated) business cycle shocks. For the panel available for this study (2006 to 2009), the credit crisis that started in 2007 might cause such period effects. Such effects may be less relevant however when looking at the effect of widowhood on tax pressure, *keeping gross income constant*, since most period effects will work through income shocks, rather than changes to taxes.

To control for these period effects, I adjusted gross household income (the denominator of net tax pressure) to the Consumer Price Index (CPI) with base year 2009.

We can also control for these period effects by adding year dummies. However, when one specifies a fixed effects (or first differencing) model including both a full set of year and age dummies, this model would suffer from a perfect collinearity problem. I solved this problem by specifying age-group dummies of 10 years. This will make the interpretation of age dummies less straightforward, but since we are more interested in the effect of widowhood and only want to control for the age effect, this is not a problem. Ultimately I both included the year dummies and CPI adjustments.

3.3.5 Controlling for remarriage

As was suggested by DiPrete and McManus, we should control for subsequent life events that alter the effect of the prior event. If we would include data on the widows who eventually remarry, we are likely to overestimate the negative repercussions of widowhood on household income and possibly underestimate the statistical significance of the effects that do exist. Remarriage is unlikely to alter the effect of widowhood (widowing and remarrying in one year is highly unlikely), but is more likely to alter the effect of lagged widowhood: experiencing widowhood in the previous year. Nevertheless we have to keep in mind that remarriage is a rare event in general, especially after widowhood and in such a short period of four years, for which the panel is available. I will come back to this in section 4.1.

3.3.6 Conditional effects

To investigate if the effect of widowhood on tax pressure differs for men and women, I added an interaction term of widowhood with a gender dummy. If the coefficient of this interaction term is significant, there is a significant difference in the effect of the transition to widowhood on net tax pressure between men and women.

I included also interaction terms with an 'old'-dummy (for being aged over 65), to see if the effect of widowhood differs for old and young widows. Furthermore, I compared individuals with and without (under aged) children. I also tested for the significance of an interaction term of widowhood with a principal breadwinner dummy to see if there is a difference between whether a person was principal breadwinner in the year before widowhood, or not.

4 Results

As described in section 3.2, I estimated the effect of widowhood on net tax pressure using pooled OLS, fixed effects and first differencing. In this section I describe the results of these estimations and tests for the model selection.

4.1 Comparison

The variables that are significant and included in all models are *gross income*, *gross income squared* (see section 3.3.2), the *widow dummy* and *lagged widowhood* (see section 3.3.1), the *age dummies* (see section 3.3.3) and the *year dummies* (see section 3.3.4). The results of the fixed effects estimator are reported in section 4.3, while the results estimated by pooled OLS and first differencing can be found in the appendix. At least all of the effects that are found to be significant when using fixed effects estimation are also significant when using the other two models. The only exception to this consistency is that widowhood is estimated to have a significant effect on net tax pressure of the principal breadwinner when using fixed effects, while this conclusion can not be drawn from the first differencing estimator. All other significant conditional effects found are confirmed by both pooled OLS as well as first differencing.

Like Zick & Smith I found that *remarriage* (see section 3.3.5) is a rare event and thus insignificant for all models. In the period of 2006 to 2009, in total only 9 cases of remarriage were identified. One is more likely to find the life event remarriage in longer panels, since 4 years is a very short notice for experiencing both widowhood and remarriage.

In the next section I will describe two tests comparing pooled OLS with fixed effects and first differencing with FE.

4.2 F-test and serial correlation

4.2.1 F-test

Fixed effects can in fact be seen as adding a dummy for each individual. I subtracted the personal mean for each individual from each variable, but mathematically adding a personal dummy would be the same. We actually want to test if these personal dummies are jointly significant. If they are, fixed effects is different from pooled OLS because there is a 'fixed effect': the personal dummies are jointly significant. In my data set, I have 38148 individuals. Thus, there will be 38147 personal dummies added to my model. The restricted model is the pooled OLS regression, the unrestricted model is the fixed effects regression.

I found that the personal dummies are jointly significant at a 0.01 level, thus there is indeed a fixed effect. This implies that pooled OLS can be inconsistent. Since both fixed effects and first differencing estimation control for an unobserved (personal) effect, I will continue with these models.

