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Giving with a warm hand

Evidence on estate planning and bequests

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DESIGN PAPER 120

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Colophon
Netspar Design Paper 120, April 2019

Design
B-more Design

Lay-out
Bladvulling, Tilburg

Editors
Frans Kooymans, Frans Kooymans-Text and Translation
Netspar

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Acknowledgements
The authors wish to thank James Banks, Eric French, Max Groneck, Michael Haliassos, Marike Knoef, and Heike Vethaak for their useful comments and suggestions, as well as participants at the NETSPAR International Pension Workshop 2016 in Leiden, the Netherlands, the PSE Applied Economics Lunch Seminar of February 28 2017 in Paris, the conference of the International Association of Applied Econometrics 2017 in Sapporo, Japan, the IFS Lunch Seminar of October 10 2017 in London, the Seminar on Ageing, Retirement and Pensions of March 27–29 2018 in Ashkelon, Israel, and the NETSPAR Taskforce Day of December 13 2018 in Amsterdam.

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Abstract

Giving with a warm hand: evidence on estate planning and bequests
In this paper we study the bequest motive for saving, using administrative data on all deaths that occurred in the Netherlands between 2006 and 2013. In doing so, we build on the previous work by Kopczuk (2007). We study whether individuals start transferring part of their estate to their heirs in the expectation of death in the foreseeable future. First, we distinguish between sudden and non-sudden death. Second, controlling for gender, age, marital status, and permanent income, we find that non-sudden deaths are associated with less wealth at the time of death. We find the strongest effect, a difference in financial wealth of about 24%, for single individuals who die of cancer. Relying on the richness of our data and on the characteristics of the Dutch institutional context, we interpret this result as a reflection estate planning that is triggered by an underlying bequest motive.

Samenvatting

Geven met een warme hand: bewijs van erfenisplanning
In dit paper bestuderen wij het erfenismotief voor sparen, gebruikmakend van administratieve data betreffende alle sterfgevallen die zich in Nederland hebben voorgedaan tussen 2006 en 2013. Hiermee bouwen wij voort op het eerdere werk van Kopczuk (2007). Wij onderzoeken of mensen een deel van hun nalatenschap overdragen aan hun erfgenamen in de verwachting van een nabije dood. Allereerst maken we onderscheid tussen verwachte en onverwachte sterfgevallen. Ten tweede, controlerend voor geslacht, leeftijd, burgerlijke staat en permanent inkomen, stellen we vast dat verwachte sterfgevallen geassocieerd worden met minder vermogen op het moment van overlijden. We constateren het sterkste effect, een verschil in financieel vermogen van ongeveer 24%, voor alleenstaanden die aan kanker overlijden. Op basis van de hoeveelheid gegevens en de kenmerken van de Nederlandse institutionele context interpreteren wij dit resultaat als een afspiegeling van het plannen van de nalatenschap waarbij een onderliggend erfenismotief de aanleiding vormt.

1. Introduction

It is widely recognized in the literature on retirement savings that retirees, especially those with a high lifetime income, do not consume their wealth as much as the stripped version of the life-cycle model predicts.[1] The economic literature has proposed three main explanations for this stylized fact: precautionary saving due to longevity risk (*e.g.* De Nardi *et al.*, 2009; and Post and Hanewald, 2013), precautionary saving due to uncertain out-of-pocket medical expenditures (*e.g.* Coile and Milligan, 2009; and De Nardi *et al.*, 2010), and the bequest motive for saving (*e.g.* Kopczuk, 2007; and De Nardi and Yang, 2014). Even though the evidence on the relative importance of these three motives is rather mixed, all three are generally considered to be meaningful additions to the life-cycle model.

Research as to whether wealth accumulation through the life cycle responds to a precautionary motive, a bequest motive, or a pure life-cycle motive contributes towards a better understanding of the spending priorities and consumption needs of retired individuals. Therefore, it is highly relevant for a range of issues related to pension policies and long-term care provision. For instance, it is relevant for a better understanding of topics such as pension adequacy and the displacement effect of pension wealth on household savings.[2] Furthermore, focusing on the bequest motive is particularly relevant since it provides insight into the intergenerational effect of pension policies. In addition, an understanding of the presence and intensity of the bequest motive is helpful for assessing the demand for insurance against longevity risk and long-term care risk (Lockwood, 2012, 2018).

In this study we contribute to the literature by empirically studying the bequest motive using Dutch administrative micro data. Previous literature on the bequest motive for saving has mostly focused on estimating bequest parameters in structural models by matching model predictions to observed saving and consumption behavior (*e.g.* Hurd, 1989; De Nardi, 2004; and Kopczuk and Lupton, 2007). To obtain sharper identification of the bequest preference parameter, more recent literature has addressed saving behavior in combination with choices regarding long-term care insurance (*e.g.* Ameriks *et al.*, 2011; De Nardi *et al.*, 2016*a*; and Lockwood, 2018). However, the main hurdle faced by this literature is that the precautionary motive

1 For thorough literature surveys and evidence on this stylized fact, see van Ooijen *et al.* (2015), De Nardi *et al.* (2016*b*), and Suari-Andreu *et al.* (2019).

2 See Knoef *et al.* (2016) for a review of the literature on pension adequacy, and see Lachowska and Myck (2018) for a review of the literature on the displacement effect.

and the bequest motive generate similar wealth trajectories, making it problematic to distinguish between the two.

By extending the previous work by Kopczuk (2007), we propose an alternative strategy which circumvents the above-mentioned identification problem. To that end, we employ an administrative dataset containing all deaths that took place in the Netherlands between 2006 and 2013. This dataset contains just over one million deaths and allows coupling of information on each decedent with information on the decedent's children. The starting point of our strategy consists of identifying sudden deaths, for which we use the operationalization proposed by Andersen and Nielsen (2010, 2016). The size of the dataset that we employ allows for accurate identification of a large number of cases of sudden death. Once these are singled out, we regress household wealth at the end of life on a dummy variable indicating sudden death while controlling for age at death, gender, marital status, household structure, permanent income, and children characteristics. We hypothesize that individuals who do not suffer a sudden death will have less wealth at the time of death, reflecting inter-vivos transfers that result from estate planning during the final phase of life. Following Kopczuk (2007), we interpret transfers to heirs resulting from deathbed estate planning as reflecting an underlying bequest motive for saving.

Our strategy faces two main challenges. First, it may be that individuals who do not suffer a sudden death die with less wealth because of higher medical and/or non-medical expenditures at the end of life. As to medical expenditures, the Dutch institutional context prevents these from having any major role due to widespread insurance coverage (Bakx *et al*., 2016).[3] As to non-medical expenditures, van Ooijen *et al*. (2018) show, using Dutch survey data, that poor health has a negative effect on non-medical expenditures. Therefore, if individuals who do not suffer a sudden death experience worse health at the end of life, any negative relation between non-sudden death and wealth at the end of life will reflect a lower bound. Second, it may be that any difference in wealth at the time of death is explained by differential incidence of health-related income shocks for sudden and non-sudden deaths.[4] Using the same Dutch administrative data that we employ, Garcia-Gomez *et al*. (2013) find that unexpected hospitalizations result on average in a 5% reduction in yearly

3 Bakx *et al*. (2016) describe the Dutch healthcare system in depth and show that out-of-pocket medical expenditures constitute only about 5% of yearly healthcare expenditures, the lowest percentage among OECD countries (OECD, 2017).

4 This argument is true as long as health shocks translate into substantial income shocks. However, the Dutch disability insurance system ensures that health shocks do not translate into large income drops. For details on the Dutch disability insurance system, see Garcia-Gomez *et al*. (2013).

income. Even though this effect is small effect, it could indeed impact our results. Therefore, we rerun our analyses leaving out individuals who were hospitalized before retirement.

