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# Non-financial determinants of retirement

Frank van Erp  
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## Abstract

This paper first confronts the observed aggregate retirement pattern in the Netherlands with predictions of traditional economic models of retirement. The retirement peaks observed in the data cannot entirely be reconciled with models putting financial incentives central to individual decision-making. After surveying different explanations from psychology and sociology, the paper concludes that social norms, default options, and reference-dependent utility are likely explanations for the observed individual propensity to retire at standard retirement ages. Most empirical evidence on these factors is, however, not related to the retirement age, so that a great deal of research remains to be done.

## 1. Introduction<sup>1</sup>

Many industrialized countries are adjusting their social security and pension schemes in order to reduce government expenditures and to increase the labor force participation rates of senior citizens. The most obvious, and also most prevalent, reform in this respect is raising the standard retirement age. This reform affects both government expenditures and participation directly. The mechanisms behind the participation effect are quite complicated. The financial incentives induced by the pension scheme are obviously a prime determinant of retirement behavior. This is well documented in the economic literature. Empirical estimates are widely available (see, e.g., Gruber and Wise, 2004). Yet, it has become clear from this same literature that the observed individual retirement behavior cannot be explained by financial incentives alone. Research on US data shows that the ‘retirement peaks’ at standard pension ages can only partially be explained by financial incentives (see, e.g., Lumsdaine, Stock and Wise, 1996). Moreover, the labor supply reaction to an increase in the normal retirement age increase is much larger than predicted by financial incentives alone (Mastrobuoni, 2009). So next to financial incentives, what are other relevant determinants of retirement behavior? Much has been theorized about the unexplained part of retirement behavior, but the empirical evidence is still limited. This survey compares observed retirement patterns across countries and examines the peculiarities of the ages at which retirement is concentrated. Next, the paper discusses the most important insights from the literature on non-financial determinants of the retirement age, and derives policy conclusions.

This survey takes an interdisciplinary approach, with a specific focus on the individual *retirement age*. The importance of an interdisciplinary approach was stressed by Hershey et al. (2010): “[D]ecisions that involve retirement planning and financial investing are exceedingly complex. [...] At the very least, they require the coordinated interplay of cognitive and personality dimensions at the psychological level, social support mechanisms and normative timing expectations at the societal level, and probabilistic information [...] about the availability and adequacy of multiple streams of future income resources. Clearly, disciplinarily accounts can

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<sup>1</sup> The authors thank Michiel Blom, Machiel van Dijk, Rik Dillingh, Rob Euwals, Lyda den Hartog, Johannes Hers, Adrie Moons, Henk Nijboer, Maarten van Rooij, Arthur van Soest, Bas ter Weel, Ed Westerhout and anonymous referees for useful comments.

only tell part of the story when it comes to explaining the range of forces that structure the thought process of those who save for retirement.” The non-financial determinants of retirement behavior can be roughly split up into four components: an individual background part (e.g. health, type of job, household situation), a part related to the limited rationality of individuals, a socio-cultural part, and an institutional part (other institutions than those causing direct financial incentives). This paper focuses on the second and third parts. The most important insights from the economic, psychological and sociological literature will be discussed. Insights from the previous literature on financial determinants are taken as given. That is to say, rational financial-economic decision-making is accepted as an important – though not sufficient – determinant of retirement behavior. The demand side of the labor market will thus not be discussed; the analysis here focuses on labor supply.

The mechanisms will be discussed against two backgrounds. The first exercise is to explain retirement behavior as observed from the data. The research question is then: given the current institutional setting, and given societal and individual preferences and determinants (such as health), to what extent can retirement behavior be explained by non-financial determinants? And which non-financial determinants matter most? The second exercise is to explain a change in retirement behavior against the background of an institutional change. In particular, which mechanisms are at play when the ‘standard retirement age’ is raised?

The impact of *bounded rationality* on pension behavior has several dimensions. People are sensitive to the presentation of their pension wealth in terms of default retirement ages. Second, loss-averse workers tend to hold on to their originally planned retirement age after a pension reform (Behaghel and Blau, 2010). Financial literacy plays an important role as well. Are individuals capable of understanding their pension plan? Are they able to understand the effects of a pension reform and act in their own interest?

Apart from bounded rationality, *social norms* may affect retirement decisions as well. The utility of individual workers may incorporate disutility from norm deviation (Lindbeck et al., 1999). If the norm is to participate in the labor market as long as one is able to, then – apart from the utility derived from leisure – early retirement would generate disutility to the individual worker. Therefore, an individual influenced by social norms prefers a retirement age close to the norm. If a social norm changes, then this will lead to an adjustment in individual behavior, and subsequently to a new equilibrium. Existing research suggests an important role for such norm effects.

This paper concludes that the default retirement age and reference points seem to be important psychological factors for explaining retirement behavior. The same holds true for social norms. The way the pension scheme is presented to the individual in terms of default retirement ages may have an important effect on the individual’s retirement age. Moreover, individuals show a tendency to stick to their originally planned retirement age (i.e. their reference point). Hyperbolic discounting may have some effect on individual retirement behavior, but does not seem crucial in explaining the retirement peaks. Social norms are likely to be important: individuals are open to ‘retirement advice’ offered by their direct environment and to more abstract social norms (e.g. from the media).