4.2.2 Serial correlation

As described in section 3.2, for this particular panel that has a large N = 38.000 and small T = 4, the choice between fixed effects and first differencing depends on the relative efficiency of the estimators. This is determined by the serial correlation in the idiosyncratic errors, u_{it}.

When the u_{it} are serially uncorrelated, fixed effects is more efficient than first differencing. If u_{it} follows a random walk – which means there is very substantial, positive serial correlation – then the difference Δu_{it} is serially uncorrelated, and first differencing is probably better (Wooldridge, 2009).

When testing whether the differenced errors Δu_{it} are serially uncorrelated, I find that there is significant negative serial correlation at a 0.01 significance level. In the following equation,

$$\hat{r}_{i,t} = \rho r_{i,t-1} + e_{it} \qquad \text{for t = 2008, 2009,}$$

ρ is estimated to be -.211. This indicates substantial negative serial correlation, since it is significantly different from zero at a 0.01 level. Nevertheless it is also not close to -.5, which would imply fixed effects is better. Based on the serial correlation present in the first difference estimator, I cannot draw a conclusion on whether fixed effects or first differencing is more efficient. In section 4.1 that the results are not sensitive to the model used. I decide to report the results of the fixed effects estimator in the following section, since using this estimator is more common practice than the first differenced estimator and because the standard errors are generally smaller.

4.3 Fixed effects

For the fixed effects model, I estimated the following equation

$$y_{it} - \bar{y}_{it} = \beta_1 (x_{it} - \bar{x}_{it}) + \ldots + \beta_k (x_{itk} - \bar{x}_{itk}) + u_{it} - \bar{u}_{it}$$

for t = 2007, 2008, 2009,

including the variables widowhood, lagged widowhood, gross income and gross income squared, age dummies and year dummies.

From table 3 we can see that widowhood is estimated to decrease net tax pressure by 2.167 percentage points in general. The table also includes the estimates for the control variables gross income and gross income squared, the age and year dummies.

Variable	Beta	Std. Error
Gross income	0.561 ***	(0.005)
Gross income squared	-0.002 ***	(0.000)
Widowhood	-2.167 ***	(0.123)
Lagged widowhood	1.840 ***	(0.149)
year 2006	-0.472 ***	(0.026)
year 2007	-0.811 ***	(0.024)
year 2008	-0.493 ***	(0.023)
age 17_26	-2.159 ***	(0.213)
age 27_36	-1.463 ***	(0.105)
age 37_46	0.486 ***	(0.067)
age 57_66	0.646 ***	(0.067)
age 67_76	-2.381 ***	(0.108)
age 77_86	-3.219 ***	(0.159)
age 87_97	-3.552 ***	(0.306)
age 97_103	-3.289	(2.157)

Table 3: *Fixed effects estimates widowhood and control variables*

This table shows the estimated coefficient with their standard error between brackets. * significant at a 0.10 level, ** significant at a 0.05 level, *** significant at a 0.01 level. Gross income and gross income squared where divided by 10 000 to make the coefficient visible in this table.

Table 4 shows the conditional effects of widowhood. Women are estimated to experience a 2.995 percentage point net tax pressure decrease at the event of widowhood. This decrease is significantly larger than the (insignificant) decrease that men experience after widowhood. Both men and women experience an increase in tax pressure when the event of widowhood occurred more in the previous year. There is no significant difference between men and women in this increase.

	Women		**Men**				
	beta	std. error	beta	std. error			
Widowhood	-2.995***	(0.147)	-0.235	(0.225)			
					Difference	-2.760***	(0.268)
Lagged widowhood	1.763***	(0.178)	2.044***	(0.271)			
					Difference	-0.281	(0.324)
	Late(>65)		**Early (<65)**				
	beta	std. error	beta	std. error			
Widowhood	-2.676***	(0.217)	-1.966***	(0.144)			
					Difference	0.710***	(0.260)
Lagged widowhood	2.311***	(0.269)	1.535***	(0.173)			
					Difference	-0.776**	(0.319)
	Principal breadwinner		**Other household member**				
	beta	std. error	beta	std. error			
Widowhood	-2.712***	(0.155)	-1.346***	(0.183)			
					Difference	1.366***	(0.229)
Lagged widowhood	1.751*	(0.906)	1.855***	(0.151)			
					Difference	0.104	(0.918)
	No children		**Children**				
	beta	std. error	beta	std. error			
Widowhood	-2.409***	(0.132)	-0.541	(0.332)			
					Difference	1.868***	(0.357)
Lagged widowhood	1.974***	(0.159)	1.128***	(0.413)			
					Difference	-0.846*	(0.442)
	No children		**Under aged children**		**Older children**		
	beta	std. error	beta	std. error	beta	std. error	
Widowhood	-2.374***	(0.131)	-1.332***	(0.215)	-0.290	(0.417)	
					Difference	1.042***	(0.222)
Lagged widowhood	1.962***	(0.158)	1.462***	(0.260)	0.963*	(0.503)	
					Difference	0.500*	(0.267)

