

The Retirement-Savings Puzzle Revisited

The Role of Housing as a Bequeathable Asset

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The Retirement-Savings Puzzle Revisited: The Role of Housing as a Bequeathable Asset

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Abstract

The so-called retirement-savings puzzle is a phenomenon by which, contrary to what the basic life-cycle model predicts, households do not run down their wealth significantly during retirement. In this survey paper we briefly review the literature that attempts to solve the retirement-savings puzzle and, in addition, we review more extensively the literature on housing equity during retirement. To establish a link between the two streams of literature, we use as a framework the work of Nakajima and Telyukova (2011), who find that homeownership interacts with the factors that explain the retirement-savings puzzle, notably with the bequest motive. Additionally, we complement the results by Nakajima and Telyukova (2011) relating them to the literature on altruistic bequests, strategic bequests and housing as a commitment device, all of which give insights on the connection between homeownership and bequests. We complement the review of the literature with descriptive evidence using Dutch data, which in general suggests that the insights stemming from the literature are relevant to understand the Dutch reality.

JEL Classification: D1, D9, D14, D91.

Keywords: Savings, retirement, housing, bequest motive, altruistic bequests, strategic bequests, commitment.

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1 Introduction

The stripped-down version of the life-cycle model (without uncertainty and without bequest motive) predicts that households accumulate wealth throughout working life and they decumulate it during retirement to support consumption when income is low (Ando and Modigliani, 1963). However, there is a large body of evidence pointing at the fact that older adults usually decumulate wealth at a slower pace than predicted by the basic life-cycle model (Poterba *et al.*, 2011). This phenomenon is known as the retirement-savings puzzle (RSP). In the present context of economic crisis and population ageing, the sustainability of public pension systems is under pressure. Thereby, it is relevant to study the underlying motives behind the RSP, since it is a key element to understand whether individuals are financially prepared to face a decrease in the generosity of pension systems. In the present survey paper, we review the literature on the RSP and focus specially on highlighting the role of housing as a bequeathable asset, which, we argue, is a potential key driver of the RSP.

This survey paper starts out by briefly reviewing the general literature on the RSP, which can be classified according to the explanation given for the puzzle. We distinguish three main explanations: lifetime uncertainty, bequest motive and uncertainty regarding medical expenditures. Even though the evidence on the motives we discuss is rather mixed, depending on the context, and after controlling for the relevant factors, they all appear as relevant enough to be considered as meaningful additions to the basic life-cycle model. In parallel to the RSP literature, there is a stream of literature that studies the evolution of housing equity during retirement (HER). Since housing equity is usually a very important component in households portfolios, we pay special attention to this literature by reviewing it more in depth. The general conclusion of the HER literature is that homeowners are in most cases reluctant to draw down their housing equity during retirement. However, most studies conducted so far are rather descriptive and the link with the RSP literature is generally missing. Therefore, the present paper aims at emphasizing the connection between these two streams of the literature.

The RSP literature and the HER literature come together in the recent work by Nakajima and Telyukova (2011), who introduce a model of retirement savings with housing. The model constitutes an extension to the previous work by De Nardi *et al.* (2010), who consider a model for single retirees which includes lifetime uncertainty, bequests and uncertain medical expenditures. The addition by Nakajima and Telyukova (NT) consists of extending the model to couples and analysing the housing asset separate from the rest of the assets in the portfolio, which turns out to have crucial consequences for the understanding of the RSP. The main conclusion of their work is that homeownership interacts with factors that explain the RSP, notably with the bequest motive. We review in depth the NT model and, furthermore, we complement it with additional literature that contributes towards the understanding of the link between homeownership, bequests and the RSP. The extensions that we consider are altruistic bequests, strategic bequests, and housing as a commitment device.

We complement our review of the literature with descriptive evidence for the Netherlands.

To that end, we rely on data from the Dutch National Bank Household Survey (DHS), which is an internet based panel survey that collects data on economic, financial and psychological aspects of household behaviour. It provides data for around two thousand Dutch households every year between 1993 and 2013. We mostly use the last ten waves, which provide a recent and large enough sample for our purposes. Households without a computer and/or access to internet are provided with a basic computer and internet connection to complete the survey, and attrition is dealt with by biannually refreshing the sample with new households to keep the panel representative of the Dutch population. The evidence that we provide mostly supports the idea that, in the Netherlands, the role of housing as a bequeathable asset is potentially an important factor to understand the underlying causes of the RSP.

The paper is structured as follows: Section 2 reviews the RSP literature which we classify according to the explanation given for the puzzle; Section 3 reviews the HER literature which we classify according to the origin of the data, *i.e.* US studies, international studies and Dutch studies; Section 4 summarizes the NT model; Section 5 complements the NT model by reviewing the literature on alternative bequest motives, *i.e.* altruistic bequests and strategic bequests; Section 6 complements the NT model by reviewing the literature on housing as a commitment device; and Section 7 and 8 close the paper with a short conclusion and policy recommendations.

2 The Retirement-Savings Puzzle

The literature on the RSP shows that, in general, households do not decline their wealth during retirement in the way the basic life-cycle model suggests. Additionally, it attempts to determine the reasons behind this phenomenon. Poterba *et al.* (2011) and Van Ooijen *et al.* (2015) provide thorough reviews of this literature. In the present paper we limit ourselves to a brief summary, which we use as a stepping stone for the rest of the paper.

Most of the literature on the RSP can be classified into three branches according to the explanation given as a key to solve puzzle. First, there is a branch of the literature, initiated by Yaari (1965), which investigates the role of lifetime uncertainty as an explanation for the RSP. Recent contributions to this literature are De Nardi *et al.* (2009), Cocco and Gomes (2012) and Post and Hanewald (2013). A life-cycle model without lifetime uncertainty implies that households are perfectly aware of their time of death. Therefore, they can plan with full accuracy to gradually draw down their wealth and deplete it completely just before they die. With lifetime uncertainty in the model households do not have full certainty about their time of death, and thus they generate an expectation about it. If households die earlier than expected, their wealth will not be totally depleted and involuntary bequests will result. On the other hand, the risk of outliving their net worth induces households to deplete their wealth more slowly compared to the case without lifetime uncertainty.

Second, there is a branch of the literature, initiated by Becker (1974), Bernheim *et al.* (1985) and Hurd (1989), which explores the role of voluntary bequests as an explanation for the RSP. More recent contributions are Laitner (2002), Kopczuk and Lupton (2007) and De Nardi

and Yang (2014). In the basic life-cycle model, households aim at dying with zero wealth. Introducing a bequest motive implies that they derive utility from dying with positive net worth, which flattens the wealth trajectory during retirement. Kopczuk and Lupton (2007) classify the literature according to three different types of bequest motive: the *egoistic* motive (Hurd, 1989; De Nardi and Yang, 2014), in which households leave a bequest simply to increase their own utility; the *altruistic* motive (Becker, 1974; Laitner, 2002), in which the utility of the recipient plays a role in determining the bequest; and the *strategic* motive (Bernheim *et al.*, 1985; Perozek, 1998), in which, besides being altruistic, older adults use the bequest to strategically influence the quantity of services provided to them by the recipients. In addition to intentional bequests, there is a related branch of the literature that focuses on inter-vivos transfers (*e.g.* Cox, 1987; Hochguertel and Ohlsson, 2009; and Alessie *et al.*, 2010), which are expected to have an effect on the saving behaviour of older adults similar to the bequest motive.

Third, there is a more recent branch of the literature (*e.g.* Palumbo, 1999; Coile and Milligan, 2009; De Nardi *et al.*, 2010; and Dobrescu, 2015) that considers the role of uncertain out of pocket medical expenditures (OPME), *i.e.* non-insured medical expenses, as an explanation for the RSP. The basic life-cycle model does not include health as a determinant of saving and consumption. The introduction of the health status allows for considering the role of uncertainty regarding OPME. The basic idea is that, depending on age, health status and a stochastic term, households face a risk of incurring medical expenditures in the future. If they are not able to fully insure against this risk, they will engage in precautionary saving and, as a result, they will retain a buffer-stock of savings that will flatten the wealth trajectory during retirement.

Even though the empirical evidence on the different explanations discussed in this section is rather mixed, depending on the context, and after controlling for the relevant factors, they all appear as relevant enough to be considered as meaningful additions to the basic life-cycle model. However, note that the different explanations need not be incompatible. It can well be that households rank them according to their preferences. In this case, the unfolding of exogenous events will crucially determine which purpose is eventually given to the savings of a retired household.

3 Home Equity in Retirement

Parallel to the RSP literature on the RSP, there is a stream of literature that studies the evolution of housing equity during retirement (HER). Housing is an asset that deserves special attention due to its dual role as consumption and investment good, and due to its associated transaction costs which make adjustments rather infrequent. Furthermore, it is very often the most important asset in household portfolios. This is the case in the Netherlands, where in the last decades there has been an important increase in homeownership, which appears to remain high as households enter retirement.¹ Table 1 shows that, according to DHS data, among three

¹According to OECD and Eurostat, the homeownership rate in the Netherlands increased by around twenty percentage points between 1990 and 2010, from 47.5% to 67.2%. This is the largest increase among OECD

cohorts of Dutch households above 60 years of age, homeownership and the ratio of housing equity over total net worth are rather high and have not significantly changed between 2009 and 2013. Furthermore, Table 1 suggests that there are relevant cohort effects indicating that younger generations gradually rely more on housing in their portfolios.