The baseline results show that, after controlling for the above-mentioned variables, individuals who suffer a non-sudden death die with significantly less wealth compared to individuals who suffer a sudden death. The effects are significant at the 0.1% level for singles and at the 0.5% level for couples, and range from -4.54% for the net worth of couples to -11.63% for the net financial wealth of singles.[5] When we exclude individuals with hospital admissions before retirement, and thus limit the possibility of income shocks that would explain our results, the effect for singles is reduced but nearly unaltered, while the effect for couples becomes insignificant. These results are in line with health-related income shocks playing a small but non-negligible role in explaining wealth differences at the end of life. They are also in line with the presence of a bequest motive towards the partner for individuals who die within a couple; this we do not directly capture since we observe wealth at the household level.

Following Kopczuk (2007), we interpret these results as reflecting estate planning that is triggered by an underlying bequest motive. The large size of our dataset allows us to study the heterogeneity of the main effect across several dimensions. These analyses yield no significant differences across gender, a slightly larger effect for individuals who die at an older age (above 70), and an especially large effect for single individuals who die of cancer. In addition, observing the entire wealth distribution allows us to test for differential effects across wealth levels using quantile regression. We find that in absolute terms the effect increases as we move up the distribution, while the relative effect decreases. Finally, we use the data on the children of decedents to test whether the effect is different between individuals with and without children. In this case the results show no significant differences for the two groups. This is in line with most relevant contributions in the literature on bequests. These find very weak evidence of a bequest motive when estimating it based on the assumption that individuals without children do not have a bequest motive (Hurd, 1989; Lockwood, 2018).

Even though we can confidently say that we succeeded in capturing estate planning type of behavior, it is less clear whether the wealth being transferred was initially accumulated for the purpose of being left as a bequest. It might be that

5 Given the large number of observations we employ in the analysis, we lower the conventional thresholds for statistical significance by dividing them by ten.

individuals save initially mostly for precautionary reasons, with the bequest motive as a secondary priority, and that, when they become ill towards the end of life, the bequest becomes then the main priority. However, our results indicate that the bequest parameter as usually modelled in the life-cycle model is positive, which according to the model itself should impact lifetime consumption and saving decisions. Even if this is not entirely the case, our results, in combination with those of van Ooijen *et al*. (2018),[6] do clearly reflect a preference for bequests vis-à-vis other uses of wealth by individuals who do not suffer a sudden death. If this preference is triggered by a health shock and/or by a shortened expected remaining lifetime, our results are still relevant for the above-mentioned policy aspects insofar as they reflect spending preferences of older individuals.

The rest of the paper proceeds as follows. Section 2 explains the strategy by Kopczuk (2007) to identify the bequest motive and how our study complements and expands this strategy. Section 3 provides the regression equation that we estimate. Section 4 describes the data and provides summary statistics for the most relevant variables. Section 5 provides the results, and Section 6 concludes and summarizes policy implications and venues for future research. The appendices provide definitions and summary statistics for all variables that we use, additional summary statistics for the cause of death and sudden death variables and full regression results.

6 van Ooijen *et al*. (2018) find that, among older individuals, health deterioration leads to lower general non-medical consumption and higher expenditure on gifts.

2. Identifying the bequest motive

2.1 Kopczuk's strategy

As mentioned in the introduction, most of the existing literature on the bequest motive for saving focuses on estimating parameters in structural models in order to match observed saving, consumption, and long-term care insurance decisions. Departing from this main stream of literature, Kopczuk (2007) pioneered a strategy consisting of identifying the bequest motive by studying whether individuals start transferring part of their estate in the expectation of imminent death. To do so, Kopczuk (2007) employed American estate data on a sample of deaths that occurred between 1976 and 1977. He identified sudden deaths as those not caused by a previously diagnosed illness, and classified deaths that are not sudden as either preceded by a short (hours, days or weeks) or long illness (months or years). Controlling for gender, marital status, age, and permanent income, he regressed wealth at time of death on length of illness. He argued that, if deaths preceded by a terminal illness are associated with lower wealth at the moment of death, this is due to individuals transferring part of their estate in the expectation of a near death.

The assumption underpinning Kopczuk's strategy is that transfers to heirs resulting from deathbed estate planning reflect the presence of a bequest motive for saving. Given a bequest motive, there are two reasons for individuals to engage in early bequest giving in the expectation of an imminent death. First, as pointed out by Kopczuk (2010) and McGarry (2013), the reason may be inheritance tax avoidance. Second, as proposed by McGarry (2000, 2013), the purpose may be to exert control over recipiency and use of the assets transferred. Contrary to these two reasons, these transfers may involve the cost of implying relinquishment of control over assets that individuals might need if they live longer than expected or encounter unexpected expenditures (McGarry, 2000).

Kopczuk (2007) observed only individuals whose wealth exceeds the minimum estate tax threshold. Effectively this means that he only observed the top of the wealth distribution and thus had to rely on truncated regression techniques. In addition, due to missing data on income, most of his analysis focused on married males, for whom he found that short illnesses lead to a 5% to 10% decline in wealth at time of death, while long illnesses lead to a decline of 15% to 20%. Even though this seems a very plausible result, it can be challenged from several angles. First, it could be explained by wealth shocks resulting from medical expenses or lost income. Second, it could be that individuals who become ill update their rate of time preference and increase their non-medical consumption. To tackle the first point, Kopczuk (2007)

controlled for previous labor income (about five years before death), and performed an additional analysis using survey data to show that the magnitude of medical expenditures is not sufficient to explain the result of the main analysis. Even though the outcome of these analyses backs his interpretation of the main results, the second point mentioned above is not addressed.

2.2 Extension of Kopczuk's strategy

In this study we perform an analysis using a dataset and a context that help addressing the shortcomings mentioned in Section 2.1. For every death that took place in the Netherlands between 2006 and 2013, we observe gender, age, cause of death, previous income (back to 2003), previous wealth (back to 2005), previous hospital admissions (dating back to 1995), household structure, and presence of children, as well as the characteristics of the latter. The richness and the size of this dataset allow us to test for the heterogeneity of the effect we estimate across several dimensions, namely gender, age, cause of death, and the presence of children. In addition, observing the entire wealth distribution implies that we do not need to rely on truncated regression, and it allows us to check, by applying quantile regression, whether the effect we want to estimate differs across the wealth distribution.

An important advantage of having access to data on cause of death and on hospital visits is that it allows us to accurately identify sudden deaths following the operationalization of Andersen and Nielsen (2010, 2016). According to the latter, sudden deaths are medically defined as unexpected deaths that occur instantaneously or within a few hours of an abrupt change in the person's clinical state. Therefore, as argued by Andersen and Nielsen (2010, 2016), a sudden death is close to a random draw, which, if properly identified, allows for a more refined application of Kopczuk's strategy. However, it may still be that differential consumption patterns and income shocks for sudden and non-sudden deaths explain an effect that would otherwise be attributed to estate planning.

As to the potential role of consumption, the Dutch context prevents any major influence of medical and non-medical expenditures on the results. As to medical expenditures, in the Netherlands there is universal coverage of both curative and long-term care. Bakx *et al*. (2016), who describe the Dutch healthcare system in depth, show that between 1998 and 2014 out-of-pocket medical expenditures constituted only about 5% of yearly healthcare expenditures, the lowest percentage among OECD countries (OECD, 2017). As to non-medical expenditures, van Ooijen *et al*. (2018), using a representative Dutch survey and exploiting individual variation over time, show that poor health has a negative effect on expenditures. They find

that poor general health leads to a 3% reduction in expenditures and that functional disabilities and severe chronic illnesses decrease consumption by 4.9% and 7.3%, respectively. They do not find an effect for mental health.[7]

In addition to preventing any major role of medical and non-medical expenditures, the Dutch context also prevents any sizeable effect of income shocks. The Dutch disability insurance system ensures that individuals receive full income for the two years following a health shock that causes disability, and a minimum replacement rate of 70% from the third year onwards. Garcia-Gomez *et al*. (2013) explain the disability benefit system in full detail and empirically study the effect on employment and income of health shocks. Using the same administrative data that we use in this study, they find that an unscheduled hospital admission lowers the probability of remaining in employment by seven percentage points, and results in a loss of about 5% in annual personal income. Even though these effects are not excessively large, we prevent them from affecting our results by rerunning our analyses using only observations without hospital admission before retirement.