The remainder of this paper is organized as follows. Section 2 shows aggregate retirement patterns in the Netherlands, Sweden and the US. The retirement peaks appear closely linked to the institutional ‘standard’ retirement options. Section 3 discusses ‘traditional’ economic models of retirement and highlights their shortcomings in describing retirement behavior. Section 4 explores the impact of bounded rationality on retirement, and section 5 deals with the impact of social norms. Section 6 concludes.

## 2. Retirement peaks in the Netherlands, Sweden and the US

### 2.1 Introduction

The retirement behavior of individuals is typically related to retirement institutions. This section highlights the correlation between the ‘standard retirement age’ in (early) retirement schemes and individual retirement behavior. While this correlation can sometimes be explained by the actuarial non-neutrality of early retirement

schemes, it will be shown here that retirement behavior is still correlated with the standard retirement age even when schemes are actuarially neutral. In the Netherlands and the US, withdrawal from the labor force at the standard early retirement ages is common— although financial incentives stimulating such behavior are hardly in place (anymore) (sections 2.2 and 2.4, respectively). In contrast, there is no standard early retirement age in Sweden, and there are no retirement peaks before the normal retirement age of 65 (section 2.3).

## 2.2 The Netherlands

In the Netherlands, individuals are entitled to a state pension starting at the age of 65. Occupational pensions and early retirement benefits may be received from that age, but typically they may also be received from an earlier age. Figure 1 shows the development of the average retirement age in the Netherlands between 1999 and 2009. Between 1999 and 2006 there is a slight upward trend of about half a month later retirement per year. In 2006 there is a sudden increase in the average retirement age by almost one year, which is likely related to the ‘VPL’ reform that took place in that year. According to this reform, all actuarially non-neutral early retirement schemes were *de facto* abolished.

The exit rates from work to retirement contain peaks at the ‘standard’ early retirement ages. Figure 2 shows exit rates from work to retirement for two different periods, 09/1999-09/2000 and 09/2008-09/2009. The largest peaks are found at the ages of 60 (in 2000) and 62 (in 2009). These peaks are related to the standard ages in early retirement schemes. The exit rate distribution shifts to higher ages in the later period. The peak at age 60 declines, whereas the exit rate at age 62 becomes much larger. All exit rates before age 62 decline, and all exit rates after that age increase.<sup>2</sup> Another retirement peak is observed at the state pension age of 65. In principle, all of these peaks might be the result of financial and non-financial motives.

Early retirement schemes in the Netherlands have shifted towards actuarial neutrality, implying that implicit taxes on working beyond the standard retirement age have been importantly reduced. It is therefore unlikely that the retirement peaks in 2008/2009 are still related to the actuarial non-neutrality of retirement schemes. In the 1980s and ‘90s, most workers were entitled to early retirement through so-called VUT schemes, which were financed on a pay-as-you-go basis and had a large implicit tax on working beyond the standard VUT-retirement age. Since the end of the 1990s, the VUT schemes were gradually replaced by so-called Flexible pension schemes. These schemes were capital-funded and largely actuarially fair, and therefore hardly generated implicit subsidies or taxes for deviation from the standard retirement age.<sup>3</sup> This means that the employee can choose to retire earlier or later than the standard retirement age without affecting his early retirement entitlements. In 2000, the VUT schemes were still common. The introduction of a new law in 2006 accelerated the transition towards the new Flexible pension schemes, and in fact the VUT schemes were abolished from that year.<sup>4</sup> Exit behavior in the initial period of 1999- 2000 is therefore largely related to the VUT schemes, and exit behavior in the second period of 2008- 2009 to the Flexible pension schemes.

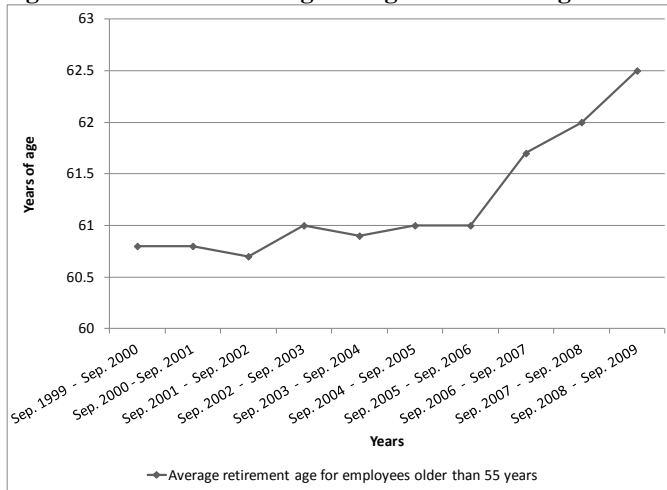
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<sup>2</sup> Preliminary data of Statistics Netherlands show that this trend continues markedly after 2009: the peak at age 60 disappears, and the peaks at 62 and 65 show a further increase.