Table 1 Homeownership and Housing Wealth among Older Adults

	Homeownership rate			Housing equity over net worth		
	Cohort 1	Cohort 2	Cohort 3	Cohort 1	Cohort 2	Cohort 3
2009	59.36%	51.11%	49.07%	39.14%	36.86%	34.13%
2010	62.71%	52.50%	50.22%	43.48%	38.12%	36.70%
2011	60.12%	49.89%	49.60%	41.81%	37.74%	36.02%
2012	61.56%	53.29%	53.02%	40.50%	36.39%	35.22%
2013	60.39%	53.53%	51.94%	40.65%	37.96%	35.81%

Source: DHS. *Notes:* Cohorts 1, 2 and 3 include households with household heads aged 60 to 64, 65 to 69 and 70 to 74 in 2009. The second panel provides the average share of housing equity (*i.e.* house value minus remaining mortgage debt) over total net worth (assets minus liabilities) of households.

In general, the HER literature aims at answering the question of whether retirees regard housing equity as a source of funds for general consumption. According to Venti and Wise (2004), answering this question is important for two reasons. First, it can help assess the potential demand for releasing the wealth locked in illiquid housing, which has implications for the development of financial products such as reverse mortgages; and, second, it contributes to understanding the adequacy of saving for retirement. If financial wealth and housing wealth are used interchangeably to finance consumption, then the latter might as well be given the same treatment as financial wealth when evaluating whether households save enough for retirement.

3.1 US Studies

One of the first to tackle the question of whether retirees use housing equity to fund general consumption were Venti and Wise (1990), who using the Retirement History Survey (RHS) find that on average older adults who move do not downsize their housing equity. They conclude that older adults are in general not willing to use housing equity for consumption. On the contrary, Sheiner and Weil (1992) find, using the Panel Study of Income Dynamics (PSID), that average levels of homeownership among the older adults decline significantly with age and conclude that housing wealth is used for consumption. However, even though the results are statistically significant, their economic significance is questionable since the observed decline in homeownership is rather small. Hurd (2002) confirms, by exploiting a panel data set derived from the Asset and Health Dynamics among the Oldest Old (AHEAD), a modest decline in housing wealth and homeownership rates among older adults. In addition, he points out that

countries during this period.

households experiencing a health shock or a widowhood event display larger declines in housing equity and are more likely to terminate homeownership

Following on the work by Hurd (2002), Venti and Wise (2004) perform a comprehensive analysis of the evolution of housing equity during retirement, paying special attention to the effect of precipitating events, *i.e.* widowhood and nursing home entry. They combine the Health and Retirement Study (HRS) with the AHEAD survey and consider two ways by which homeowners can change their housing equity: by discontinuing homeownership or by selling and moving to a newly purchased residence. By means of cohort specific analysis, they find that households who experience a widowhood event or nursing home entry display considerable declines in homeownership and in housing equity; while for households who do not experience any of these events housing equity remains almost intact throughout retirement. Overall, they find that older adults are rather unlikely to move or to terminate homeownership.² They conclude that housing equity is generally not used for consumption, which has two implications: first, the demand for reverse mortgages is low, and, second, housing wealth should not be counted when assessing retirement savings, since it is not interchangeable with financial wealth. Instead, it might be suited to think of housing equity as a consumption good that, at the same time, provides a preventive buffer for adverse shocks.

In contrast to Venti and Wise (2004), Sinai and Souleles (2007) study the evolution of housing equity in retirement but do not consider homeowners that move. Instead, they look at homeowners that stay in the same residence and study how they react to the remarkable increase in house prices experienced in the US market between 1983 and 2004. Using the Survey of Consumer Finances (SCF), which provides repeated cross sections over time, they report that households, specially the youngest among the older adults, have offset the rise in housing equity by increasing their housing debt through housing equity loans. However, they point out that the offset effect is rather small and that it could be larger were there less restrictions to borrow against housing wealth. Contrary to Venti and Wise (2004), Sinai and Souleles conclude that households are potentially willing to liquidate housing wealth to finance consumption. Therefore, only the share housing wealth that cannot be borrowed against should be considered as not interchangeable with financial wealth.

3.2 International Studies

Moving away from only US based studies, Banks *et al.* (2012) compare downsizing among retirees in Britain and in the US. Their work is similar to Venti and Wise (2004) in the sense that they analyse downsizing by focusing on households that move to a new location. The analysis is based on data from PSID for the US, and on data from the British Household Panel Survey (BHPS) for Britain. They find that, upon moving, British older adults downsize more than Americans. However, the percentage of older households that actually move is much higher in

²Venti and Wise (2004) do find a very slight decrease in the housing equity among the oldest households (75+) that do not experience any precipitating event. However, they attribute it to depreciation of the housing asset, which can actually be considered as a form of housing equity withdrawal.

the US. As a consequence, considering the whole population above retirement age, there is more downsizing in the US than in Britain even though in both countries the vast majority of older households do not actually move. These comparative results hold when controlling for marital status, family size and employment transitions. Additionally, Banks *et al.* focus on studying the factors that explain the difference in mobility. They conclude that it is a mix of geographical – in the US there is more climate diversity and variation in environmental amenities – and institutional factors – in Britain there are more transaction costs due to taxation of home sales – that explain the higher share of moving households in the US. These results suggest that, in Europe in general, moving house during retirement might be even less popular than in the US due to higher institutional restrictions and less within country variation in tax regimes and in geographical amenities.

In some of the very few fully international studies, Chiuri and Jappelli (2010) use data on 15 OECD countries, while Angelini *et al.* (2014), in the only Europe-wide study so far, use data on 13 European countries. The former employ data from different country specific surveys which allow them to construct a dataset of repeated cross-sections over time. They look at the cross-sectional relationship between homeownership and age, and find that homeownership rates decline considerably after age 60. However, after controlling for cohort effects, the decline becomes much more moderate and it does not start until after age 75. In addition, they find that cross-country variation in terms of institutions, such as tax regimes and mortgage market regulations, have an impact on the degree to which housing wealth is withdrawn during retirement. On the other hand, Angelini *et al.* (2014) use life history data from the Survey of Health, Ageing and Retirement in Europe (SHARE) and, similarly to Venti and Wise (2004) and Banks *et al.* (2012), study the behaviour of homeowners and renters that move. Even though they assert that moves are rare all over Europe, they very likely to happen when there is a precipitating event, *i.e.* divorce, widowhood and nest-leaving by children. In addition, they also find that economic reasons can play a role, since, after controlling for country characteristics and family transitions, retirees that are cash-poor and house-rich are the most likely to downsize their housing asset.

3.3 Dutch Studies

Narrowing the focus to the Dutch case, Van der Schors *et al.* (2007) employ data from the Dutch Social Economic Panel (SEP) for the period 1990-2002 and find a strong negative cross-sectional relation between age and homeownership among Dutch households. However, a detailed analysis indicates that this age gradient is mostly due to cohort effects. They find that higher life time income due to long-term productivity growth is the main factor explaining generational effects in homeownership among older adults. In addition, they find that changes in the supply of housing and relaxation of the requirements to obtain a mortgage also play a role in explaining why younger generations of older adults display higher homeownership rates. This evidence has been recently confirmed by Van Ooijen *et al.* (2015) who describe the saving behaviour and the portfolio choice of Dutch retirees by exploiting high quality administrative data for the period

2005-2010. Like Van der Schors *et al.* (2007), they find strong differences between cohorts, however, both homeownership rates and the amount of housing equity held by older households do not appear to decline significantly with age.

In a different study, De Graaf and Rouwendal (2012) investigate whether older Dutch households liquidate housing wealth by means of second mortgages. Using data from the Dwelling Research Netherlands (WoON) survey for the period 1985-2009 they find that older adults, although many times their mortgage is still not completely redeemed, do not increase their mortgage debt, not even when house prices were increasing at considerably high rates. They conclude that the vast majority of older homeowners do not use mortgage debt to decumulate housing equity. Their result is specially compelling when taking into account that a second mortgage could represent an appealing way to liquidate housing equity given the tax deductability of interest payments present in the Netherlands. More recently, Dillingh *et al.* (2015), investigate a similar issue by conducting a survey on the psychological and economic aspects of reverse mortgage attitudes of homeowners in the Netherlands. They explain to the respondents what a reverse mortgage is and then they ask to what extent they would be interested in such a product. Even though they are optimistic about a potential demand for reverse mortgages, only 6% of respondents show a clear interest, while 21% show moderate interest. However, given the evidence in De Graaf and Rouwendal (2012) about second mortgages, it is not clear to what

Table 2 Housing Moves among Older Adults (2003-2013)

Total older households interviewed	1043	
Registered moves	118	100%
Rent-to-own	8	6.77%
Own-to-rent	24	20.33%
Own-to-own	48	40.67%
Downsize	24	20.33%
Upsize	24	20.33%
Rent-to-rent	38	32.20%

Source: DHS. *Notes:* Older households are defined as households with a household head who is 60 or older. The survey does not capture nursing home entries.