7 In addition to their main results, van Ooijen *et al*. (2018) also find that the decrease in non-medical expenditures does not coincide with an increase in medical expenditures. Their results agree with a large strand of literature which argues that poor health has a negative effect on the marginal utility of non-medical consumption. For a survey of this literature, see Finkelstein *et al*. (2009, 2013).

3. Econometric model

The insights by Garcia-Gomez *et al*. (2013), Bakx *et al*. (2016), and van Ooijen *et al*. (2018) make clear that the Netherlands provides a very appropriate context to apply our strategy to identify the bequest motive for saving. We regress wealth at the end of life on a dummy indicating sudden death using a cross-section of deaths that occurred between 2006 and 2013. The regression equation we estimate is the following

$$W_i = \beta_0 + NS_i\beta_1 + X'_{1i}\beta_2 + X'_{2i}\beta_3 + t'_i\beta_4 + \varepsilon_i, \quad (1)$$

where W_i stands for either household net worth or net financial wealth at the end of life for individual i ; NS_i is a dummy variable that takes a value of one in case of a non-sudden death; X_{1i} is a vector of controls including age dummies, household structure, and permanent income; X_{2i} is a vector containing children variables (*i.e.* number of children, average age, and average permanent income of the children); t_i contains a set of dummies controlling for the year of death; and ε_i is the individual-specific error term. Since we control for both age and year of death, we indirectly control as well for cohort effects. Operationalization of wealth, sudden deaths, and permanent income is discussed in Section 5, while Appendix A provides definitions and summary statistics for all variables employed in the analysis.

We estimate Equation (1) separately for singles and couples to account for the fact that the incentives and motivations behind the life cycle decisions of these two types of household are intrinsically different from each other.[8] In addition, we assume that the error term ε_i is independent across observations. However, given the skewness of the wealth distribution, it is likely that ε_i is not homoskedastic. Therefore, we use heteroskedasticity-robust standard errors in all our estimations. However, since we observe the whole universe of deaths that occurred between 2006 and 2013 in the Netherlands, and thus there is no sampling error, it is not straightforward what the interpretation of the standard errors should be. In that regard, we follow Abadie *et al*. (2014) and think of our study in a potential outcome framework. In such a framework, we observe one of all possible states of the world. The standard errors tell us thus how representative is the state of the world that we observe of all potential states.

8 In that way we also avoid using in the same regression two observations belonging to the same household. That is because if both individuals within a couple die between 2006 and 2013, the first death will be included in the couples regression while the second will be included in the singles regression.

4. Data and summary statistics

4.1 Data sources

For our study, we use Dutch data from different administrative sources, which we merge into one single dataset. All data were provided to us by Statistics Netherlands. They encompass the universe of deaths that occurred in the Netherlands between 2006 and 2013, *i.e.* 1,079,126 deaths. By means of an encrypted social security number, we merge data on cause of death from the death register with data on demographic characteristics from municipal records, on household income and wealth from the tax administration, and on hospital admissions from the hospital discharge register. In addition, we are able to match each decedent in the data set with the decedent's children.

After the merging process, we are left with a dataset of individual deaths that contains the following information on each decedent: date of death, cause of death, age, gender, marital status, household structure,[9] household net worth at the end of the year prior to death, yearly household disposable income from 2003 until the year prior to death, hospital admissions from 1995 until the time of death, and presence and characteristics of children. The data on hospital admissions contain date and diagnosis for each admission. Causes of death and hospital diagnoses are classified according to the 10th revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10), as assembled by the World Health Organization.[10]

Net worth equals total assets minus total liabilities.[11] Assets can be divided into financial and non-financial assets. The former can be disaggregated into deposits, saving accounts, stocks, and bonds, while the latter can be disaggregated into housing (primary residence) and other non-financial assets (housing wealth other than the primary residence plus business wealth).[12] Liabilities can be disaggregated into mortgage debt and non-mortgage debt. Due to missing data on wealth and income, the number of observations after the merging process drops from 1,079,126 to 1,073,282.

9 Household structure includes several categories indicating the presence of children and/or other relatives and non-relatives in the household. It also includes a separate category for institutionalized households, *i.e.* households whose members live in a nursing home.

10 For further information on the ICD-10, see WHO (2016).

11 For additional description and applications of the wealth data that we employ, see de Bresser and Knoef (2015) and Knoef *et al.* (2016).

12 Stocks and bonds also include indirect ownership through mutual funds.

Table 1 *Wealth at the end of life (thousands of e)*

	Mean	p10	p25	p50	p75	p90	p95	p99	Obs.
Net worth									
Single females	132	1	5	21	127	366	569	1,336	409,816
Single males	152	0	3	23	167	410	629	1,463	213,223
Married females	236	1	14	91	288	534	786	1,921	146,115
Married males	253	2	16	104	309	573	841	2,037	304,128
All	**184**	**1**	**7**	**32**	**223**	**466**	**698**	**1,638**	**1,073,282**
Net financial wealth									
Single females	62	0	4	16	42	140	255	749	409,816
Single males	67	0	2	15	46	147	270	791	213,223
Married females	90	1	6	24	68	179	314	1,049	146,115
Married males	97	1	8	25	72	186	330	1,143	304,128
All	**77**	**0**	**4**	**20**	**54**	**162**	**287**	**896**	**1,073,282**

4.2 Wealth at the end of life

The data on assets and liabilities are given at the household level and are measured as of December 31 of the year prior to death. Therefore, we use wealth on December 31 of the year prior to death as a measure of wealth at the end of life. This implies that there is a delay between the date of wealth measurement and the actual date of death. Since we observe the exact date of death, we compute this delay (in days) and include it as a control variable in our regressions. We distinguish between total net worth (NW) and net financial wealth (NFW) since liquid wealth is arguably the most likely to be passed on as an early bequest. We calculate net financial wealth by deducting non-mortgage debt from the sum of all financial assets (deposits, saving accounts, stocks, and bonds).

Table 1 shows how both NW and NFW at the end of life are distributed by gender and marital status of the decedent. The first thing to note is that, as the literature on retirement savings summarized by De Nardi *et al*. (2016*b*) points out, individuals retain considerable amounts of wealth at the very end of their life, be it accidental or intentional. Males generally die with more wealth than females, and NW is considerably higher than NFW. A second aspect to note is that, as expected, wealth shows a high degree of positive skewness. Grouping all demographic categories together, Table 1 shows that for NW the average is 5.75 higher than the median, while for NFW it is 3.85 higher. The 99th percentile column shows very high values for all demographic groups, especially for married males. The possibility of capturing this percentile accurately is a strong advantage of the administrative data that we use, since the top 1% is usually underrepresented in survey data.

4.3 Sudden deaths

Kopczuk (2007) defines sudden deaths as deaths that are not caused by a previous illness, and he classifies deaths that are not sudden as either preceded by a short (hours, days or weeks) or long (months or years) illnesses. We refine this strategy by using the operationalization of sudden deaths provided by Andersen and Nielsen (2010, 2016). They use the ICD-10 and distinguish between natural and unnatural deaths. As to the former, they consider acute myocardial infarction (ICD-10: I21-I22), cardiac arrest (I46), congestive heart failure (I50), stroke (I60-I68), and sudden deaths from unknown causes (R95-R96) as sudden deaths. As to unnatural deaths, they consider transport accidents (V00-V99), and deaths caused by other accidents and violence (W00-W99, X00-X59, X85-X99, and Y00-Y84) as sudden.[13] Given the size and the richness of our dataset we can go further than Andersen and Nielsen (2010, 2016) in refining the definition of sudden death. We do so by excluding from the sudden death category those deaths that are caused by a cardiovascular event and that are preceded by at least one hospital admission related to a cardiovascular disease. With this definition we get 141,308 sudden deaths, which is 13.17% of all deaths.[14]

Andersen and Nielsen (2010, 2016) consider sudden deaths to be a random draw and thus, in principle, unrelated to specific individual characteristics. Table 2 shows the average and the median of each variable used in our analysis for sudden and non-sudden deaths.[15] Most values are similar for the two groups, but there are some small differences. Individuals who suffer a sudden death die at a slightly older age and include slightly more males than females. In addition, they are less likely to be married and have slightly lower wealth and income. Table 3 shows the share of sudden deaths by gender, marital status, and age category. The most noticeable features are that younger males are the most likely to suffer a sudden death as a share of age-specific total deaths, and that the relation between the share of sudden deaths and age is U-shaped: the former decreases up to the 60-70 age category and then increases again for older age categories.