<sup>3</sup> Flexible early retirement schemes are in principle capital-funded. However, at the start the funding of these schemes still closely resembled a pay-as-you-go scheme, as there was no pension capital yet. Actuarial fairness was largely established *between* early retirement ages, but in general not when retirement was postponed until after the state pension age. Take-up after the age of 65 may lead to either a loss or a gain of early retirement benefits, as the result of a different fiscal regime after this age.

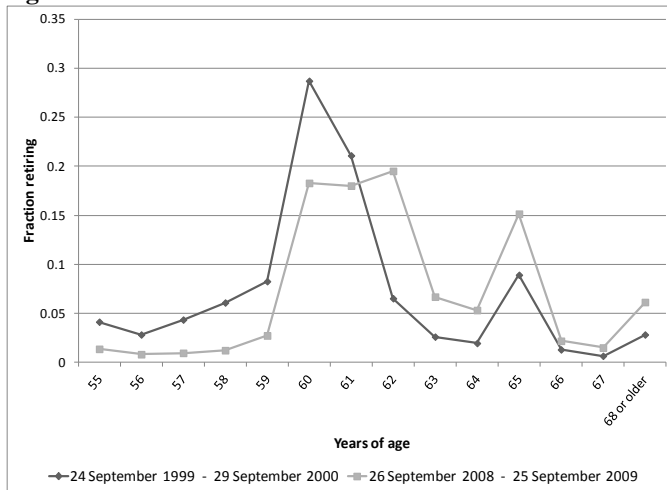
<sup>4</sup> In Dutch: Wet aanpassing fiscale behandeling VUT- en prepensioenregelingen en introductie levensloopregeling (wet VPL). As a direct consequence of this law, the Flexible pension schemes were integrated with the occupational pension schemes.

**Figure 1** Increasing average retirement age



Source: own calculations based on data from Statistics Netherlands (CBS, Sociaal Statistisch Bestand). Retirement is defined as the transition of employed individuals to retirement. This transition is defined as having labor income as primary income at the beginning of the period and having retirement income at the end of the period.

**Figure 2** Exit rates to retirement in the Netherlands shift to higher ages

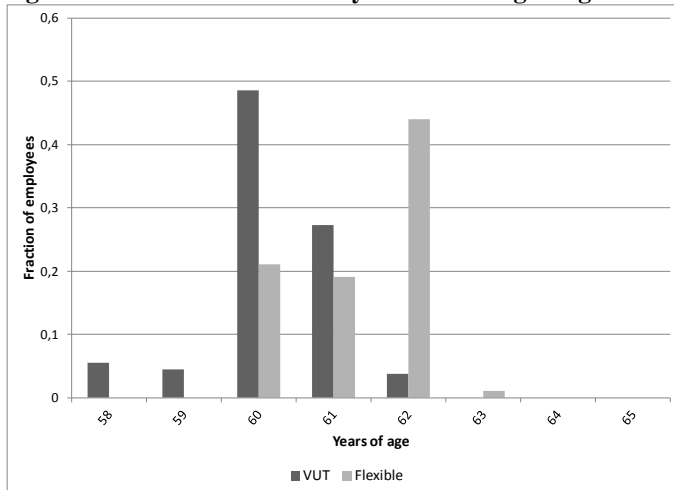


Source: own calculations based on data from Statistics Netherlands (CBS, Sociaal Statistisch Bestand). In this figure, the exit rate at a certain age is defined as the share of formerly employed retirees leaving the workforce at that age. This transition is defined as having labor income as primary income at the beginning of the period and having retirement income at the end of the period.

Standard early retirement ages have gone up. Figure 3 shows the distribution of standard retirement ages for the two kinds of early retirement schemes, based on a sample of collective labor agreements representing more than 4.9 million employees.<sup>5</sup> The distribution shows that the average standard early retirement age has increased. A large fraction of employees was confronted with an early retirement age of 60 in the VUT schemes. With the Flexible pension schemes, the larger part of the employed individuals faced an early retirement age of 62 and the fraction of employed individuals enjoying an retirement age earlier than 61 was drastically reduced. It can thus be concluded that the exit rates shown in Figure 2 tend to follow the standard retirement ages shown in Figure 3. This appears to be the case, regardless of whether the retirement scheme is actuarially neutral or not. Financial incentives thus appear to have limited explanatory power. The end of this section takes a closer look at the correlation between exit rates and standard retirement ages. But before doing this, the section first repeats the above exercise for the three largest sectors of industry in the Netherlands.

<sup>5</sup> This is the total number of employees for all 132 collective labour agreements. For some collective labour agreements the standard height of the pension age for the VUT- or Flexible scheme is not known or there is no early retirement scheme. So these employees are not included in the distribution. These 4.9 million employees can be compared to the total number of jobs under collective labour agreements in 2002, which amounts 7.1 million jobs.