Table 3 Willingness to Use Equity Contained in the Main Residence (2004-2013)

	Certainly yes	Probably yes	Probably not	Definitely not	Do not know	N of obs.
Full sample	2.40%	4.35%	36.14%	54.54%	2.58%	9458
Older households	2.23%	4.37%	32.94%	58.65%	1.80%	3773

Source: DHS. *Notes:* Households are asked: "Are you planning on using the surplus value of your property in the next two years (by taking out an extra mortgage, by increasing your mortgage amount or by moving)? Older households are defined as households with a household head who is 60 or older. The year 2003 is excluded from the sample since the question was not included in that year's wave of the survey.

extent these respondents would actually purchase a second mortgage in practice.

The findings by Van der Schors *et al.* (2007) and Van Ooijen *et al.* (2015) agree with the evidence in Table 1, which shows very clear cohort effects. Table 2 takes the analysis a step further by showing that, according to DHS data, most Dutch older households do not move. Among those who move, less than a half (42%) do it to downsize their housing asset either through own-to-rent or own-to-own transitions. In addition, Table 3 shows that Dutch households are generally not willing to use their housing equity, which could be done by either moving, by taking out an extra mortgage or by increasing the amount of the present mortgage. The results in Table 3 support the findings by De Graaf and Rouwendal (2012), and do not leave much room for optimism regarding the potential demand for reverse mortgages in the Netherlands. The evidence in Tables 1 to 3 is in accordance with the findings by Suari-Andreu (2014), who, using the same DHS dataset employed in the present study, reports that Dutch households of all ages do not compensate house price declines by increasing their stock of savings. This type of behaviour suggests that Dutch households do not plan to tap housing equity during retirement to finance regular consumption.

In summary, even though the evidence provided by the HER literature surveyed in this whole section appears to be somewhat mixed, it comes forth as a general conclusion that older households do not usually withdraw housing equity during retirement. However, the HER literature is mostly descriptive and the link with the RSP literature is rather limited. Therefore, the next step to take is asking why is housing equity not withdrawn. Is it because of lifetime uncertainty? Is it because housing wealth is used as precautionary savings? Or is it because housing is regarded as an asset to be bequeathed? While these questions are crucial for policy and for the understanding of the RSP, the HER literature summarized in this section is generally descriptive and does not tackle them directly. In the next section we introduce a theoretical framework that aims at tackling these questions, and, by doing so, it connects the HER literature with the literature on the RSP discussed in Section 2.

4 A Model of Retirement Savings with Housing

The two streams of literature outlined in Sections 2 and 3 come together in the work by Nakajima and Telyukova (2011), who argue that the RSP cannot be explained without emphasizing the role of the housing asset. Using HRS data, Nakajima and Telyukova (NT) find that the post-retirement evolution of assets shows a very different picture for homeowners compared to renters; while the former do not withdraw their wealth during retirement, the latter do, which suggests that homeownership interacts with factors that explain the RSP. These insights are of clear potential importance for explaining the RSP in the Netherlands, where, as shown by Tables 1 to 3, it is very likely to be driven by the lack of housing equity withdrawal during retirement.

NT are the first to study housing equity in retirement in the context of a structural life-cycle model, similar to the ones employed in the RSP literature. The model constitutes an extension to the previous work by De Nardi *et al.* (2010), who consider a model for single retirees which

includes lifetime uncertainty, bequests and uncertain medical expenditures. The addition by NT consists of extending the model to couples and analysing the housing asset separate from the rest of the portfolio, which turns out to have crucial consequences for the understanding of the RSP. In this section we explain in detail the NT model and the results they obtain when estimating its parameters using HRS data. Furthermore, we propose several extensions to their framework: altruistic bequests, strategic bequests, and housing as a commitment device.

4.1 Utility Function

In the NT model, every household is born as a retiree at age $i = 1$ and potentially lives up to age I . In every period, the household chooses consumption, saving and housing such as to maximize remaining lifetime utility, which is time-additive. The within-period utility function has the form:

$$V(c, h, b, o; s) = s \frac{\left(\frac{1}{\mu_s} c^\eta (\omega_o h)^{1-\eta} \right)^{1-\sigma}}{1-\sigma} + \gamma \frac{(b + \zeta)^{1-\sigma}}{1-\sigma}, \quad (1)$$

where the first term captures the utility derived from consumption and housing, and the second term captures the utility derived from leaving posthumous wealth as a bequest. In the first element, c is (non-housing) consumption, h is consumption of housing services, s is the number of adults in the household, the subscript o is the tenure status, with $o = 1$ indicating owner, and $o = 0$ indicating renter, μ_s is the effective household size, ω_o captures the extra utility from owning a house,³ $0 \leq \eta \leq 1$ is a parameter capturing the relative weight of non-housing consumption versus housing services, and $\sigma \geq 0$ is the coefficient of relative risk aversion. In the second element in (1), b is posthumous wealth, $\gamma \geq 0$ captures the strength of the bequest motive, and $\zeta \geq 0$ is a parameter determining the extent to which bequests are luxury goods.

Regarding the first element in (1), there are two relevant features worth mentioning. The first is that utility is non-separable in consumption and housing, which allows for the marginal utility of consumption to be (positively) dependent on housing, *i.e.* $\partial u(\cdot)/\partial c = f(h, c)$ and $\partial f(h, c)/\partial h > 0$. The intuition is that the quantity of housing services consumed, which is assumed to increase linearly with the size of the house, increases the marginal utility derived from an additional unit of consumption. The second relevant feature refers to the way couples are modelled. NT follow the unitary assumption, implying that both members in a couple have the same utility function and consumption is split equally between the two. However, each member enjoys more than half of the consumption flow because of the returns to scale within couples, captured by the *household size multiplier*, given by $s/\mu_s^{1-\sigma}$.⁴

As indicated by the second element in (1), in addition to the utility derived from consumption and housing, a household gains utility from leaving a bequest once all members in it have died. A bequest is composed by all of the wealth posthumously left behind, which includes the house

³NT set $\omega_0 = 1$, while $\omega_1 > 1$.

⁴NT assume that $\mu_1 = 1$ and $\mu_2 \in \{1, 2\}$, which implies that the household size multiplier for a single is $1/\mu_1^{1-\sigma} = 1$; while for a couple it is $2/\mu_2^{1-\sigma}$, which is equal to 2 if $\mu_2 = 1$ and it is equal to 2^σ if $\mu_2 = 2$.

if the household dies as a homeowner. Similarly to Hurd (1989), Kopczuk and Lupton (2007) and De Nardi *et al.* (2010), NT assume that bequests follow an egoistic motive, since the utility derived from leaving a bequest does not depend on the utility of the recipient. Furthermore, there is no room for bequests to be used strategically as a compensation for services provided by the recipients.

4.2 Housing

For a homeowner, the housing decision consists of two options: staying in the present residence or becoming a renter. For a renter the only housing choice is the size of the rental property. Own-to-own and rent-to-own moves are assumed away by NT due to their low frequency in the HRS.⁵ The nominal value of a house is given by ph , where p is the price of a unit of housing. Upon the sale of the house, a homeowner receives its value net of any remaining debt and net of a proportional transaction cost κ . In addition, a homeowner pays every period a proportional maintenance cost δ .

Unlike owners, renters can move from one rental property to another at no moving cost. Therefore, a renter chooses the quantity of housing services consumed h at every period. All rental contracts are for one period, and the per-period rental rate, *i.e.* the proportion of the house value ph that is paid as rent, is given by:

$$r_h = r + \delta, \tag{2}$$

where r is the market interest rate. The rental rate reflects the competitive cost to a landlord of holding a house and renting it out.

4.3 Income, saving and borrowing

The non-financial income of a household is given by $\psi_s y$, where y is the pension income, which changes across households but not over time, and ψ_s adjusts it according to the number of adults in the household. In addition, households can save at an interest rate r , and homeowners can borrow against the value of their house at a rate $r + \xi$, where ξ is the mortgage premium. The value of the house sets the borrowing limit, which is defined by:

$$a \geq -(1 - \lambda_i)hp, \tag{3}$$

where a denotes the stock of financial wealth and λ_i determines the share of housing wealth that can be borrowed against, which NT allow to vary with age (hence the subscript i) to capture age-specific variation in the costs of borrowing against housing wealth.

⁵Table 2 shows that this is not the case in the DHS dataset since own-to-own moves are more popular than own-to-rent moves. However, note that here we are describing the NT model as presented in Nakajima and Telyukova (2011).

4.4 Health, Mortality and Medical Expenditures

The health status of a household is denoted by $m \in \{0, 1, 2, \dots, M\}$, where $m = 0$ represents the death of the household. Different from De Nardi *et al.* (2010), in the NT model the health status does not affect the marginal utility of consumption. NT assume that m follows a first-order Markov process in which $\pi_{i,m,m'}^m$ denotes the transition probability from a health state m to a health state m' , which is dependent on the present health state and on the age of the household, i . In addition, at any period a household can transit from $s = 2$ to $s = 1$, which captures the death of a spouse. NT assume away divorces and remarriages due to their low frequency in HRS. Household size transition probabilities from s to s' are given by $\pi_{i,s,s'}^s$.⁶ These transition probabilities imply that one spouse can die first via a stochastic shock to s , or both spouses can die at the same time via the household-wide mortality shock, the probability of which is given by $\pi_{i,m,0}^m$.