Table 4: Fixed effects estimates widowhood and interaction terms

This table shows the estimated coefficient and their standard errors (between brackets) of the effect of widowhood for each subdivision, and the difference between the groups. * significant at a 0.10 level, ** significant at a 0.05 level, *** significant at a 0.01 level. The households with under aged children are defined as having at least one child under 18 in the household.

Both the principal breadwinner, as well as other members of the household, is estimated to experience a decrease in tax pressure at the life event widowhood. This decrease is estimated to be 1.366% larger for the principal breadwinner. Widowing the previous year only causes a significant increase in this year's tax pressure for members of the household who are not principal breadwinner.

Widowhood is estimated to decrease tax pressure for families without children, and for families with under aged children. Households with under aged kids are found to experience a significantly different decrease in tax pressure as compared to families without children or with older children. Widowhood in the preceding year is estimated to increase tax pressure again for families without children and for families with under aged children. There is no difference in this increase for either families with or without (under aged) children.

The same conclusions can also be drawn from the other estimated models: pooled OLS and fixed effects. The estimated effects for the groups mentioned above are also negative and significant, with relatively small differences in magnitude. Thus, I conclude that the results found are not sensitive to the model that was chosen in the previous subsection.

5 Conclusion

Although it has often been concluded that widowhood has no negative effect on standardized income for women and men, it does seem to have a negative effect on net tax pressure. This decrease in tax pressure in the transition year (the year that a household's marital status changes from married to widowed) is generally followed by an *increase* in tax pressure in the following year.

A *decrease* in net tax pressure can basically be caused by a decrease in income (which comes with a shift to a lower tax scale which is part of the Dutch progressive income tax system), or a change in tax rebates/advantages received. To find out the true effect of widowhood on *tax pressure*, I controlled for changes in *income* that follow this life event. Thus, this thesis shows the effect of widowhood on tax pressure, controlling for changes in income associated with this life event.

The *increase* in tax pressure after the transition year is likely to stem from a decrease in tax relief (Dutch: *belastingvoordeel*). This decrease arises when the widow was previously not the principal breadwinner, and now has to subtract the tax allowances (such as child allowance) from her lower income and can therefore obtain less tax relief.

In the light of an ageing society such as the Netherlands, the effect of the life event widowhood on the financial position of households is of increasing importance, since this event usually takes place at later age. I found that both early (before 65) and late widowhood (above 65) have a negative effect on tax pressure in the transition year, and a positive effect on tax pressure in the year after that. There is a difference between early and late widowhood in the increase in tax pressure that is experienced by both in the year after the transition: the increase in tax pressure is bigger for late widowhood. This is likely to be caused by the single parent tax rebate (Dutch: *alleenstaande ouderkorting*) which improves the situation of early widows substantially as compared to late widows in the year after widowhood.

The difference in financial position after a life event for men and women has often been investigated. Especially marriage is found to have a more positive effect for men. For widowhood, a significant difference in tax pressure between men and women in the transition year was found. One would expect a difference between men and women when looking at the effect of widowhood on *income*, since the majority of men is still principal breadwinner and thus we would expect a larger decrease in income for women when they loose their partner. When we look solemnly at tax pressure however, no such difference between men and women is expected, since the Dutch tax system does not distinguish between men and women. Nevertheless a difference in tax pressure in the transition year was found: women experience a significantly larger decrease in tax pressure at the life event widowhood. This difference cannot be explained by the fact the majority of men is principal breadwinner, since I found exactly the opposite result for these households: principal breadwinners experience a significantly larger decrease in tax pressure in the transition year than other members of the household do. This is a somewhat puzzling finding for which I do not find an explanation. The year after the transition, tax pressure is estimated to increase for those who were previously not principal breadwinner, as was expected. This increase is however not significantly different from the increase that is experienced by principal breadwinners.