**Figure 3 Standard early retirement ages higher in the new Flexible pension schemes**

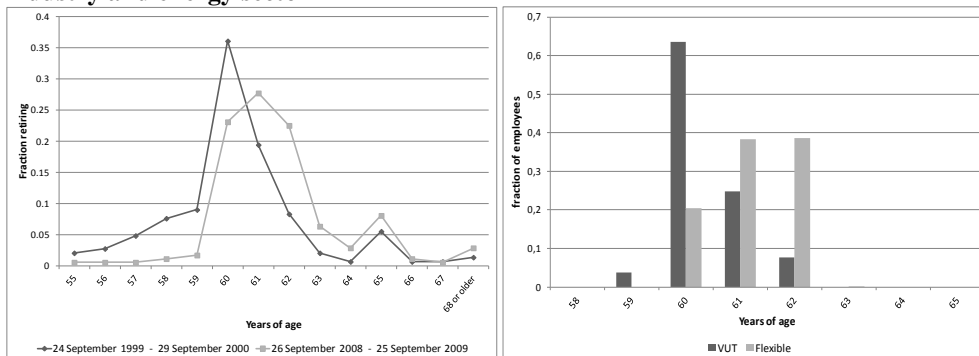


Source: Ministry of Social Affairs and Employment. The histogram is based on a sample of 132 collective labor agreements that were in effect at the end of 2002. At that time the transition towards flexible pensions was gradually taking place. New legislation in 2006 accelerated this transition. The collective labor agreements are weighted by the number of employees. Collective labor agreements without listed early retirement schemes are omitted.

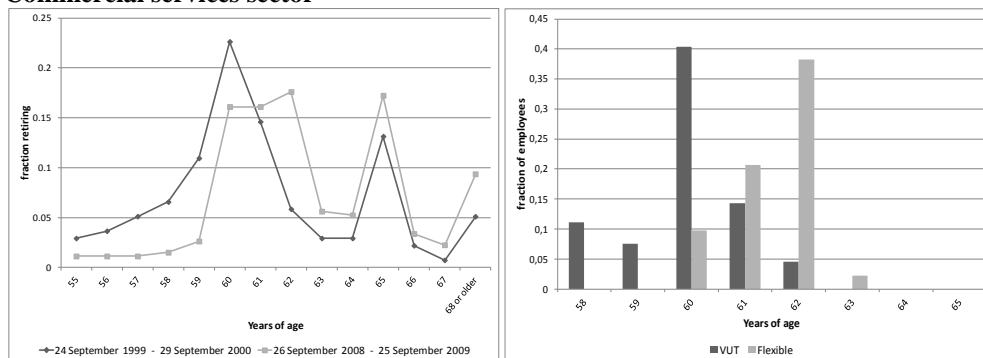
A closer look at different sectors of industry suggests that the correlation between exit rate and standard retirement age stays in place. The three largest sectors of the Dutch economy are industry and energy, commercial services, and non-commercial services. The non-commercial services sector mostly includes the government, education and health care sector. Figure 4 shows the exit rates for employees in these sectors (left panel), together with the distribution of standard early retirement ages (right panel). In all sectors, both the standard early retirement distribution and the exit rate distribution have shifted towards higher ages. In the first two sectors, 30-40% of the employees no longer have age 60 as their standard early retirement age. At the same time, the share of employees retiring at that age has decreased by 5-10 %-points. In the non-commercial services sector, age 61 is hardly anymore a standard early retirement age, and at the same time the exit rate at this age has gone down by 15 %-points. In the two other sectors, age 61 has instead become more important as a standard early retirement age, and indeed, exit rates at this age rose by about 5%-points. Finally, age 62 has become a much more important early retirement age in all three sectors, evidenced by the largest exit rate increase at this age for the (non-) commercial services sector, about 20 %-points. The correlation between exit rate and standard retirement age is understandable for the first period, when VUT schemes with high implicit taxes on continued work were prevalent. It is remarkable, however, that the correlation is still there for the Flexible pension schemes, as these schemes are in principle actuarially neutral.

**Figure 4 Exit rates from employment to retirement (left) and standard early retirement ages (right) both shift towards higher ages**