The inclusion of the health status in the model allows defining the probability of incurring out of pocket medical expenditures (OPME). Realized OPME are denoted by x , and the probability that a given x is drawn is denoted by $\pi_{i,m,x}^x$, which is dependent on age and health status. The way medical expenditures are modelled could imply that because of a large OPME shock a household is forced to have negative consumption. Therefore, NT introduce a consumption floor guaranteed by the government and denoted by \underline{c} . This insurance provided by the government is means tested, which implies that consumption of each member of a household is subsidized up to a level \underline{c} only after the household sells all of its assets and chooses the minimum rental property available.

4.5 Household Problem

Households choose consumption, saving and housing such as to maximize present and future streams of utility. The latter are discounted by the rate of time preference, β , and the probability of survival. Furthermore, for all future periods, households weight the discounted utility of bequests with the probability of death. In addition, couples take into account the possibility of a transition into a one person household by weighting both possible future scenarios (remaining a couple or become a single household) by its respective probability.

For the case of a household that rents the house it occupies, utility is maximized subject to the following restrictions:

$$\tilde{c} + a' + r_h hp + x = (1 + r)a + \psi_s y, \quad (4)$$

$$c = \begin{cases} \max\{s\underline{c}, \tilde{c}\} & \text{if } a' = 0 \text{ and } h = h_1 \\ \tilde{c} & \text{otherwise,} \end{cases} \quad (5)$$

$$p' = (1 + g)p, \quad (6)$$

⁶By assumption, $\pi_{i,1,1}^s = 1$ and $\pi_{i,1,2}^s = 0$ for all i .

where a prime is used to denote a variable in the next period. Equation (4) is the periodic budget restriction; Equation (5) introduces the consumption floor, where h_1 is the smallest rental property available; and Equation (6) provides the evolution of house prices, where g is the house price growth rate.

The maximization problem of a homeowner consists of a choice between staying in his current house or becoming a renter. The homeowner will choose at any point in time the option that provides the higher stream of current and future utility. A homeowner that chooses to sell the house and become a renter maximizes utility subject to (5), (6) and

$$\tilde{c} + a' + x + (\kappa + \delta)hp = hp + (1 + \bar{r})a + \psi_s y, \quad (7)$$

$$\bar{r} = \begin{cases} r & \text{if } a' \geq 0 \\ r + \xi & \text{if } a' \leq 0. \end{cases} \quad (8)$$

The budget constraint (7) does not include the rental cost since the household still owns in the current period, but it includes the proceedings from selling the house net of the maintenance cost δ and of the transaction cost κ . Equation (8) shows that the interest rate is different depending on whether a homeowner is a saver or a borrower. Upon the sale of the house a homeowner can still be indebted. However, once she is a renter the borrowing constraint (3) turns into $a \geq 0$.

Finally, a homeowner who does not move maximizes utility subject to (3), (6), (8) and

$$c + a' + x + \delta hp = (1 + \bar{r})a + \psi_s y. \quad (9)$$

In this case there is no access to the consumption floor since the homeowner decides not to sell the house, which is a necessary condition to benefit from it.

4.6 Estimation and Results

NT estimate the model in two steps. First they calibrate the parameters that can be identified without explicitly using the model. These are defined in the vector $\Theta = (\mu_2, \psi_2, \delta, \kappa, r, \xi, g)$. In addition, in the first step they compute the health status and household structure transition probabilities, as well as the probability of incurring medical expenditures, *i.e.* $\chi = (\pi_{i,m,m'}^n, \pi_{i,s,s'}^s, \pi_{i,m,x}^x)$. In the second step, they use the method of simulated moments to estimate the rest of the parameters in the model, *i.e.* $\mathcal{T} = (\beta, \eta, \sigma, \omega_1, \gamma, \zeta, \underline{c}, \lambda_i)$. The latter are estimated such as to provide the best match between the model and several moments in a sample of three HRS cohorts (those of age 65, 75 and 85 in 1996), which are followed over time between 1996 and 2006. The targets are homeownership rate profiles, life-cycle profiles of median total, financial and housing assets, proportion of households in debt, median debt of debtors, and median net worth profiles for homeowners and renters separately.

Once the model is estimated, NT investigate the role of several model features on the saving behaviour of retirees. They do so by shutting down each mechanism one at a time and comparing the outcome to the benchmark model. The mechanisms they consider are the following:

bequest motive, medical expenses, extra utility from homeownership, collateral constraints and the housing boom of 1996-2006. The results show that leading motivators for homeownership in retirement are the bequest motive and utility benefits of homeownership. Upon shutting down the bequest motive, *i.e.* setting $\gamma = 0$, NT observe considerably faster declines in homeownership and net worth of homeowners compared to the benchmark. The net worth withdrawal rate of renters is also increased, however, less so than the one of homeowners. Similar results are found for homeowners when the utility benefits of homeownership are shut off, *i.e.* $\omega_1 = \omega_0 = 1$.⁷

Another key feature of the results is that there seems to be potential demand for housing equity loans and reverse mortgages. Regardless of the importance of the bequest motive and of the utility benefit of homeownership, owner-occupiers react to a lower λ_i by somewhat increasing debt through housing equity loans. However, due to tight borrowing conditions that apply in practice, many older households remain unable to liquidate housing. In addition to this result, by manipulating the value of g , NT find that the house price boom in the US, even though it increased housing equity borrowing somewhat, contributed substantially to the low net worth withdrawal rate among homeowners. Finally, NT find a rather modest effect of OPME. They do find that when setting $x = 0$, the youngest retirees shift towards a slightly faster decline in their net worth. However, the effect is almost negligible for older retirees.

In summary, NT find that housing interacts with factors that explain the RSP, notably with the bequest motive. In addition, homeownership decreases the net worth withdrawal rate through the utility benefits it provides and the high costs of housing equity borrowing. On the other hand, OPME do not seem to play a major role in explaining homeownership late in life. These results differ importantly from those in De Nardi *et al.* (2010), who find an insignificant bequest motive and a larger role for OPME. There are several potential explanations for these differences. First, De Nardi *et al.* (2010) do not consider housing as a separate element of the portfolio and thus they do not match the evolution of homeownership and housing wealth when estimating their parameters. In the work of NT, matching these facts clearly emphasizes the role of bequests and of the utility benefits of homeownership. Second, De Nardi *et al.* (2010) employ data on singles who, arguably, are less prone to have a bequest motive than couples. Couples are more likely to have children and they are also likely to be richer, both of which are facts that potentially lead to a stronger bequest motive. Third, De Nardi *et al.* (2010) consider that the worsening of the health status has a negative effect on the marginal utility of consumption, while NT do not. Was this feature included in the TN model, it could easily compete with the bequest motive in explaining the HRS wealth profiles. However, it is not entirely clear what the outcome would be.

⁷The utility benefits of homeownership capture factors such as attachment to one's house and neighbourhood and the ability to adapt the house to one's tastes. Furthermore, they capture financial benefits of ownership that are not explicit in the model, *e.g.* tax exemption of imputed rents, mortgage interest payment deduction, and insurance against rental rate fluctuation.

5 Alternative Bequest Motives

The correlation between homeownership and the bequest motive pointed out by NT serves as a link between the two streams of literature discussed in Sections 2 and 3, and has relevant implications for the understanding of the RSP. Table 4 shows how in a sample of DHS households running from 2003 to 2013, homeownership clearly correlates with the bequest motive. On the one hand, households are asked to rank the importance of saving for a bequest on a scale from 1 (very unimportant) to 7 (very important). On the other hand, households are asked what is the chance that they leave a bequest. On both cases, homeowners seem more inclined than renters to leave a bequest, which holds when considering both the mean and median of the responses' distribution. The relationship between homeownership and bequests becomes even more clear when only older households are considered.

Table 4 Correlation between Homeownership and the Bequest Motive (2003-2013)

		Homeowners			Renters		
		Mean	Median	N. of obs.	Mean	Median	N. of obs.
Importance of saving for a bequest	Full sample	2.99	3	9493	2.35	2	3981
	Older adults	3.30	3	3793	2.38	2	1508
Chance of leaving a bequest	Full sample	81.50	99	9233	48.60	50	3967
	Older adults	83.26	100	3798	42.24	25	1587

Source: DHS. *Notes:* Older households are defined as households with a household head who is 60 or older. Importance of saving for a bequest is measured on a scale from 1 (very unimportant) to 7 (very important). Chance of leaving a bequest is measured on a scale from 0 (no chance) to 100 (100% chance).

The results of the work by NT, as well as the evidence for the Netherlands shown in Table 4, suggest that an important reason why housing is held throughout retirement is because it is viewed as an asset to be bequeathed. This insight has relevant implications for understanding the RSP, specially in the Netherlands, where due to public coverage of long-term expenses, precautionary saving is unlikely to play a role. Davidoff (2010) suggests that in the US, older homeowners use housing as long-term care insurance. However, in the Netherlands there is public coverage of long-term care expenses and, nevertheless, as shown by De Graaf and Rouwendal (2012) and Van Ooijen *et al.* (2015) among others, older homeowners still do not decumulate their housing equity, which opens the door to consider bequests as an important factor. This idea is supported by the evidence provided by Dillingh *et al.* (2015), who find that, among homeowners, both having children and the willingness of leaving a bequest have a strong negative impact on interest on reverse mortgages.