It is these differences across age groups that seem to drive the higher share of sudden deaths among single individuals. This evidence shows that sudden deaths are

13 The latter category excludes deaths by suicide.

14 Table B1 in Appendix B shows all deaths classified using the ICD-10 general categories for diseases and conditions. Table B2 shows only sudden deaths and classifies them using more specific categories.

15 Following Abadie *et al*. (2014), we do not provide standard errors in Table 2. The latter derive a formula for the standard error of a sample mean that converges to zero as the sample approaches the population.

Table 2 *Summary statistics by (non-)sudden death*

	Sudden deaths		Non-sudden deaths	
Variable	Mean	Median	Mean	Median
Permanent income	18,932	16,491	19,337	16,910
Net worth	181,381	29,228	184,845	32,863
Net financial wealth	79,041	19,900	76,661	19,584
Female	0.51	–	0.56	–
Age	77.42	82	76.46	79
Retired	0.75	–	0.77	–
Number of children	2.20	2	2.27	2
Marital status				
– Married	0.34	–	0.43	–
– Divorced	0.08	–	0.08	–
– Widowed	0.23	–	0.21	–
– Never married	0.35	–	0.27	–
Household structure				
– One person household	0.36	–	0.31	–
– Single parent	0.03	–	0.03	–
– Couple without children	0.27	–	0.36	–
– Couple with children	0.06	–	0.06	–
– Multiperson household	0.05	–	0.04	–
– Institutionalized household	0.23	–	0.20	–

Notes: Multiperson household refers to households with any of the other possible structures (except *institutionalized household*) plus at least one additional member who is not a child or a spouse. A household is considered institutionalized if at least one member lives in a nursing home or other institution. The dataset is composed of 141,308 sudden deaths (13.17%) and 931,974 non-sudden deaths (86.83%).

Table 3 *Share of sudden deaths by age, gender, and marital status*

	Single				Married			
	Females		Males		Females		Males	
Age Category	Share	Obs.	Share	Obs.	Share	Obs.	Share	Obs.
<50	14.21%	2.49%	24.88%	8.06%	11.43%	6.69%	21.59%	3.16%
50-60	10.53%	3.29%	16.35%	9.82%	8.09%	13.88%	14.31%	8.14%
60-70	9.99%	6.39%	13.02%	14.78%	7.84%	23.18%	9.78%	20.05%
70-80	12.38%	16.39%	11.13%	22.60%	11.01%	29.32%	8.72%	33.49%
80-90	15.84%	44.54%	12.44%	32.43%	14.57%	24.20%	10.22%	30.69%
>90	18.59%	27.15%	16.26%	12.31%	17.91%	2.74%	14.59%	4.47%
All	15.45%	100%	14.09%	100%	10.95%	100%	10.51%	100%

not purely random and that we have to control at least for age, gender, and marital status.

4.4 Permanent income

Besides the demographic variables pointed out in Section 4.3, it is important to control for permanent income. That is because it might correlate with both wealth and health status at the end of life.[16] To measure permanent income, Kopczuk (2007) used as a proxy personal labor income observed for a single period, which may be from five to ten years before death. In our study, we observe yearly total income at the household level for the period between 2003 and the year prior to death. Additionally, for every year we know the main source of income of the household.

With this information, we generate a proxy for permanent income by applying the following rule: if the main source of income in the year prior to death is not pension income, we take the average of equivalized household income between 2003 and the year prior to death; if the main source of income in the year prior to death is pension income, then we just take equivalized household income corresponding to that particular year.[17] This strategy is based on Knoef *et al*. (2013), who, using data for the Netherlands, argue that pension income is a particularly good proxy for permanent income.[18] To account for the two different methodologies employed to measure permanent income, we generate a dummy variable, indicating which methodology is used for each decedent, and include it in our regressions.[19]

16 The key assumption here is that controlling for permanent income, together with age, accounts for the correlation between health status, mortality, and wealth that is frequently encountered in the literature (Attanasio and Emmerson, 2003).

17 We equivalize household income by dividing yearly income by the square root of the number of members in the household in that year. We apply this transformation because in many cases household structure experiences changes during the years prior to death.

18 Knoef *et al*. (2013) show that the variance of income shocks is smaller for retirees than for working individuals, and that income shocks are more persistent for retirees. For these reasons they argue that pension income is a specially good proxy for permanent income.

19 Pension income is used in 77.06% of the cases.

5. Results

We start out this section by estimating Equation (1) without controlling for the children variables (*i.e.* setting $\beta_3 = 0$), using both net worth and net financial wealth as dependent variables and pay attention to the estimate of the effect of a non-sudden death (*i.e.* β_1), which we expect to be negative. In a second step, we test whether the results hold when we leave out individuals with hospital admissions before retirement. In a third step, we test whether the effect is dependent on gender, age, and cause of death. In a fourth step, we employ quantile regression to test whether the effect differs along the wealth distribution. In a fifth and final step, we introduce the vector of children variables X_{2i} in the regression equation, which includes number of children, average age of the children, and average permanent income of the children, and test whether the effect differs between individuals with and without children. Throughout this section we provide estimates of β_1 only. Appendix C provides the full results of our baseline estimation.

Table 4 *Results: baseline*

	Net worth		Net financial wealth	
(a)				
Singles	-7,643.79***	-5.49%	-4,446.95***	-6.94%
	(1,642.00)	(1.18%)	(1,278.34)	(2.00%)
Couples	-11,374.39**	-4.60%	-7,797.85*	-8.22%
	(3,635.17)	(1.47%)	(3,175.98)	(3.35%)
(b)				
Singles	-10,106.52***	-7.26%	-7,284.17***	-11.63%
	(1,819.19)	(1.31%)	(1,441.29)	(2.30%)
Couples	-11,413.14**	-4.54%	-10,010.55**	-10.57%
	(3,848.61)	(1.53%)	(3,315.01)	(3.50%)

Notes: Each cell provides an estimate of β_1 in Equation (1). Percentage effects are presented next to each coefficient estimate. Heteroskedasticity-robust standard errors are provided in parenthesis. Panel (a) provides the effect of NS_i on W_i, while Panel (b) provides the same effect conditional on non-sudden deaths having at least one hospital admission related to cause of death. In Panel (a), singles regressions include 588,818 observations, while couples regressions include 433,202 observations. In Panel (b), singles regressions include 296,744 observations, while couples regressions include 245,849 observations. Given the large number of observations we employ in the analysis, we lower the conventional thresholds for statistical significance by dividing them by ten. *Significant at the 1% level, **significant at the 0.5% level, ***significant at the 0.1% level.

5.1 Baseline

Panel (a) in Table 4 provides the baseline estimates of β_1 in Equation (1), separately for singles and for couples. As explained in Section 3, we estimate separate models for singles and couples to account for the fact that incentives and motivations behind the life-cycle decisions of these two types of households are intrinsically different from each other. Panel (b) provides the same estimates, conditional on non-sudden deaths being preceded by at least one hospital admission related to cause of death. All estimates of β1 in Table 4 are negative as expected, with stronger effects being estimated in Panel (b) compared to Panel (a). Focusing on the relative effects, these are larger for singles than for couples and for net financial wealth vis-à-vis net worth. In addition, the estimates for couples are less statistically significant.[20] These differences are in line with the estimates reflecting transfers that result from estate planning. That is because, on the one hand, these transfers are likely to be made in liquid forms of wealth, while, on the other hand, individuals who die within a couple are likely to also have a bequest motive towards their partner, which we do not capture because we observe wealth at the household level.