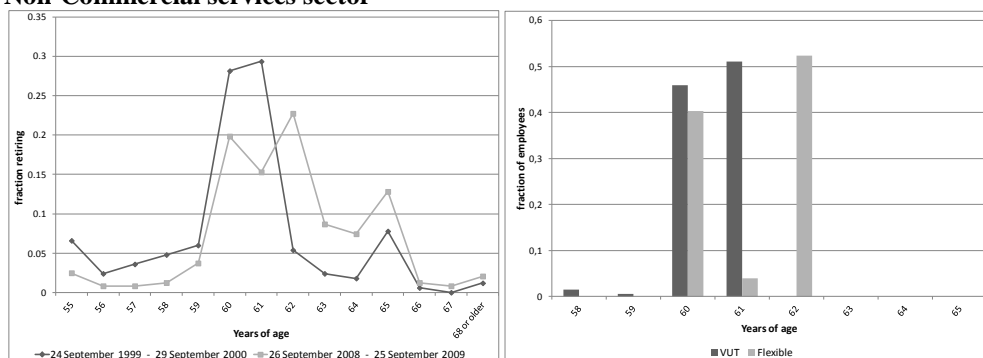
**Industry and energy sector**



## Commercial services sector



## Non-Commercial services sector

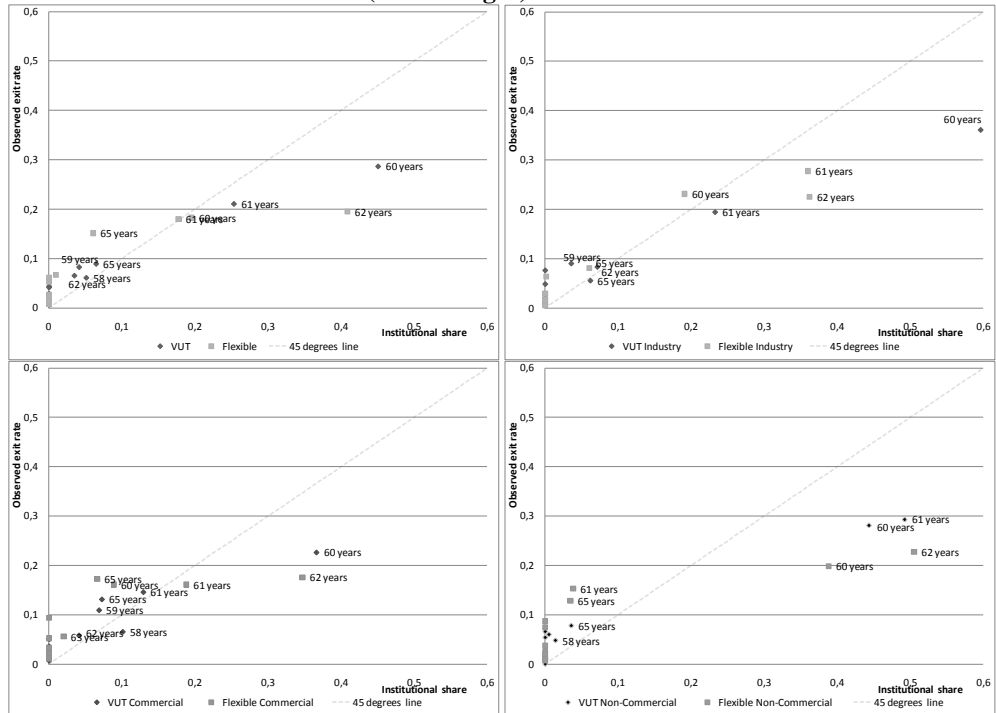


Source: own calculations based on Sociaal Statistisch Bestand of Statistics Netherlands (left) and Ministry of Social Affairs and Employment (right). In the figures on the left, the exit rate at a certain age is defined as the share of formerly employed retirees leaving the workforce at that age. This transition is defined as having labor income as primary income at the beginning of the period and having retirement income at the end of the period. The figures on the right are based on samples of collective labor agreements representing 1.1 million, 2.2 million, and 1.5 million employees, respectively.

The correlation between exit rates and standard retirement ages is presented more directly in Figure 5. The exit rates observed in 1999-2000 are mainly related to VUT schemes, whereas those in 2008-2009 are mainly related to Flexible pension schemes. The figures confirm that the standard early retirement age is positively associated with the exit rate at that age. The correlation between the VUT exit rate and the standard retirement age is 0.96. This same correlation for Flexible pension schemes is lower, but still remarkably high at 0.80 (Table 1). The high correlation for VUT schemes is understandable, as this scheme leads to an implicit tax on working beyond the early retirement age. This implies that employees have a financial incentive to not deviate from the standard early retirement age. It is therefore likely that financial incentives largely explain the correlation between the VUT early retirement age and the observed exit rate. This is not the case, however, for the Flexible pension scheme, which has in principle no financial incentives to choose a particular early retirement age. Yet, the figure shows a clear correlation between the standard early retirement age of the Flexible pension scheme and the observed exit rate to retirement. Possible explanations for this large correlation will be offered in the rest of this paper.



**Figure 5** The standard early retirement age correlates with exit rates for all sectors (top left), the Industry and energy sector (top right), Commercial (bottom left) and Non-commercial services sector (bottom right)



Source: own calculations on basis of data of Statistics Netherlands (CBS, Sociaal Statistisch Bestand) and Ministry of Social Affairs and Employment. The institutional shares are multiplied by the collective agreement coverage rate, which equals 93% for the total economy, 94% for industry and energy, 91% for commercial services and 96% for non-commercial services.

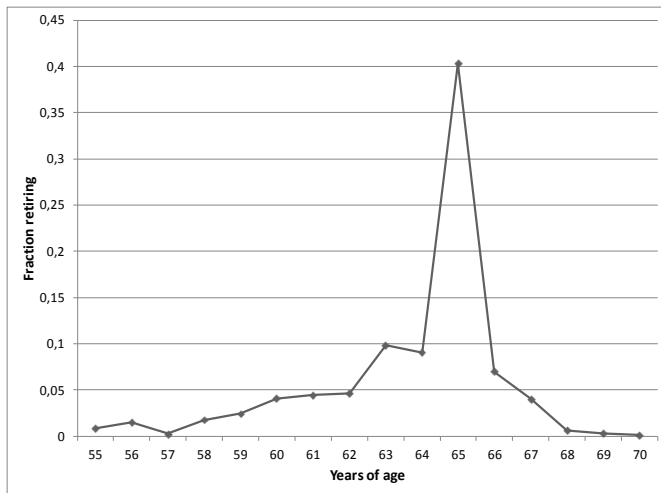
**Table 1** Correlation actual retirement age with institutional retirement age remains high after switch to actuarially neutral schemes