There are several reasons to think why households would prefer to leave a bequest in the form of a house rather than doing it in the form of cash for example. NT suggest that because there are extra utility benefits of homeownership, households who want to accumulate assets in retirement due to a bequest motive prefer to do so in housing. In addition, there are alternative

ways of modelling bequests that provide insights on why saving for a bequest in the form of a house implies extra benefits compared to other alternatives. In this section, we review these alternative bequest motives in order to better grasp this issue.

5.1 Altruistic Bequests

Following previous work such as Hurd (1989) and Kopczuk and Lupton (2007), NT model the bequest motive as an egoistic motive, which implies that bequests are generated purely by the desire of individuals to have positive net worth upon death, *i.e.* their aim to be the richest in the cemetery. The egoistic motive is thus independent of the economic situation of the heirs and it can be present even when a household has no descendants.

As an alternative to the egoistic motive, Laitner (2002) proposes a model in which the bequest function depends on the consumption possibilities of the heirs. This idea originated from earlier work by Barro (1974) and Becker (1974), and, in its simplest form, it consists of rewriting the within period utility in the NT model as follows:

$$V^P = u(c, h, o; s) + \alpha V^K(b), \quad (10)$$

where $V^P(\cdot)$ is the utility function of the parents and $V^K(\cdot)$ is the utility function of the heirs. The first element in (10) is simply the same as in Equation (1), whereas the second element substitutes the bequest motive in the NT model by $\alpha V^K(b)$, where α indicates to what extent a household cares about its heirs. The size of the bequest influences the life time income of the recipient and thus it has a positive effect on her utility, *i.e.* $\partial V^K(b)/\partial b > 0$. However, the higher the life time income of the recipient, the lower is the marginal utility of additional bequeathed wealth. Therefore, if the heirs have already high life time income without considering the bequest, the amount bequeathed is likely to be comparatively small.

Employing a survey of US pension holders, Laitner and Juster (1996) find that willingness to leave a bequest is higher for households with the lowest assessments of their children's likely earnings. In addition, Laitner and Ohlsson (2001) find evidence of parental altruism in Sweden and the US. However, this evidence contradicts with the work by Altonji *et al.* (1997) and Poterba (2001), who find that in the US parents do not modify inter vivos transfers in response to changes in their children's permanent income. In addition, Kopczuk and Lupton (2007), who employ panel data on singles from the AHEAD survey, make a case against the altruistic model by showing that there are households who save for a bequest without having children, and thus argue that children and bequests are independent of each other. However, we must note that altruism is not necessarily only towards children. There can be as well altruism towards other family members and/or towards non-family members.

Table 5 shows that, according to DHS data, among Dutch older households, those who have children give higher importance to saving for a bequest. This difference is the most clear when only homeowners are considered. Considering altruism only towards children, this descriptive

Table 5 Correlation between Having Children and the Bequest Motive (2003-2013)

		Children		N. of obs.	No children		N. of obs.
		Mean	Median		Mean	Median	
Homeowners							
Importance of saving for a bequest	Full sample	3.32	3	7107	1.746	1	1823
	Older adults	3.45	3	3357	1.683	1	322
Chance of leaving a bequest	Full sample	81.12	99	6962	80.37	99	2271
	Older adults	83.37	100	3327	82.48	100	471
Renters							
Importance of saving for a bequest	Full sample	2.65	2	2256	1.87	1	1415
	Older adults	2.47	2	1244	1.65	1	194
Chance of leaving a bequest	Full sample	41.86	25	2302	60.48	75	1665
	Older adults	40.14	20	1310	52.16	50	277

Source: DHS. *Notes:* Older households are defined as households with a household head who is 60 or older. Importance of saving for a bequest is measured on a scale from 1 (very unimportant) to 7 (very important). Chance of leaving a bequest is measured on a scale from 0 (no chance) to 100 (100% chance).

result suggests that the altruistic model is likely to apply in the Dutch case. However, regarding the chances of leaving a bequest, having children does not seem to play such an important role. In fact, among renters, those who declare not having children report a higher chance of leaving a bequest compared to those who declare having children. Just like Table 4, Table 5 shows that homeowners are more likely to leave a bequest and give more importance to saving for that end.

Even though in general the evidence appears to be mixed, the altruistic model should not be dismissed since it has important implications for understanding the rationale behind the bequest motive, as well as for understanding how wealth inequality is transferred from one generation to the next. In addition, as it will become clear below, the altruistic model can help explain the interaction between homeownership and the bequest motive that stems from the NT model.

5.2 Strategic Bequests

A different approach to the bequest motive was introduced by the early work of Bernheim *et al.* (1985), who suggest that bequests are generated in a context of intergenerational exchange. In this context, parents are still altruistic in that they care about the utility of their descendants. However, at the same time, they also care about services provided to them by their children. In consequence, they try to strategically influence the descendants' actions in their favour by using the bequest as an incentive. In the strategic model, it makes sense to separate housing from the other elements of the household portfolio, since it is an asset that parents can easily use to signal a reward to their children's services. In that way, the strategic model can help understand better the interaction between homeownership and the RSP.

In a very stylized way, strategic bequests can be introduced in the NT model by modifying

the within period utility of the altruistic version of the model, given by Equation (10), as follows:

$$V^P = u(c, h, o, \tau; s) + \alpha V^K(b, \tau), \quad (11)$$

where τ denotes the services provided by the children to their parents, which increase parental utility, *i.e.* $\partial u(\cdot)/\partial \tau > 0$, but affect the utility of the children negatively, *i.e.* $\partial V^K(b, \tau)/\partial \tau < 0$. In Bernheim *et al.*'s model, the household commits herself to a bequest rule. The latter specifies the fraction of the bequest given to each recipient for each amount of services provided, and establishes that a descendant will be disinherited in favour of other recipients if she does not contribute with a minimum amount of services. For the rule to be convincing, parents must be credibly committed to retain enough wealth as a bequest. This can be done by holding wealth in illiquid form such as housing equity. If transactions costs are high and financial products to liquidate housing are hardly available, holding a house can be a way for older adults to signal a future bequest to the heirs.

The empirical literature on the strategic model generally follows an approach that consists of regressing the number of visits by the heirs to the parents on parental wealth. The main challenge is to take into account the endogeneity of parental wealth, since, if strategic behaviour applies, parents will increase their wealth holdings in response to increased attention. Furthermore, there may be unobserved factors affecting both parental wealth and the number of contacts. The literature generally tackles this issue by instrumenting for wealth. Bernheim *et al.* (1985) instrument wealth with life-time earnings and, based on US data, find evidence supporting the altruistic model. Perozek (1998) instruments with an index that maps occupations into a socio-economic ranking and controls for additional individual and family characteristics. Using a different US dataset, he claims that the results by Bernheim *et al.* are not entirely robust. On the other hand, Angelini (2007) uses the educational level and the number of rooms in the parental house as instruments. Using data on several European countries finds empirical

Table 6 Presence of Strategic and Altruistic Bequests Motives (2003-2013)

	Full sample		Older households	
	Homeowners	Renters	Homeowners	Renters
(1) Strategic bequest	3.33%	1.38%	3.54%	1.98%
(2) Altruistic bequest	21.66%	9.01%	30.74%	9.43%
(3) No explicit plans about bequests	66.55%	55.12%	57.53%	51.79%
(4) No bequest	1.55%	6.44%	1.51%	8.30%
(5) None of the above	6.90%	28.05%	6.68%	28.49%
Number of observations	7563	2531	2515	1060

Source: DHS. *Notes:* Conditional on having children, respondents are asked which statement is closest to their opinion: (1) Leaving a bequest if children provide services; (2) Leaving a bequest regardless of services provided; (3) No explicit plans about leaving a bequest; (4) No intention to leave a bequest; (5) None of the above. Older households are defined as households with a household head who is 60 or older.

support for the strategic model. The effect appears to be the strongest when using illiquid forms of wealth, such as housing, as explanatory variable. This finding suggests that housing is used as a strategic bequest and it helps understand the interaction between homeownership and bequests observed by NT.

Table 6 shows that, according to DHS data, the strategic motive is not so popular among Dutch households. Homeowners who are above 65 years of age appear to be the most prone to use bequests strategically. However, only 3.54% of them report a strategic bequest motive. There are three caveats to keep in mind when using these data: first, the majority of households, especially among homeowners, report to have still no preconceived bequest plans; second, households may be inclined towards reporting altruistic bequests to hide their self-indulgence; and, third, those willing to leave a bequest regardless of the services provided, might be willing to increase it if services are actually provided. These are all arguments suggesting that strategic bequests might be more important than reflected in Table 6. In any case, Table 6 shows that both strategic and altruistic bequest motives are present, and that they are more popular among homeowners than among renters.

6 Housing as a Commitment Device

An additional complement to the NT model that might shed light on how housing equity during retirement can help explain the RSP is provided by the literature on temptation and self-control. In two seminal contributions to this literature, Gul and Pesendorfer (2004) develop a model in which an agent chooses between different sets of alternatives for consumption, some of which contain a tempting good. The latter is a good that the agent may crave for, however, consuming it represents a sub-optimal choice. If the agent chooses the set of alternatives that contains the tempting good, she will either consume it or exert self-control in order not to do so, which comes at a utility cost. A different option consists of choosing a set of alternatives that excludes the temptation good and thus commits the agent to not choosing it. This option saves the cost of self-control.