Following the above-mentioned reasoning, it makes sense that the smallest effect in Table 4 (*i.e.* -4.54%) is estimated for the net worth of couples, while the largest effect (*i.e.* -11.63%) is estimated for the net financial wealth of singles. In addition it makes sense that Panel (b) shows larger effects than Panel (a). That is because non-sudden deaths that are preceded by a cause-of-death-related hospital admission are more likely to be expected. The results we present here are in line with those by Kopczuk (2007), and we interpret them as reflecting estate planning triggered by an underlying bequest motive.

5.2 Income shocks

As mentioned in Section 2, the results in Table 4 could be explained by either differential patterns in consumption or the differential incidence of income shocks for individuals who suffer a sudden death vis-`a-vis individuals who do not suffer a sudden death. As to differential consumption patterns, we rely on evidence showing that out of pocket medical expenditures are relatively low in the Netherlands, and that poor health has on average a negative effect on non-medical expenditures (Bakx *et al.*, 2016; and van Ooijen *et al.*, 2018). This evidence suggests that individuals who suffer

20 Given the large number of observations we employ in the analysis, we lower the conventional thresholds for statistical significance by dividing them by ten.

Table 5 *Results: income shocks excluded*

	Net worth		Net financial wealth	
(a)				
Singles	-9,087.48***	-6.20%	-4,647.89***	-6.76%
	(1,677.29)	(1.14%)	(1,252.62)	(1.82%)
Couples	-11,431.89*	-4.50%	-7,604.85	-7.47%
	(4,445.03)	(1.75%)	(3,930.79)	(3.86%)
(b)				
Singles	-10,158.91***	-6.88%	-6,905.82***	-10.15%
	(1,846.52)	(1.25%)	(1,425.67)	(2.10%)
Couples	-8,260.69	-3.19%	-8,688.47	-8.42%
	(4,730.20)	(1.82%)	(4,042.83)	(3.92%)

Notes: Each cell provides an estimate of β_1 in Equation (1). Percentage effects are presented next to each coefficient estimate. Heteroskedasticity-robust standard errors are provided in parentheses. Panel (a) provides the effect of the non-sudden death dummy on wealth at the end of life, while Panel (b) provides the same effect conditional on non-sudden deaths having at least one previous hospital admission related to cause of death. In Panel (a), singles regressions include 503,165 observations, while couples regressions include 317,843 observations. In Panel (b), singles regressions include 243,252 observations, while couples regressions include 164,729 observations. Given the large number of observations we employ in the analysis, we lower the conventional thresholds for statistical significance by dividing them by ten. *Significant at the 1% level, **significant at the 0.5% level, ***significant at the 0.1% level.

a non-sudden-death have lower non-medical expenditures during the last years of life, which would imply that the estimates in Table 4 are a lower bound.[21]

As to differential incidence of income shocks, as mentioned in Section 2.1, Garcia-Gomez *et al*. (2013) show that an unexpected hospital admission leads to a drop in yearly income of 5%. This effect would be larger without the generous disability benefit system in the Netherlands. However, it could still partially explain the results in Table 4. For that reason, we rerun the same estimations but excluding non-sudden deaths of individuals whose first cause-of-death-related hospital admission took place at age 65 or younger. For comparability purposes, we also exclude all deaths not preceded by any cause-of-death-related hospital admission that occurred at age 65 or younger.

Table 5 shows that, when we apply the above-mentioned restriction, the results do not change substantially. The most remarkable is that estimates for couples

21 van Ooijen *et al*. (2018) show that the decrease in non-medical expenditures due to poor health is not offset with an increase in out-of-pocket medical expenditures. This result suggests that the net effect of differential medical and/or non-medical consumption patterns would imply higher wealth at time of death for individuals who suffer a non-sudden death. This would counteract the effect we want to estimate, thus making our result a lower bound.

become statistically insignificant. This is in line again with the idea that individuals who die within a marriage are likely to have a bequest motive towards the partner, suggesting that the effects for couples in Table 4 are mostly due to income loss due to poor health. The estimated effects for singles in Table 5 are still significant at the 0.1% level even though the effects are slightly smaller compared to those in Table 4. Therefore, this analysis suggests that income loss due to poor health does have some effect on wealth at the end of life. However, this effect is not strong enough to explain the results for singles reported in Table 4.

5.3 Gender, age, and cause of death interactions

The effects reported in Tables 4 and 5 may be heterogeneous across different characteristics, *i.e.* gender, age, and cause of death. Testing these heterogeneities can help attribute the effect we estimate to estate planning.[22] Regarding gender, there is a large body of literature on differences in terms of financial literacy, and, arguably, a certain degree of literacy is necessary to engage in estate planning.[23] When we interact *NSi* in Equation (1) with a gender dummy we do find statistically significant effects for both genders. However, the effects for men and women do not appear to be significantly different from each other.[24]

Regarding heterogeneity of the effect across age groups, it appears that younger individuals do not engage in estate planning even when contracting an illness that is characterized by low survival rates. That is because younger individuals generally have a higher expectation of survival. At the same time, older individuals may start engaging in estate planning regardless of their health condition simply because they have already outlived the general life expectancy. For that reason we divide the sample into three age-of-death groups, *i.e.* young (age$<$70), middle aged (70$\leq$age$<$85) and old (age$\geq$85), and interact a dummy for each of these groups with *NSi* in Equation (1). The top panel in Table 6 shows that the effect for the younger group does not significantly differ from zero, while for the middle-aged and older groups the effects are statistically significant at the 0.1% significance level and not significantly different from each other. The effect for the younger group is only significantly different from

22 Hereafter in the results section we focus on the results for singles provided in Panel (b) of Table 4. The same extensions for the results for couples do not provide additional insights, so they are not reported here, but they are available upon request.

23 For a review of this literature and a seminal contribution to it, see Lusardi and Mitchell (2008).

24 The results of the gender interaction are not provided here, but they are available upon request.

Table 6 *Results: age and cause of death interaction (singles)*

	Net worth		Net financial wealth	
Age				
Age<70	12,032.03	11.40%	772.48	1.96%
	(5,539.12)	(5.25%)	(4,552.97)	(11.60%)
70≤Age<85	−11,824.46***	−8.09%	−7,885.22***	−12.81%
	(2,645.28)	(1.81%)	(1,893.43)	(3.08%)
Age≥85	−12,290.44***	−8.26%	−8,389.79***	−11.21%
	(2,593.88)	(1.74%)	(2,140.38)	(2.86%)
Cause of death				
Cancer	−11,211.26***	−7.45%	−14,621.90***	−24.38%
	(2,705.91)	(1.80%)	(2,221.24)	(3.70%)
Cardiovascular	−9,879.29***	−7.22%	−5,917.48***	−9.56%
	(2,144.11)	(1.57%)	(1,738.42)	(2.81%)
Respiratory	−12,420.47***	−11.48%	−1,365.10	−2.79%
	(3,035.52)	(2.81%)	(2,236.58)	(4.57%)
Mental	2,456.52	1.60%	6,597.09	7.88%
	(8,672.35)	(5.61%)	(8,108.70)	(9.69%)

Notes: Each cell provides an estimate of the main effect for each age and/or cause of death group. Percentage effects are presented next to each coefficient estimate. Estimates are obtained by interacting NS_i in Equation (1) with age and with cause of death dummies. Heteroskedasticity-robust standard errors are provided in parentheses. All estimates are conditional on non-sudden deaths having at least one previous hospital admission related to cause of death. Regressions include 243,252 observations. Given the large number of observations we employ in the analysis, we lower the conventional thresholds for statistical significance by dividing them by ten. *Significant at the 1% level, **significant at the 0.5% level, ***significant at the 0.1% level.

the effect for the older groups (at the 1% level of significance) when using net worth as a dependent variable.