	VUT	Flexible
<b>Industry and Energy</b>	0.97	0.94
<b>Commercial Services</b>	0.85	0.69
<b>Non-commercial Services</b>	0.97	0.81
<b>Total</b>	0.96	0.80

### 2.3 Sweden

The exit rate from employment to retirement of the Swedish labor force peaks at age 65, but no peaks are seen before that age (Figure 6). Before age 65, there is a slow increase in the exit rate starting in the late 50s. The nonzero exit rate before age 60 is related to the disability insurance scheme. The age of 60 is the first age for which retirement is possible. In Sweden there is no standard early retirement age. Retirement is possible between the ages of 60 and 70. Retiring before (after) 65 leads to smaller (larger) retirement benefits than retiring at that age. The peak at age 65 used to coincide with the age of mandatory retirement (Gruber and Wise, 1999). Reforms since 2005 enable employees to continue working past that age. But after the age of 67 years consent from employers is needed. Negotiations with the social partners determine this (OECD, 2012).

**Figure 6 Exit rate from employment into retirement in Sweden, 2000-2011**

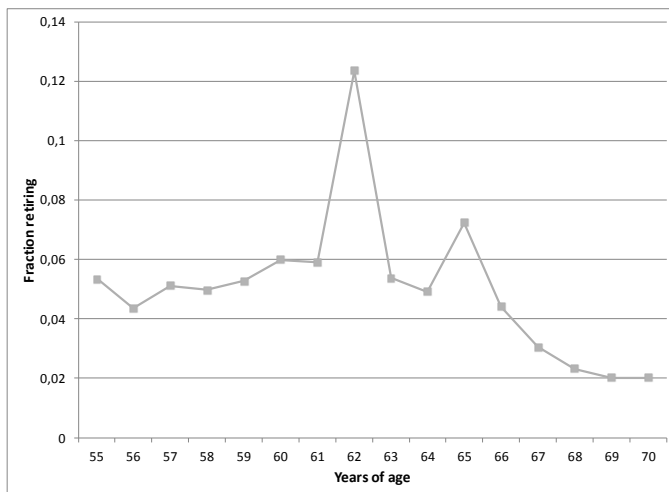


Source: own calculations on basis of SHARE data (wave 4).<sup>6</sup> The figure shows the number of respondents retiring at a particular age as a fraction of the total number of retirees. Weighted data have been used.

## 2.4 The United States

Workers in the US, like the Netherlands, generate a spiked retirement pattern. Figure 7 shows spikes at the ages of 62 and 65 in the exit rate out of the labor force in the United States. The age of 62 coincides with the early retirement age for social security, and 65 was the normal retirement age. The early retirement spike in the US is likely related to market imperfections or individual irrationalities (Gruber and Wise, 1999). There is a small implicit tax on continued work beyond the early retirement age, but it is not comparable to the large work disincentive in the Netherlands before 2006 (section 2.2). Since 1986 there is no longer mandatory retirement in the US. Non-financial determinants of retirement are therefore likely important.

**Figure 7 Exit rate from employment into retirement in the US, 2000-2010**



Source: own calculations on basis of RAND HRS data (2010).<sup>7</sup> HRS records the retirement and birth month and year of the respondents. The figure shows the number of respondents retiring at a particular age as a fraction of the total number of retirees. Weighted data have been used.

<sup>6</sup> This paper uses data from SHARE wave 4 release 1, as of November 30th 2012. The SHARE data collection was funded primarily by the European Commission through the 5th Framework Programme (project QLK6-CT-2001-00360 in the thematic programme Quality of Life), through the 6th Framework Programme (projects SHARE-13, RII-CT-2006-0621 93, COMPARE, CIT5-CT-2005-028857, and SHARELIFE, CIT4-CT-2006-028812) and through the 7th Framework Programme (SHARE-PREP, N° 211909, SHARE-LEAP, N° 227822 and SHARE M4, N° 261982). Additional funding from the US National Institute on Aging (U01 AG09740-13S2, POI AG005842, POI AG08291, P30 AG12815, R21 AG025169, Y1-AG-4553-01, IAG BSRO6-11 and OGHA 04-064) and the German Ministry of Education and Research as well as from various national sources is gratefully acknowledged (see [www.share-project.org](http://www.share-project.org) for a full list of funding institutions).

## 2.5 Conclusion

Retirement peaks differ among countries. The US and Netherlands have strong peaks at standard early retirement ages, even when schemes are (nearly) actuarially neutral. The retirement peaks can therefore not be explained by financial incentives alone. In Sweden there is no standard early retirement age, and indeed, there are no early retirement peaks either. These findings suggest that the institutional early retirement age has a causal effect on retirement behavior.

## 3. Classic models of retirement and their incompleteness

### 3.1 Introduction

The peaks observed in individual retirement behavior cannot entirely be explained with standard economic models. This section first discusses the achievements of economic models in explaining individual retirement behavior in general, and second, discusses their ability to predict individual reactions to policy measures such as raising the statutory pension age.