The model by Gul and Pesendorfer has been applied to several fields within economics. There is a recently emerging literature (*e.g.* Angelini *et al.*, 2013; Kovacs, 2014; and Ghent, 2015) that applies it to the study of housing demand over the life-cycle. This literature points out the role of housing as a commitment device. The idea is that if immediate consumption is a temptation good, households will suboptimally choose to consume too much in the present and will not save enough for retirement. In this context, households can commit themselves to save by investing their wealth in housing. This feature can be incorporated in the NT model of Section 4.1.1 by rewriting the utility function as follows:

$$V = u(c, h, o; s) - \rho(v(c^*, h, 0; s) - u(c, h, o; s)), \quad (12)$$

where for simplicity we have excluded the bequest motive. The second element in (12) is the temptation term, which is weighted by ρ , and where $v(\cdot)$ is the level of utility attained when all wealth is liquidated, the household is a renter ($o = 0$), and consumption is set to its maximum immediate level, c^* . If the household chooses this utility level, the temptation term cancels out. Otherwise, the temptation term is assumed to be positive, *i.e.* $u(\cdot) < v(\cdot)$ if $c < c^*$, and it can be seen as the utility cost of self-control, since it provides the utility difference between the tempting alternative and the actual choice.

To increase lifetime utility, a household should save for the future, but at the same time reduce the cost of self-control. This is possible by investing in illiquid assets, which will reduce the wealth disposable for immediate consumption and, in turn, will reduce as well the cost of self-control. Housing can play this role, since its liquidation usually implies high transaction costs and housing equity lines are not always readily available. The temptation motive has the potential to explain the interaction between homeownership and altruistic or strategic bequests. If, in the presence of immediate consumption as a tempting alternative, one wants to make sure that a bequest is left for the following generation, using housing as a commitment device can come in handy, especially if one wants to strategically signal that a bequest will come.

To test the temptation motive for housing, Angelini *et al.* (2013) use European life history data and regress the hazard rate of homeownership, *i.e.* the probability for a renter to transit to homeownership, on the value of liquid and illiquid financial assets in the household portfolio. They find a considerable effect of holding illiquid financial assets, which is especially strong for individuals above forty years of age. The latter are the most expected to transit into homeownership for commitment purposes, since earlier in life the purchase of a house is more likely related to family formation. On the other hand, Kovacs (2014) follows a different approach consisting of estimating a structural life-cycle model with temptation preferences. Her model predicts that the interaction between housing services in the utility function and temptation preferences induces a high demand for housing as a commitment device. Housing demand appears to be about 30% higher at its peak over the life-cycle when housing plays a commitment role compared to when it does not.

Table 7 Rent-to-own Moves and Remaining Mortgage Debt (RMD) (2003-2013)

		Below 40	40-50	50-60	60-70	70+	Total
Rent-to-own moves	Number	139	59	17	4	4	222
	%	62.61%	26.58%	7.66%	1.80%	1.80%	100%
RMD	% with RMD	26.60%	33.48%	38.10%	38.94%	32.19%	33.61%
	Average	46.82	46.94	45.44	40.75	27.56	42.53

Source: DHS. *Notes:* Average RMD is provided in thousands. The last column of the RMD panel provides the % of households with RMD and the average RMD when all ages are pooled together. Renters are included when computing statistics regarding RMD.

Table 7 shows that 37.39% of the rent-to-own transitions registered in the DHS dataset correspond to households with a household head that is 40 years of age or more. According to Angelini *et al.* (2013), rent-to-own transitions that take place above forty are likely to be for commitment purposes. In addition, the lower panel of Table 7 shows that remaining mortgage debt is still relatively high for households that are above 60, which suggests that a reasonable share of households have become homeowners (or have increased the size of their property) late in life. In summary, Table 7 indicates that commitment demand for housing is an element to take into account in the Netherlands. Combined with the previous descriptive evidence on the relationship between homeownership and bequests, the commitment demand for housing potentially adds to the understanding of the RSP in the Netherlands.

7 Conclusion

The full understanding of the underlying causes behind the retirement-savings puzzle (RSP) is crucial for the assessment of the adequacy of retirement savings in a context of pension system reforms. To that end, we complement the RSP literature by reviewing the literature on housing equity during retirement (HER). The HER literature indicates that retirees are generally reluctant to withdraw their housing equity, which has clear implications for the understanding of the RSP. This insight is picked up by Nakajima and Telyukova (2011), who develop a model of the retirement savings of couples with housing. One of their main conclusions is that housing as a bequeathable asset plays a major role in explaining the RSP. Further literature on altruistic and strategic bequests, as well as on housing as a commitment device, provide additional insights to understand the connection between bequests, homeownership and the RSP.

The descriptive evidence that we draw from the Dutch National Bank Household Survey (DHS) shows that a vast majority of Dutch homeowners do not sell their house to finance retirement, and it is likely that homeownership among retirees will increase in the near future due to cohort effects. In addition, the evidence shows that there is a strong correlation of homeownership with the importance given to leave a bequest, as well as with the self-perceived chance that a bequest will be left. Since there are still own-to-rent moves at advanced ages and mortgage debt is still high among older adults, it is likely that Dutch households use housing as commitment to signal a bequest and/or to altruistically pass it on to the next generation. This type of behaviour potentially explains a large share of the low wealth withdrawal rate among Dutch retirees pointed out by Van Ooijen *et al.* (2015). Furthermore, it is in accordance with the fact that retirees are not willing to withdraw their housing wealth to finance retirement, which can explain why financial products such as reverse mortgages have never rooted in the Netherlands.

The RSP literature is still a fertile ground for new contributions. Structural models in the line of De Nardi *et al.* (2010) and Nakajima and Telyukova (2011), as well as reduced form type of analysis, can bring on a better understanding of the connection between homeownership, bequests and the RSP. The literature on strategic bequests as well as the literature on temptation

and commitment provide potentially fruitful lines of research for the further understanding of the stylized facts laid out in this survey paper.

8 Policy Recommendations

The ageing of the Dutch population is gradually putting financial pressure on the pension system as well as on the long-term care (LTC) insurance system. This is implying already changes in the direction of shifting the financial responsibility from the government towards the individuals themselves. For example, the second pillar of the Dutch pension system is gradually shifting from a defined benefit scheme towards a defined contribution scheme. At the same time, as of 1st of January 2015, the Exceptional Medical Expenses Act (AWBZ) has been replaced by the Long-Term Care Act (WLZ), a change that implies several cutbacks in the public provision of LTC as well as the inclusion of wealth holdings in the means test for eligibility. This situation rises a lot of concern about whether individuals are financially prepared to bear the costs that these changes imply.

In this context, policymakers as well as academics are paying attention to the potential of housing equity as a source of funds to finance both general consumption and LTC during retirement. In the Netherlands, housing equity represents a large share of the portfolio of retired households, and it is expected to be even more important in the future, since the generations currently in the pre-retirement phase of the life-cycle are more exposed to housing than those already in retirement. For Dutch retirees housing is estimated to represent nowadays about 40% of their net wealth, while this number surpasses 50% for households that are between 50 and 65 years of age. We propose a number of measures and caveats to help combine in the best possible way the use of private savings, including housing equity and other forms of wealth, with public assistance to guarantee the financial well-being of Dutch retirees in the years to come.

Facilitate the use of housing equity when a precipitating event occurs

The literature on the evolution of house equity during retirement points at the fact that households do not generally plan to use housing equity as a source of funds to finance general consumption during retirement. In fact, there seems to be a tendency to regard housing as an asset to be bequeathed. Nevertheless, there is recurrent evidence showing that when a precipitating event occurs, the chances that a retired homeowner liquidates housing increase substantially. The literature identifies several of such precipitating events that trigger downsizing of housing equity. The most important are nursing home entry, widowhood, divorce and nest leaving by children. This suggests that housing is viewed as an asset that, in the best case scenario, is left as a bequest. However, on the one hand it serves the purpose of preventive buffer against adverse shocks (*e.g.* nursing home entry), and, on the other hand, it appears to be sensitive to family transitions (*e.g.* widowhood, divorce and nest leaving by children).

When a precipitating event occurs, the government should facilitate the drawdown of hous-

ing wealth for those households that consider it to be necessary, as this will clearly improve their welfare.⁸ For instance, when older homeowners experience nursing home entry, they might want to sell their house since, first, it is not needed any more for housing purposes and, second, it can help finance their stay in the nursing home. Similarly, an older household that experiences a widowhood event might contemplate the possibility of selling to move into a smaller owned or rented accommodation, which can be coupled with the transfer of part of the bequest to the heirs. In situations like these, the government can consider to ease the transaction costs that such transitions imply, which can be done mainly in two ways. First, it can be done by exceptionally reducing the transaction tax households have to pay upon buying a house, currently at 6% of the purchase price,⁹ and, second, it can be done by directly aiding retirees in the process of selling and searching for a new house or nursing home.