Regarding heterogeneity across causes of death, it might be that certain diseases are more likely than others to trigger estate planning type of behavior. The most likely to stimulate estate planning would be diseases that are well known to have low survival rates and that do not affect the cognitive abilities of the potential estate planner. Since we do not have information on prognoses, our approach here is to take the most common causes of death (*i.e.* those causing at least 5% of all deaths) and to generate a dummy variable for each of them. As Table B1 in Appendix B shows, the categories that each generate at least 5% of deaths are: neoplasms, *i.e.* cancers (31.57%), diseases of the circulatory system, *i.e.* cardiovascular diseases (29.18%),

diseases of the respiratory system (9.98%), and mental and behavioral disorders (5.73%).[25]

The bottom panel in Table 6 shows strong significant effects for both cancer and cardiovascular diseases. However, when using net worth, the estimates do not significantly differ across all cause-of-death categories at the 99% confidence level. When using net financial wealth as a dependent variable, we find a very strong and significant effect for deaths resulting from cancer and a less strong effect, but still highly significant, for deaths resulting from cardiovascular diseases. The effect for deaths resulting from cancer is significantly different from the effect for respiratory diseases, but not significantly different from the effect for mental disorders. That is because the latter effect is estimated with a large degree of uncertainty. Nevertheless, the results suggest relevant effects for deaths resulting from cancer and cardiovascular diseases, which is not the case for deaths resulting from respiratory diseases and mental disorders. Given the reduced cognitive abilities of individuals with mental disorders, it is reasonable to assume that the effect can be equal or close to zero, reflecting absence of estate planning.

If we break down deaths by type of cancer we see that the most common types of cancer are lung (23.57% of cancer deaths), colon (9.00%), breast (7.64%), prostate (5.85%), and pancreas (5.61%). Siegel *et al*. (2017) show, using data for the United States, that the five-year survival rates for these types of cancer range from 8% for pancreas to 99% for prostate, with lung (18%), colon (65%), and breast (90%) having values in between these two extremes.[26] When interacting dummies for each one of these types of cancer with NS_i in Equation (1), we find strong and highly significant effects (at the 0.1% level) for each type of cancer, ranging from -30% for pancreatic cancer to -23% for breast cancer. The point estimates are higher the lower is the survival rate for each type of cancer. However, the effects do not significantly differ from each other.[27] Therefore, we cannot conclude that the estimated effect is stronger for certain types of cancer compared to others.

25 We generate a dummy for each of these causes of death and an additional dummy that takes value one if the cause of death is not one of the four mentioned here. The effect of these dummies is estimated using sudden deaths as a reference group.

26 Note, however, that in our analysis we use a selection of cancer diagnoses that eventually all led to death. Therefore, we are almost certainly looking at a selection of diagnoses that had a below-average probability of survival.

27 The results for type-of-cancer interactions are not provided here, but they are available upon request.

Table 7 *Results: quantile regression (singles)*

	Net worth		Net financial wealth	
p50	-3,273.69***	-15.14%	-1,809.44***	-12.02%
	(100.05)	(0.46%)	(71.74)	(0.48%)
p75	-7,336.88***	-5.00%	-4,627.36***	-11.10%
	(543.82)	(0.37%)	(215.43)	(0.52%)
p90	-16,806.22***	-4.39%	-11,737.02***	-8.51%
	(1,789.28)	(0.47%)	(911.11)	(0.66%)
p95	-19,133.02***	-3.25%	-14,987.92***	-5.96%
	(3,347.17)	(0.57%)	(1,820.79)	(0.72%)
p99	-35,774.88*	-2.62%	-27,796.87***	-3.76%
	(13,159.45)	(0.96%)	(7,537.95)	(1.02%)

Notes: Each cell provides an estimate of the main effect for each percentile. Percentage effects are presented next to each coefficient estimate. Heteroskedasticity-robust standard errors are provided in parentheses. All estimates are conditional on non-sudden deaths having at least one previous hospital admission related to cause of death. Regressions include 243,252 observations. Given the large number of observations we employ in the analysis, we lower the conventional thresholds for statistical significance by dividing them by ten. *Significant at the 1% level, **significant at the 0.5% level, ***significant at the 0.1% level.

5.4 Quantile regression

As shown in Table 1, the dependent variable exhibits a high degree of skewness. It is thus relevant to examine whether the effect of interest differs across the distribution since individuals at the mean might not be very representative of individuals at the top. Kopczuk (2007) solved this issue by assuming that wealth follows a log-normal distribution and that, after applying the log transformation, the effect is the same at all percentiles of the distribution. In that scenario, the average effect is representative of the effect across the full distribution.[28] However, Kopczuk (2007) could not test the log-normality assumption since he only observed individuals above the minimum estate tax threshold in the US, which effectively means that he only observed the very top of the wealth distribution. Since we observe the entire distribution, we can test whether absolute and relative effects differ across percentiles of the dependent variable. If relative effects at different points of the distribution are not significantly different from each other, it can be argued that the assumption of log-normality by Kopczuk (2007) is reasonable.

28 Angrist and Pischke (2009) show that using a symmetrically distributed dependent variable and homoskedastic errors, the estimated effects will be the same at any point of the distribution of the dependent variable.

Table 7 shows that, for both net worth and net financial wealth, significant effects are estimated along the upper half of the distribution.[29] In both cases, absolute effects increase as we move up the distribution, while relative effects decrease. Focusing on the relative effects, we find that, at the 99% level of confidence, the effects at the top of the distribution are differ significantly from those at the median and at the 75th percentile. This implies that effects estimated using OLS are not fully representative of what happens around the median, since they are slightly reduced by the smaller effects at the top of the distribution. Since Kopczuk (2007) reported only average relative effects, the results in Table 7 indicate that his results are not fully representative of the full distribution. This implies that he would most likely have estimated larger effects had he been able to run median regressions.

It is not completely straightforward to reconcile the effects in Table 7 with the estate planning interpretation. If, given a bequest motive for saving, estate planning is triggered mostly by the motivation to avoid taxes, it makes sense that individuals at the top of the distribution show smaller relative effects, even when absolute effects are larger for them. That is because the Dutch estate tax schedule limits the amount of yearly tax exemptions for inter-vivos transfers, thus not allowing the very rich to avoid most of their tax obligation. Furthermore, it may be that individuals at the top of the distribution find other ways within the law to avoid paying taxes, so that transfers related to estate planning become relatively less important for them.

5.5 Children variables

A very interesting feature of our data is that it allows matching all individuals in our sample with information on their children. These data would allow conducting a study from the point of view of the children, to see what happens to their wealth when parents are terminally ill and engage in estate planning. This would also open the door to the possibility of distinguishing between different types of bequest motive, *i.e.* egoistic, altruistic, and strategic bequests.[30] Although this is a very interesting endeavor, it would require a different methodological set-up from that in our study. Therefore, we leave this approach for future work and focus here on introducing children variables in Equation (1) as control and interaction variables.

When introducing children variables in our analysis (*i.e.* number of children outside of the household, average permanent income of children, and average age

29 As shown in Table 1, individuals below the median have very little or no wealth. Therefore, results for that section of the distribution are not provided here.

30 See Suari-Andreu *et al.* (2019) for an explanation of the different types of bequest motive, as well as for a review of the literature on each of these.

of children), the change in the coefficients reported in Tables 4 and 5 is negligible. That is what we would expect since, even though the presence, income and age of children do have an effect on wealth at death, there is no reason to expect that these variables would correlate with the incidence of sudden deaths. In fact, Table 2 shows that the average number of children of individuals who suffer a sudden death and individuals who do not is virtually the same. When we interact *NSi* with the presence of children outside of the household, we find strong and highly significant effects for both individuals with and without children outside of the household. However, the effects for these two groups do not significantly differ from each other.[31]

These results are in line with most relevant contributions in the literature on bequests (*i.e.* Hurd, 1989; Kopczuk and Lupton, 2007; and Lockwood, 2012). Both Hurd (1989) and Lockwood (2012) find very weak evidence of a bequest motive when estimating it based on the assumption that individuals without children do not have a bequest motive. In addition, both Lockwood (2012), using the Health and Retirement Study (HRS) for the US, and Suari-Andreu *et al.* (2019), using the Dutch National Bank Household Survey, show that over 50% of individuals without children report that they find it at least somewhat important to leave a bequest.[32] In line with these results, Hurd and Smith (2002) use the HRS exit interviews and find that the wealth of single individuals without children is mostly bequeathed to siblings (39%) and other relatives (45%), followed by friends (10%) and charity (6%).[33]

In our dataset, 30.03% of single individuals and 16.49% of married individuals die without children. Following the above-mentioned literature, it is reasonable to assume that these individuals might also have a bequest motive (towards family members and/or non-family members) and thus engage in estate planning. Therefore, it is not possible to draw strong conclusions from this part of our analysis. Nevertheless, the availability of intergenerational data opens the possibility for future studies to analyze changes in children's wealth in response to a shock that may trigger intergenerational transfers. The main hurdle is then to identify in the data the exact moment when these shocks that trigger intergenerational transfers occur.