Widows with children are eligible for the single parent tax rebate and there is an additional single parent tax rebate for widows with under aged children. Therefore, one would expect a lower tax pressure for households with children as compared to households without. I did not find confirmation of this. In fact, I found that widowhood is estimated to decrease tax pressure for widows with and without children in the transition year, and that the tax pressure significantly increases in the year after for both. This increase in tax pressure is likely to be caused by the decreased tax relief from tax allowances, although the child allowance apparently does not create a significant difference between households with and without children. The decrease in the transition year is significantly larger for households without children, which could be interpreted such as that the single parent tax rebate apparently does not improve the financial position of households with children as compared to households without. Furthermore, no difference in tax pressure was found for households with *under aged* children despite of the additional single parent tax rebate (Dutch: *aanvullende alleenstaande ouderkorting*) they become eligible for.

One of the shortcomings of this thesis is that it does not identify the long term effects of the life event widowhood. This is one of the disadvantages of the available panel data. Although panel data have many advantages, such as controlling for cohort effects and being able to follow the same individuals over time, they may not be available for a period long enough to identify long term effects. Weir et al. (2000) for example find that an important part of the poverty of today's elderly widows is comprised of women who were widowed relatively long ago. Such long term effects of widowhood could not be identified in this study.

For future research I recommend to look at the effect of other life events on tax pressure, since this was shown to be an interesting valuation of the financial position of different households. A conditional effect (the effect of a life event for individuals with specific characteristics) that was not identified here but is worth investigating are the house owner effect (whether the household owns a house).

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Appendix

Variable	Beta	Std. Error	Variable	Beta	Std. Error
Gross income	**0.561 *****	**(0.005)**	**year 2006**	**-0.472 *****	**(0.026)**
Pooled OLS	-1.103	(0.004)***	Pooled OLS	-0.531 ***	(0.046)
First Differencing	0.488	(0.005)***	First Differencing	Base year	Base year
Gross income squared	**-0.002 *****	**(0.000)**	**year 2007**	**-0.811 *****	**(0.024)**
Pooled OLS	-0.004	(0.000)***	Pooled OLS	-0.934 ***	(0.046)
First Differencing	-0.002	(0.000)***	First Differencing	-0.324***	(0.023)
Widowhood	**-2.167 *****	**(0.123)**	**year 2008**	**-0.493 *****	**(0.023)**
Pooled OLS	-1.818	(0.194)***	Pooled OLS	-0.582 ***	(0.046)
First Differencing	-2.191	(0.133)***	First Differencing	0.583***	(0.033)
Lagged widowhood	**1.840 *****	**(0.149)**	**year 2009**	**Base year**	**Base year**
Pooled OLS	1.812 ***	(0.275)	Pooled OLS	Base year	Base year
First Differencing	1.532 ***	(0.147)	First Differencing	0.797***	(0.033)

Table A3: Fixed effects, pooled OLS and first differenced estimates widowhood and control variables gross income, gross income squared and year dummies.

Variable	Beta	Std. Error	Variable	Beta	Std. Error
age 17_26	**-2.159 *****	**(0.213)**	**age 67_76**	**-2.381 *****	**(0.108)**
Pooled OLS	-2.345 ***	(0.189)	Pooled OLS	-5.351 ***	(0.058)
First Differencing	1.280 ***	(0.271)	First Differencing	-0.258 **	(0.131)
age 27_36	**-1.463 *****	**(0.105)**	**age 77_86**	**-3.219 *****	**(0.159)**
Pooled OLS	-1.482	(0.062) ***	Pooled OLS	-6.713 ***	(0.083)
First Differencing	-0.699 ***	(0.131)	First Differencing	-0.576 ***	(0.164)
age 37_46	**0.486 *****	**(0.067)**	**age 87_97**	**-3.552 *****	**(0.306)**
Pooled OLS	-0.675 ***	(0.047)	Pooled OLS	-6.354 ***	(0.263)
First Differencing	-0.142 *	(0.085)	First Differencing	-0.658 *	(0.373)
age 57_66	**0.646 *****	**(0.067)**	**age 97_103**	**-3.289**	**(2.157)**
Pooled OLS	2.932 ***	(0.048)	Pooled OLS	-3.587	(3.668)
First Differencing	0.489 ***	(0.075)	First Differencing	-0.815	(2.628)

Table A3: Fixed effects, pooled OLS and first differenced estimates widowhood and control variables age dummies.