Stimulate the demand for releasing wealth locked in housing equity

Besides facilitating the drawdown of housing equity for those households who are willing to carry it out due to a precipitating event, which as the literature points out represent a small minority of households, the government can also consider promoting the demand for releasing housing equity among households who have not yet considered it or are not aware of their options. Stimulating this demand can be oriented towards the use of housing as funds for general consumption, as well as towards increasing its use as an insurance against adverse shocks and as a way to accommodate family transitions. This can be done through two main channels: the first implies making housing equity liquidation more easy through the development of new products, while the second implies informing the broad public about the possibility to use housing equity.

The first channel may consist of a range of different measures that can go from making existing ways to release home equity more attractive, to the development of new home equity release products. For example, it may consist of easing housing transaction costs not only for those who experience a precipitating event, but as well through introducing basic measures that can apply to all retired households. In addition, special tax advantages can be considered as a way to stimulate the use of second mortgages and mortgage refinancing among retired homeowners who are in need of cash. Regarding the development of new products, the introduction of reverse mortgages can be considered. The latter have never rooted so far in the Netherlands. Therefore, it might be of help to relate them to LTC expenditures since, on the one hand due to the need of liquidity required to afford LTC, and, on the other hand due to the reduced life expectancy of those in need of care, it can be a realistic way to initiate a market for reverse mortgages.

⁸We acknowledge that the welfare improvement will depend on the relative importance of the housing asset in the household portfolio. The literature recognizes that households that are house-rich and cash-poor are the most benefited from measures directed towards facilitating home equity release. Any of these potential measures should take this into account.

⁹Between 2011 and 2012 this transaction tax was reduced temporarily to 2% of the purchase price with the purpose to stimulate the housing market. What we propose is a similar measure but targeted only to retired homeowners that experience a precipitating event.

Furthermore, it can be of help to consider reverse mortgages that fully cover against longevity risk, *i.e.* that provide a stream of payments for as long as the household lives, since the reverse mortgages that have been tested so far in the Netherlands did not provide such a feature.

The second channel may consist as well of a range of measures that can go from promoting financial literacy with a stress on the uses of housing equity, to informing the public in detail about the different instruments that can be used to liquidate housing equity. For instance, the use of second mortgages and mortgage refinancing as a way to tap housing equity is an option that is present in the Netherlands and can easily be publicized by the government and the banks. Regarding reverse mortgages, the literature shows that the general Dutch public is mostly ignorant about what a reverse mortgage is and what can it be used for. More precisely, a recent survey reveals that only one in every ten homeowners in the Netherlands knows what a reverse mortgage is. Therefore, a campaign delivering basic information can be useful to generate interest, stimulate demand and, in that way, help the market get started.

Stress the possibility to use reverse mortgages as a way to time bequests

The literature on housing equity after retirement and the documented descriptive evidence for the Netherlands suggest that the role of housing as a bequeathable asset is relevant to understand the saving patterns of Dutch retirees. One important implication of a strong bequest motive related to housing is that it reduces the market niche for reverse mortgages, since the latter imply that the house becomes property of the bank once the household decides to move or dies. In such a context, it seems difficult to kick start a market for reverse mortgages that could benefit a non-negligible share of retired homeowners who do not want to bequeath a part, or the totality, of their wealth.

A plausible solution to this problem is to market reverse mortgages as an instrument that, besides helping provide liquidity for general consumption and LTC expenses, can as well provide a way to optimally transfer the bequest to the heirs. Given the recent increases in life expectancy, individuals nowadays are likely to receive bequests at an increasingly advanced stage of the life-cycle, which might not be the preferred option. For example, an optimal period in life to receive a bequest can typically be around ages between 30 and 40, when family building and house purchase are more likely to take place nowadays. However, due to the rise in longevity, individuals are increasingly likely to receive a bequest at ages between 50 and 60, when the need for financial help is likely to be smaller.

A reverse mortgage can potentially offer a solution to this problem, since it would allow parents to transfer the bequest to the heirs at any time they prefer without having to move out of their main residence. If preferred, a reverse mortgage can as well allow for the liquidation of the housing asset to translate into a stream of periodical inter-vivos transfers over time, as an alternative to a lump sum transferred at a particular point in time. In summary, reverse mortgages can increase flexibility in the timing of bequests, which can result in benefits for both

the parents and the heirs. Taking into account this aspect may help kick start the market for reverse mortgages which in the end would be beneficial for both households with and without a bequest motive.

Couple tax incentives to inter-vivos transfers with an income test for LTC eligibility

In line with the recommendation to market reverse mortgages as a way to time bequests, it is as well advisable to foster inter-vivos transfers by favouring their tax treatment relative to bequests. At the moment, inter-vivos transfers have exactly the same tax treatment as bequests, *i.e.* a progressive tax levied on the beneficiary's share of the transfer that depends on the relationship between the giver and the receiver; with spouses and children, siblings, and others being subject from lower to higher rates respectively. Given the relevance of the bequest motive, fostering inter-vivos transfers by lowering the taxes relative to bequests can help optimize the timing of bequests for the reasons already mentioned above. The potential success of this measure is supported by recent experience with the introduction of temporary tax exemptions for intergenerational transfers.¹⁰

The problem of such a measure is that it can have negative side effects due to the recently introduced wealth test in determining eligibility to publicly provided LTC. Since the 1990s eligibility to provisions was essentially needs-based coupled with co-payments dependent on income. With the new regime, wealth is also counted when determining the amount of the co-payment. Therefore, decreasing taxes for inter-vivos transfers can have a side effect in the sense that it creates an incentive for retired households to run down their wealth by passing it on to their children and, in that way, become eligible for LTC provision.¹¹ Taking this caveat into account, it is prudent to only consider tax advantages to inter-vivos transfers if coupled with an income test and not with a wealth test. Furthermore, in the case of retired households using an income test has an additional benefit. That is because pension income is a good proxy for permanent income, which compared to wealth holdings is a better indicator of whether someone has enough life-time resources to afford or not LTC expenses during retirement.

An alternative way to tackle the negative side effects of favouring inter-vivos transfers can be the introduction of a so-called look back period, which has already been introduced in the US in relation to Medicaid provisions. It consist of extending the wealth test to certain number of years (5 years in the US) previous to the moment in which LTC is requested. Therefore, if in recent years a household transferred wealth to its offspring, this will imply a penalty when calculating the co-payment required for LTC provision. This measure would prevent households

¹⁰To stimulate to housing market, the Dutch government recently introduced a tax stimulus, valid during 2013 and 2014, allowing parents to transfer to their children a maximum of 100.000 Euro untaxed, provided that the amount was used for expenses related with the purchase of a house. The measure has proven to be a great success. The National Association of Real State Agents (NVM) estimates that 10% of the houses purchased in 2013 and 2014 made use of this measure.

¹¹The wealth test does not include the main residence. Therefore, introducing reverse mortgages as a way to optimize the timing of bequests would not imply the negative side effect mentioned here.

from running down their wealth by transferring it to their children with the purpose to become eligible for public coverage of LTC. Furthermore, it would make the system more fair since it would treat people with the same lifetime income, but with different preferences when it comes to saving either for a bequest or for precautionary reasons, in a more similar way.

Promote the intergenerational exchange of bequests for informal LTC provision

An additional way to counteract the decline in generosity of the pension and the LTC insurance systems is to foster the provision of informal care within families for those who can afford to do it. In the Netherlands, an individual that lives with a dependent family member of whom he/she takes care, can apply to be considered as a care-giver, in Dutch *mantelzorger*. If the status is granted, the care-giver will enjoy lower inheritance taxes on the bequest that he/she will receive from the dependent family member when the latter dies.

The literature on bequests and the documented evidence for the Netherlands indicate the presence of a strategic bequest motive. The latter implies that there are retirees who use the bequest as a way to incentivize provision of services by the heirs. These retirees have an incentive to use the house as a bequest, since it is both a visible and illiquid asset that can easily be used to signal that a bequest will come. The presence of such a bequest motive indicates that there are grounds to extend the benefits for care-givers to promote informal care to a larger extent, which can help counteract the recent cutbacks in the public provision of LTC.

Nowadays, the care-giver status is only granted if the care-giver and the dependent person live in the same house, and if the care-giver is a first-degree relative, *i.e.* offspring, parent or sibling, of the dependent person. The government can consider relaxing these conditions to foster the use of bequests (in the form of housing equity and/or other wealth components) as a way to incentivize the provision of informal LTC by the recipients. The final outcome of this measure would be the same as promoting the use of housing equity to finance LTC, with the difference that in this case it would not imply liquidating the house, but leaving it as a bequest in exchange for the provision of informal care. As a word of caution, any measure in this direction should take into account that providing informal care may imply a major disruption in the labour supply of the provider. Therefore, the cost in terms of forgone earnings should be considered when determining the compensation to the care-giver.

Earmark inheritance tax revenues for LTC related expenses

Due to the presence of a bequest motive related to housing and as well due to the attachment of retirees to their own houses, it can be that relying on the withdrawal of housing equity through different means is not enough to counterbalance the changes in the pension system and the public LTC insurance system. Under such a scenario it can be recommendable to introduce a clearly progressive tax on the housing equity share of bequests. The revenues generated can then

be earmarked for expenses related to the LTC of retired individuals. This would complement the financing sources of the LTC public insurance system, which currently consist of mandatory insurance premiums and a small share of funds from the co-payment scheme.