31 The results for the presence-of-children interactions are not provided here, but they are available upon request.

32 Both studies find that individuals with children are more likely to report that they consider it important to save for a bequest. However, the share of individuals without children that consider it important to save for a bequest is certainly non-negligible as it is in both cases above 50%.

33 Hurd and Smith (2002) report as well that single individuals with children bequeath 92% of their wealth to their children. In addition, they report that married individuals bequeath 80% of their wealth to the surviving spouse. The latter result is in line with what we report in Table 5, which shows no effect for individuals who die within a couple.

6. Conclusion

In our study we provide evidence on estate planning and bequests. To do so, we use a comprehensive administrative dataset, including all deaths that occurred in the Netherlands between 2006 and 2013, and regress wealth at time of death on a dummy that indicates sudden deaths while controlling for gender, age, marital status, household structure, permanent income, and children characteristics. We find that individuals who do not suffer a sudden death die with less wealth compared to individuals who suffer a sudden death. The baseline effects are significant at the 0.5% level for singles and at the 0.1% level for couples. They range from -4.54% for the net worth of couples to -11.63% for the net financial wealth of singles. When controlling for the possibility of income shocks explaining our results, we find that the effect for couples becomes insignificant, while the effect for singles stays strong and significant. In addition, we find that the effect is somewhat stronger at older ages, and that it is especially strong when we focus on singles who die of cancer.

Following Kopczuk (2007), we interpret these results as capturing estate planning in the expectation of an imminent death. As we explain in Section 2, the richness of our data, as well as several characteristics of the Dutch context described in Garcia-Gomez et *et al*. (2013), Bakx *et al*. (2016), and van Ooijen *et al*. (2018), imply that our results are not likely explained by differential income shocks and or differential consumption patterns between individuals who suffer a sudden death and individuals who do not. In addition, our results are in line with van Ooijen *et al*. (2018) who, using Dutch survey data, find that health shocks at an advanced age lead to higher expenditures on gifts. The fact that we only find strong and significant effects for singles and when using net financial wealth as a dependent variable points in the direction that we are indeed capturing estate planning type of behavior.[34] Therefore, the richness of our data and the context of our study represent a considerable advantage compared to Kopczuk (2007) and provide additional credibility to his strategy for capturing estate planning.

The strategy we pursue in this paper allows us to identify a bequest motive for saving insofar as this motive triggers the transfers that we observe. Compared to structural modeling, the main advantage of this strategy is that precautionary motives do not play a confounding factor, and thus no additional assumptions are needed to distinguish them from the bequest motive. However, the main shortcoming is that,

34 That is because married individuals are likely to have a bequest motive towards their partner, which we do not capture since we observe wealth at the household level.

even though we claim that estate planning reflects a bequest motive for saving, we cannot say with certainty what the initial main motive was for the accumulation of the wealth that ends up being transferred. It can be that individuals save initially for precautionary reasons with a bequest motive as a secondary priority, and that once they become terminally ill the bequest then becomes the main priority.

Taking into account the above-mentioned caveat, we argue that our results imply that the bequest parameter as usually modelled in the life-cycle model (*e.g.* see De Nardi and Yang, 2014; and Lockwood, 2018) is positive. This implies that individuals derive utility from dying with positive wealth. If this argument holds, this positive bequest parameter will have non-negligible influence on individuals' consumption and saving decisions throughout life. Nevertheless, it may also be that health shocks shift preferences towards using accumulated wealth as a bequest, and thus we observe inter-vivos transfers made in the anticipation of a near death. Even though we cannot fully distinguish between these two interpretations for our results, we argue that in both cases they reflect aspects of individuals' preference towards their savings that are relevant for pension and long-term care policies.

If pension wealth changes, the reaction of individuals in terms of their saving might be different depending on whether their priority is saving for future consumption, for self-insurance, or for intergenerational transfers. Our results thus indicate that the literature on the displacement effect of pension wealth should take the bequest motive into account. In addition, our results, combined with those by van Ooijen *et al.* (2018), suggest that the priorities of older individuals lean more towards intergenerational transfers rather than towards own consumption.[35] This priority might be intensified for individuals who suffer a terminal illness.[36] Information on the spending priorities of older individuals is a crucial input for determining pension adequacy to the consumption needs of retirees.

As to long-term care policies, our result suggests that, should publicly provided long-term care becomes less generous, this might generate a conflict between an individual's preference to leave a bequest and the necessity of covering out-of-pocket medical expenditures. Therefore, in line with the argumentation by Lockwood (2012, 2018), in such a scenario the welfare of individuals would improve if they can

35 As explained in Section 2, van Ooijen *et al.* (2018) find that the onset of a chronic illness reduces consumption by close to 7%. In addition, they find that health shocks increase expenditures on gifts.

36 A terminal illness is a condition in which setting money aside for future health shocks becomes less important due to poor health condition and reduced life expectancy. Therefore, in such a situation the trade-off may be only between using wealth either for own expenditure or for gifts and/or bequests.

purchase actuarially fair long-term care insurance products that allow them to set part of their wealth aside for a potential bequest. In that sense, financial products that combine annuities with long-term care insurance might become important in allowing individuals to best adapt their wealth to their personal preferences. That is because such products provide insurance against both longevity risk and medical risk, while ideally leaving enough leeway to set aside the amount of wealth that one wishes to bequeath.[37]

Even though our study contributes to the line of research initiated by Kopczuk (2007) and complements the literature that focuses on identifying bequests using structural models (*i.e.* Kopczuk and Lupton, 2007; and Lockwood, 2012, 2018), there are still several venues for improvement through future research. For instance, linking administrative and survey data would allow for a better distinction between the estate planning interpretation of the results, and the other interpretation referring to differential consumption patterns and income loss. In addition, variation in estate tax rates can be used in the future to identify whether and to what extent, given a bequest motive, estate planning is triggered by the aim of avoiding estate taxes. This strategy may help to better capture not only the presence of a bequest motive, but also its intensity. That could be done by investigating to what extent individuals exploit the possibilities for exemption that tax regulations provide. Finally, shifting the focus from parents to children might allow identifying how children's wealth is affected by shocks to their parent's health, and to possibly distinguish between different types of bequest motive.

37 The possibility of combining annuities with long-term care insurance products has been widely studied, see *e.g.* Davidoff (2009). He argues that it might be optimal to combine these two products to counteract the adverse selection problems individuals are often confronted with. Allowing access to long-term care insurance in such way may help individuals to satisfy their preference to leave a bequest, which they would otherwise have to spend on medical care in case of poor health.