	Women		Men				
	beta	std. error	beta	std. error			
Widowhood	**-2.995*** **	**(0.147)**	**-0.235**	**(0.225)**			
Pooled OLS	-2.587***	(0.232)	0.120	(0.353)			
First Differencing	-2.687***	(0.181)	-0.546***	(0.243)			
					Difference	**-2.760*** **	**(0.268)**
					P.OLS	-2.706***	(0.421)
					FD	-2.348***	(0.290)
Lagged widowhood	**1.763*** **	**(0.178)**	**2.044*** **	**(0.271)**			
Pooled OLS	1.336***	(0.328)	3.054***	(0.498)			
First Differencing	0.944***	(0.183)	1.920***	(0.271)			
					Difference	**-0.281**	**(0.324)**
					P. OLS	-1.718***	(0.594)
					FD	-0.553*	(0.323)

	Late(>65)		Early (<65)				
	beta	std. error	beta	std. error			
Widowhood	**-2.676*** **	**(0.217)**	**-1.966*** **	**(0.144)**			
Pooled OLS	-1.020***	(0.344)	-2.146***	(0.232)			
First Differencing	-2.587***	(0.283)	-2.053***	(0.156)			
					Difference	**0.710*** **	**(0.260)**
					P.OLS	-1.126***	(0.415)
					FD	0.534*	(0.283)
Lagged widowhood	**2.311*** **	**(0.269)**	**1.535*** **	**(0.173)**			
Pooled OLS	4.233***	(0.525)	0.905***	(0.317)			
First Differencing	2.405***	(0.261)	1.073***	(0.174)			
					Difference	**-0.776** **	**(0.319)**
					P.OLS	-3.328***	(0.613)
					FD	-1.332***	(0.312)

Table A3: Fixed effects, pooled OLS and first differenced estimates widowhood and interaction terms with gender and late widowhood.

	Principal breadwinner		Other household member				
	beta	std. error	beta	std. error			
Widowhood	**-2.712*** **	**(0.155)**	**-1.346*** **	**(0.183)**			
Pooled OLS	-2.415 ***	(0.250)	-0.863***	(0.305)			
First Differencing	-1.983***	(0.144)	-0.456	(0.560)			
					Difference	**1.366*** **	**(0.229)**
					P.OLS	1.552***	(0.393)
					FD	1.527***	(0.575)
Lagged widowhood	**1.751***	**(0.906)**	**1.855*** **	**(0.151)**			
Pooled OLS	0.901	(1.421)	1.773***	(0.280)			
First Differencing	0.352	(0.729)	1.100***	(0.168)			
					Difference	**0.104**	**(0.918)**
					P.OLS	0.872	(1.448)
					FD	0.748	(0.746)

	No children		Under aged children		Older children				
	beta	std. error	beta	std. error	beta	std. error			
Widowhood	**-2.374*** **	**(0.131)**	**-1.332*** **	**(0.215)**	**-0.290**	**(0.417)**			
Pooled OLS	-2.266***	(0.204)	-0.154	(0.239)	1.958***	(0.665)			
First Differencing	-2.365***	(0.140)	-1.404***	(0.239)	-0.443	(0.461)			
							Difference	**1.042*** **	**(0.222)**
							P.OLS	2.112***	(0.354)
							FD	0.961***	(0.243)
Lagged widowhood	**1.962*** **	**(0.158)**	**1.462*** **	**(0.260)**	**0.963***	**(0.503)**			
Pooled OLS	1.696***	(0.284)	2.063***	(0.510)	2.430**	(0.992)			
First Differencing	1.612***	(0.155)	1.207***	(0.260)	0.801	(0.499)			
							Difference	**0.500***	**(0.267)**
							P.OLS	0.367	(0.523)
							FD	-0.405	(0.262)

Table A4: Fixed effects, pooled OLS and first differenced estimates widowhood and interaction terms with principal breadwinner and children.