The life-cycle framework is the standard way economists think about the intertemporal allocation of time and income (Browning and Crossley, 2001). There is no such thing as *the* life-cycle model, and many particular life-cycle models have been developed within this framework. The basic assumption is that individuals keep their (time-adjusted) marginal utility of money constant over time. If – as economic textbooks often assume – marginal utility depends entirely on consumption, then the life-cycle framework implies a flat consumption profile or constant growth of consumption over the life-cycle. Subsection 3.2.1 first describes the simplest structural neoclassical life-cycle model that optimizes consumption and leisure by adjusting savings and labor supply (both hours and retirement). Within this model, financial incentives play a dominant role. We describe the underlying assumptions and main predictions. Individual heterogeneity typically leads to a distribution of retirement ages without peaks, which appears difficult to reconcile with empirical data as presented in section 2. Subsection 3.2.2 discusses individual heterogeneity and institutions affecting the retirement decision. In addition to the textbook life-cycle model, many empirical studies have used reduced-form models or simplified structural models, such as the option value model. Such reduced-form analyses leave more room for non-financial determinants, but are again not able to predict ‘spiked’ retirement behavior (subsection 3.2.3). Section 3.3 discusses the ability of traditional models focusing on financial incentives to predict individual retirement behavior after raising the statutory pension age. Again ‘spiked’ retirement behavior is observed, whereas these models of retirement predict more heterogeneous and smooth reactions of individuals.

### 3.2 Traditional models of retirement behavior

#### 3.2.1 The traditional neoclassical life-cycle model

Within a neoclassical life-cycle model individuals maximize their expected lifetime utility subject to a lifetime budget constraint. Consumption and leisure are the choice variables, and the individual’s optimal retirement date is implied by his leisure time path. If individuals face uncertainty about future wages, then they maximize expected lifetime utility given this uncertainty. A neoclassical context is often based on the following assumptions:

1. Self-interested and rational agents make choices on consumption and labor supply, giving them the best possible outcome without considering the impact on other individuals (external effects). *Choices are not affected by an external context like preceding decisions, social norms or presentation;*
2. Perfect information is available about current and future circumstances, such as prices and institutions. *Individuals are capable of processing the information.* For instance, uncertainty over future outcomes is weighted by objective probabilities;

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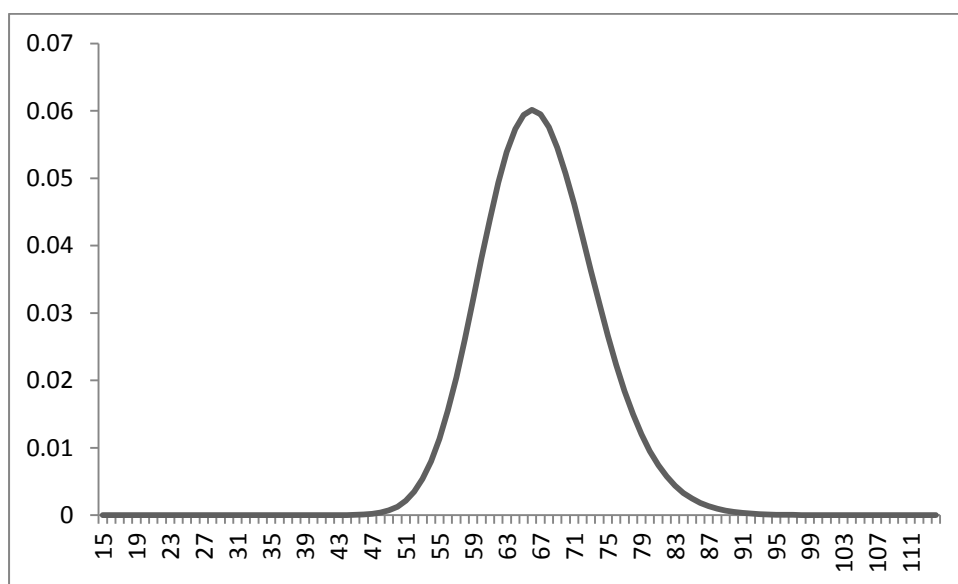
<sup>7</sup> RAND HRS Data, Version L. Produced by the RAND Center for the Study of Aging, with funding from the National Institute on Aging and the Social Security Administration. Santa Monica, CA (December 2011). The HRS (Health and Retirement Study) is sponsored by the National Institute on Aging (grant number NIA U01AG009740) and is conducted by the University of Michigan.

3. Perfect financial markets exist, where agents may borrow and lend without constraints;
4. There is *time-consistent behavior*, implying that intended future actions will actually be carried out as planned;
5. Labor and consumption are fully divisible. Aside from the budget constraint, there are no constraints on the amount of hours worked.