Such a measure can have several benefits. First of all, it can help provide a source of stable funds to finance the assignments in terms of coverage of long term-care that the Dutch government still has under the new regime. Second, it can help give to an important share of the aggregate private wealth stocked in the form of housing an adequate use in the present context of declining generosity of the pension and public LTC systems. In fact, as a matter of final result, this measure would be similar to nudging households into liquidating housing equity to finance LTC expenses. Third, this measure would maintain the redistributive feature of the pension system, which would be lost if the pension and public LTC system were to be completely substituted for a system relying solely on private savings. The main problem of such a measure, is that individuals may try to bypass it by leaving bequests in more liquid forms of wealth. However, this would imply an incentive to liquidate housing during retirement, which, in itself is not necessarily a problem since it would give more flexibility to assign every Euro of liquidized housing to its most preferred use.

References

- Alessie, Rob, Viola Angelini, and Giacomo Pasini.** 2010. "Is it True Love? Altruism Versus Exchange in Time and Money Transfers." *De Economist*, 162(2): 193–213.
- Altonji, Joseph G, Fumio Hayashi, and Laurence J Kotlikoff.** 1997. "Parental Altruism and Inter Vivos Transfers: Theory and Evidence." *Journal of Political Economy*, 105(6): 1121–1166.
- Ando, Albert, and Franco Modigliani.** 1963. "The Life Cycle Hypothesis of Saving: Aggregate Implications and Tests." *The American Economic Review*, 53(1): 55–84.
- Angelini, Viola.** 2007. "The Strategic Bequest Motive: Evidence from SHARE." Marco Fanno Working Paper, 62.
- Angelini, Viola, Agar Brugiavini, and Guglielmo Weber.** 2014. "The Dynamics of Homeownership Among the 50+ in Europe." *Journal of Population Economics*, 27(3): 797–823.
- Angelini, Viola, Alessandro Buccioli, Matthew Wakefield, and Guglielmo Weber.** 2013. "Can Temptation Explain Housing Choices in Later Life?" Netspar Discussion Paper, 05/2013-021.
- Banks, James, Richard Blundell, Zöe Oldfield, and James P. Smith.** 2012. "Housing Mobility and Downsizing at Older Ages in Britain and the USA." *Economica*, 79(313): 1–26.
- Barro, Robert J.** 1974. "Are Government Bonds Net Wealth?" *The Journal of Political Economy*, 82(6): 1095–1117.
- Becker, Gary S.** 1974. "A Theory of Social Interactions." *Journal of Political Economy*, 82(6): 1063–1093.
- Bernheim, B. Douglas, Andrei Shleifer, and Lawrence H. Summers.** 1985. "The Strategic Bequest Motive." *The Journal of Political Economy*, 93(6): 1045–1076.
- Chiuri, Maria Concetta, and Tullio Jappelli.** 2010. "Do the Elderly Reduce Housing Equity? An International Comparison." *Journal of Population Economics*, 23(2): 643–663.
- Cocco, Joao F., and Francisco J. Gomes.** 2012. "Longevity Risk, Retirement Savings, and Financial Innovation." *Journal of Financial Economics*, 103(3): 507–529.
- Coile, Courtney, and Kevin Milligan.** 2009. "How Household Portfolios Evolve After Retirement: The Effect of Aging and Health Shocks." *Review of Income and Wealth*, 55(2): 226–248.
- Cox, Donald.** 1987. "Motives for Private Income Transfers." *The Journal of Political Economy*, 95(3): 508–546.

- Davidoff, Thomas.** 2010. “Home Equity Commitment And Long-Term Care Insurance Demand.” *Journal of Public Economics*, 94(1): 44–49.
- De Graaf, Marc, and Jan Rouwendal.** 2012. “The Demand for Mortgage Debt, Increases in House Prices and the Elderly Home Equity Puzzle.” Amsterdam School of Real State Research Papers, 1878-4607.
- De Nardi, Mariacristina, and Fang Yang.** 2014. “Bequests and Heterogeneity in Retirement Wealth.” *European Economic Review*, 72: 182–196.
- De Nardi, Mariacristina, Eric French, and John B. Jones.** 2009. “Life Expectancy and Old Age Savings.” *The American Economic Review*, 99(2): 110–115.
- De Nardi, Mariacristina, Eric French, and John B. Jones.** 2010. “Why Do the Elderly Save? The Role of Medical Expenses.” *Journal of Political Economy*, 118(1): 39–75.
- Dillingh, Rik, Henriette Prast, Mariacristina Rossi, and Cesira U. Brancati.** 2015. “The Psychology and Economics of Reverse Mortgage Attitudes: Evidence from the Netherlands.” Netspar Desgin Paper 38.
- Dobrescu, Loretta I.** 2015. “To Love or to Pay: Savings and Health Care in Older Age.” *Journal of Human Resources*, 50(1): 254–299.
- Ghent, Andra.** 2015. “Home Ownership, Household Leverage and Hyperbolic Discounting.” *Real Estate Economics*, 43(3): 750–781.
- Gul, Faruk, and Wolfgang Pesendorfer.** 2004. “Self-Control and the Theory of Consumption.” *Econometrica*, 72(1): 119–158.
- Hochguertel, Stefan, and Henry Ohlsson.** 2009. “Compensatory Inter Vivos Gifts.” *Journal of Applied Econometrics*, 24(6): 993–1023.
- Hurd, Michael D.** 1989. “Mortality Risk and Bequests.” *Econometrica*, 57(4): 779–813.
- Hurd, Michael D.** 2002. “Portfolio Holdings of the Elderly.” In *Household Portfolios*, ed. Luis Guiso, Michael Haliassos and Tullio Jappelli, 431–472. MIT Press.
- Kopczuk, Wojciech, and Joseph P. Lupton.** 2007. “To Leave or Not to Leave: The Distribution of Bequest Motives.” *The Review of Economic Studies*, 74(1): 207–235.
- Kovacs, Agnes.** 2014. “Temptation and Commitment: the Role of Housing.”
- Laitner, John.** 2002. “Wealth Inequality and Altruistic Bequests.” *American Economic Review*, 92(2): 270–273.
- Laitner, John, and F. Thomas Juster.** 1996. “New Evidence on Altruism: A Study of TIAA-CREF Retirees.” *The American Economic Review*, 86(4): 893–908.

- Laitner, John, and Henry Ohlsson.** 2001. "Bequest Motives: a Comparison of Sweden and the United States." *Journal of Public Economics*, 79(1): 205–236.
- Nakajima, Makoto, and Irina Telyukova.** 2011. "Home Equity Withdrawal in Retirement." Federal Reserve Bank of Philadelphia Working Paper, 11-15.
- Palumbo, Michael G.** 1999. "Uncertain Medical Expenses and Precautionary Saving Near the End of the Life Cycle." *The Review of Economic Studies*, 66(2): 395–421.
- Perozek, Maria G.** 1998. "A Reexamination of the Strategic Bequest Motive." *Journal of Political Economy*, 106(2): 423–445.
- Post, Thomas, and Katja Hanewald.** 2013. "Longevity Risk, Subjective Survival Expectations, and Individual Saving Behavior." *Journal of Economic Behavior & Organization*, 86: 200–220.
- Poterba, James.** 2001. "Estate and Gift Taxes and Incentives for Inter Vivos Giving in the US." *Journal of Public Economics*, 79(1): 237–264.
- Poterba, James, Steven Venti, and David Wise.** 2011. "The Composition and Drawdown of Wealth in Retirement." *The Journal of Economic Perspectives*, 25(4): 95–117.
- Sheiner, Louise, and David N. Weil.** 1992. "The Housing Wealth of the Aged." National Bureau of Economic Research Working Paper, 4115.
- Sinai, Todd, and Nicholas S. Souleles.** 2007. "Net Worth and Housing Equity in Retirement." National Bureau of Economic Research Working Paper, 13693.
- Suari-Andreu, Eduard.** 2014. "The Effect of Declining House Prices on Household Savings. A Theoretical and Empirical Study of the Dutch Case." Netspar Discussion Paper, 12/2014-056.
- Van der Schors, Anna, Rob Alessie, and Mauro Mastrogiacomo.** 2007. "Home and Mortgage Ownership of the Dutch Elderly; Explaining Cohort, Time and Age Effects." *De Economist*, 155(1): 99–121.
- Van Ooijen, Raun, Rob Alessie, and Adriaan Kalwij.** 2015. "Saving Behavior and Portfolio Choice After Retirement." *De Economist*, 163(3): 353–404.
- Venti, Steven F., and David A. Wise.** 1990. "But They Don't Want to Reduce Housing Equity." In *Issues in the Economics of Aging*, ed. David A. Wise, 13–32. University of Chicago Press.
- Venti, Steven F., and David A. Wise.** 2004. "Aging and Housing Equity: Another Look." In *Perspectives on the Economics of Aging*, ed. David A. Wise, 127–180. University of Chicago Press.
- Yaari, Menahem E.** 1965. "Uncertain Lifetime, Life Insurance, and the Theory of the Consumer." *The Review of Economic Studies*, 32(2): 137–150.