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Appendices

A. Variable definitions and summary statistics

Table A1 *Variable definitions*

Variable	Definition
Net worth	Total assets minus total liabilities at the household level. Measured as of December 31 of the year prior to death.
Net financial wealth	Sum of deposits, savings accounts, stocks and bonds, minus non-mortgage debt at the household level. Measured as of December 31 of the year prior to death.
Sudden death	Dummy variable indicating unexpected deaths that occur instantaneously or within a few hours of an abrupt change in a person's clinical state. Operationalized using the ICD-10 categories for myocardial infarction, cardiac arrest, congestive heart failure, stroke, sudden death from unknown causes, transport accidents, and death caused by other accidents and violence. Individuals with one or more hospital admissions due to cardiovascular disease are excluded from the sudden death category if their death resulted from one of the cardiovascular causes mentioned here.
Marital status	Marital status of single decedents. 1: Never married; 2: Divorced or separated; 3: Widowed.
Household structure	Demographic structure of the household. 1: One-person household; 2: Single parent; 3: Couple without children; 4: Couple with children; 5: Multiperson household; 6: Institutionalized household.
Age	1: age<70; 2: 70≤age<85; 3: age≥85.
Permanent income	If the main source of income in the year prior to death is not pension income: average of yearly equivalized household income between 2003 and the year prior to death. If the main source of income the the year prior to death is pension income: equivalized household income in the year prior to death. Income is equivalized by diving it by the square root of the number of members in the household.
Delay	Measure in days of the delay between wealth measurement and time of death. Wealth measurement corresponds to December 31 of the year prior to death.
Children outside	Presence of children outside the household.
Avg. age of children	Average age of the children of the decedent.
Avg. permanent income of children	Average permanent income of the children of the decedent. Permanent income is computed using the same method as for the permanent income of the decedent.

Notes: ICD-10 stands for the International Statistical Classification of Diseases and Related Health Problems assembled by the World Health Organization.

Table A2 *Summary statistics – singles*

Variable	Mean	Median	Std. Dev.	Min.	Max.
Net worth	139,193.80	22,073	487,880.70	-2.06e+07	6.69e+07
Net financial wealth	64,047.77	15,759	361,415.90	-2.06e+07	6.59e+07
Sudden death	0.16	–	–	–	–
Female	0.52	–	–	–	–
Marital status					
– Never married	0.48	–	–	–	–
– Divorced or separated	0.15	–	–	–	–
– Widowed	0.35	–	–	–	–
Household structure					
– One person household	0.58	–	–	–	–
– Single parent	0.05	–	–	–	–
– Multiperson household	0.06	–	–	–	–
– Institutionalized household	0.31	–	–	–	–
Age					
<70	0.13	–	–	–	–
70-85	0.24	–	–	–	–
>85	0.63	–	–	–	–
Permanent income	18,364.87	16,100	9,573.88	-353,553.40	670,258.80
Retired	0.81	–	–	–	–
Delay	177.63	174	107.72	0	365
Presence of children outside	0.71	–	–	–	–
Avg. age of children	52.10	53.50	10.18	0	89
Avg. permanent income of children	23,802.62	22,074.25	10,669.25	-139,308.30	766,374.40

Note: All summary statistics are based on the number of observations in the singles regressions of Panel (a) in Table 4, *i.e.* 588,818.

Table A3 *Summary statistics – couples*

Variable	Mean	Median	Std. Dev.	Min	Max.
Net worth	247,456.60	100,122	847,030.50	-1.42e+07	2.58e+08
Net financial wealth	94,809.91	24,821	701,322.9	-6.96e+07	2.53e+08
Sudden death	0.11	–	–	–	–
Female	0.33	–	–	–	–
Household structure					
– Couple without kids	0.79	-	-	-	-
– Couple with kids	0.09	-	-	-	-
– Multiperson household	0.03	-	-	-	-
– Institutionalized household	0.07	-	-	-	-
Age					
<70	0.35	-	-	-	-
70–85	0.50	-	-	-	-
>85	0.15	-	-	-	-
Permanent income	20,523.30	17,937.18	11,046.35	-353,553.40	707,106.80
Retired	0.74	–	–	–	–
Delay	181.09	179	107.31	0	365
Presence of children outside	0.84	–	–	–	–
Avg. age of children	44.23	45	9.21	0	86
Avg. permanent income of children	23,109.44	21,593.64	9,744.10	-183,785.50	506,818

Note: All summary statistics are based on the number of observations in the couples regressions of Panel (a) in Table 4, *i.e.* 433,202.

B. Cause of death classification

Table B1 *Cause of death categories ICD-10*

Category	Frequency	Percentage
Infectious diseases	17,133	1.60%
Neoplasms	338,811	31.57%
Blood diseases	3,608	0.34%
Endocrine, nutritional, and metabolic diseases	30,453	2.84%
Mental and behavioural disorders	61,544	5.73%
Diseases of the nervous system	37,382	3.48%
Diseases of the ear and mastoid process	123	0.01%
Diseases of the circulatory system	313,222	29.18%
Diseases of the respiratory system	107,154	9.98%
Diseases of the digestive system	41,170	3.84%
Diseases of the skin	2,888	0.27%
Diseases of the musculoskeletal system	6,909	0.64%
Diseases of the genito-urinary system	26,194	2.44%
Pregnancy, childbirth, and puerperium	57	0.01%
Conditions originating in the perinatal period	3	0.00%
Congenital malformations	1,703	0.16%
Ill-defined conditions	41,942	3.91%
External causes of morbidity and mortality	42,986	4.01%
Total	**1,073,282**	**100%**

Notes: Causes of death are classified according to the ICD-10. For further information, see WHO (2016).

Table B2 *Sudden death categories ICD-10*

Category	Frequency	Percentage
Acute myocardial infarction	34,578	24.41%
Cardiac arrest	13,520	9.54%
Congestive heart failure	23,533	16.61%
Stroke	38,729	27.34%
Transport accidents	4,670	3.30%
Other accidents and violence	23,468	16.57%
Sudden deaths from unknown causes	3,157	2.23%
Total	**141,655**	**100%**

Note: Causes of death are classified according to the ICD-10. For further information, see WHO (2016).

Table B3 *Cancer deaths by type of cancer ICD-10*

Category	Frequency	Percentage
Lung	79,836	23.56%
Colon	30,501	9.00%
Breast	25,897	7.64%
Prostate	19,814	5.85%
Pancreas	18,992	5.61%
Oesophagus	12,652	3.73%
Stomach	11,278	3.33%
Other	139,841	41.27%
Total	**338,811**	**100%**

Note: Causes of death are classified according to the ICD-10. For further information, see WHO (2016).

C. Full regression results

Table C1 *Full results: baseline*

	Net worth		Net financial wealth	
	Singles (1)	Couples (2)	Singles (3)	Couples (4)
Non-sudden death	-7.64*** (1.64)	-11.37** (3.64)	-4.45*** (1.28)	-7.80* (3.18)
Female	11.41*** (2.00)	11.48*** (2.42)	16.33*** (1.85)	12.67*** (1.99)
Divorced	-40.55*** (2.11)		-12.81*** (1.72)	
Widowed	-3.72 (1.51)		-13.54*** (1.33)	
Single parent	-1.56 (5.43)		-23.73*** (4.99)	
Couple with kids		-28.15 (20.23)		-44.33*** (12.51)
Multiperson household	18.60 (9.76)	-68.57 (44.66)	4.61 (6.62)	-75.55*** (13.42)
Institutionalized household	-11.85*** (2.82)	-2.10 (8.91)	26.38*** (2.71)	33.99*** (7.41)
Age2	110.96*** (35.68)	153.92*** (5.80)	64.17*** (2.75)	106.78*** (5.31)
Age3	116.60*** (40.07)	170.44*** (5.21)	71.74*** (30.89)	136.59*** (4.34)
Permanent income	22.18*** (1.08)	29.42*** (1.57)	16.32*** (1.10)	21.34*** (1.51)
Retired	-193.22*** (5.20)	-172.36*** (8.30)	-122.38*** (3.59)	-91.74*** (6.51)
Delay	-5.45 (5.38)	-21.88 (13.10)	-2.66 (4.00)	-16.07 (11.47)
R^2	0.23	0.16	0.20	0.12
Observations	588,818	433,202	588,818	433,202

Notes: Heteroskedasticity-robust standard errors are provided in parentheses. All coefficients are given in thousands of euros except for *permanent income* and *delay*. The category *one-person household* is used as a reference category for the household structure of single households, while the category *couple without kids* is used for married households. All regressions include dummy variables indicating year of death. Given the large number of observations we employ in the analysis, we lower the conventional thresholds for statistical significance by dividing them by ten. *Significant at the 1% level, **significant at the 0.5% level, ***significant at the 0.1% level.

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This is a publication of:
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Phone +31 13 466 2109
E-mail info@netspar.nl
www.netspar.nl

April 2019