The assumptions highlighted in italics are of special interest for this paper. The following discussion focuses on two predictions of the neoclassical life-cycle model. First, the model predicts a smooth life-cycle pattern of marginal utilities, which leads to modest changes over time in labor supply and consumption. A second implication is that the impact of a change in external circumstances is divided among all periods of the residual lifetime. Within a life-cycle model, labor supply and consumption will therefore show a mitigated reaction in response to a shock.<sup>8</sup> When the pension age is raised by one year, then a person with an expected residual lifetime of 30 years sees a relative change in his lifetime wealth of, say, between 1 and 5%. Many life-cycle models then predict a similar increase in labor supply. This limited response corresponds to the empirical literature on the income effects of early retirement schemes.

The main prediction of traditional life-cycle models is a smooth time pattern of marginal utilities. In the absence of age-dependent preferences, wages and social security arrangements (including taxation) this leads to a flat profile of consumption and labor supply over the residual life-span. Net savings as the counterpart of consumption and labor supply will also show a flat age-profile. In such an oversimplified setting, retirement will never occur. Many life-cycle models therefore typically feature age-dependent wages, preferences and institutions. The time-profiles of consumption and labor supply are not flat in that case. For instance, an increasing preference for leisure with age will – ceteris paribus – increase the marginal utility of leisure. The life-cycle profile is then adjusted such that the marginal utility is again made constant over time. An increasing preference for leisure will thus result in a decreasing age-profile of labor supply. If individuals differ with respect to their health, preference for leisure, wage rate, preference for current vs. future consumption, then retirement ages differ as well. The aggregate pattern of retirement ages might then look like a normal or lognormal distribution. People start retiring from a certain age, and the majority of the labor force retires between, say, 55 and 70 years of age (Figure 8).

**Figure 8**      **Stylized example of what the aggregate retirement pattern may look like, on basis of a life-cycle model**



<sup>8</sup> A longer residual lifetime implies stronger mitigation. Mitigation is obviously no longer possible if the residual lifetime equals one period.

### Retirement peaks

The retirement pattern in Figure 8 is not consistent with patterns observed in actual data. There is a tendency to retire at specific ages (with much higher frequency than the top of Figure 8). For the Netherlands, we observed two retirement peaks concentrated at institutional retirement ages (section 2.2). Gruber and Wise (1999) contain a collection of papers describing retirement hazard rates in several industrialized countries at the end of the previous century. In many cases, these hazard rates show two typical peaks which coincide with (i) the standard retirement age of the social security pension scheme and (ii) the ‘standard early retirement option’. More recent data for the US suggest a shifted average retirement age, but leave the profile of two peaks unaltered (Johnson et al., 2010).

Within the neoclassical model, financial incentives may explain a part of the retirement peaks. Empirical evidence points at an important role for financial incentives, but its role is not sufficiently important to entirely explain the peaks. Lumsdaine and Mitchell (1999) conclude that the impact of financial incentives on early retirement in the United States is important, but that not more than half of the observed variation in retirement patterns in the US can be explained from these incentives. Euwals et al. (2010) looked at the impact of the Dutch early retirement scheme and conclude that the loss of an annual salary results in a shift of retirement of about one-and-a-half to two months. Banks et al. (2007) find virtually the same effect for the UK. For working individuals above age 50, they find that a reduction of pension wealth of about one year of salary leads to a retirement postponement of about two months. French (2005) and Bloemen (2011) also find limited effects of pension wealth on labor supply. Bloemen’s estimates imply that a reduction in pension wealth by one year of salary leads to later retirement by a month and a half. In a more general context — not specifically focused on retirement — Imbens et al. (2001) estimate that lottery winners consume just 11% of their winnings on leisure, which is in the same order of magnitude as the studies specifically focusing on pension wealth effects.<sup>9</sup> Therefore we may conclude that merely the financial incentive of a raised entitlement age is insufficient to shift a peak in the exit rates.

Historical data for the US also suggest an important relation between retirement peaks and the institutional age(s). Before 1920, there were no retirement peaks in the US. In 1940, five years after the introduction of Social Security, a peak had emerged at the standard Social Security age of 65 (Costa, 1998). The size of the peak rose to 30% in the 1980s and then declined to 19% after 2000 (Perrachi and Welch, 1994; Behaghel and Blau, 2010).

It seems likely that the retirement peaks are not only correlated with institutional pension ages, but that there is a causal link as well. Although pension systems often contain financial incentives to retire at particular institutionalized ages, several studies have shown that the financial incentives of these schemes cannot entirely explain the observed (changes in) labor supply responses at these particular ages. So, a typical large unexplained retirement ‘spike’ remains at these ages (Lumsdaine et al., 1996; Duflo and Saez, 2003). This was also strongly suggested by data for the Netherlands in section 2, particularly Figure 5.

#### 3.2.2 Extended neoclassical model

Traditional neoclassical life-cycle models may be extended with individual and institutional features (other than financial incentives) in order to explain the observed retirement patterns. Non-financial determinants of retirement behavior can be subdivided into four categories: individual factors (e.g. health, type of job, household situation), limited rationality of individuals, socio-cultural influences and institutions (other than those causing direct financial incentives). This paper addresses limited rationality and socio-cultural influences in sections 4 and 5. The focus in this section is on individual and (non-financial) institutional factors.

*Individual factors* do in general not result in retirement peaks, as heterogeneity is relevant over many individual dimensions. Health status and spousal preferences are, for instance, important determinants of retirement. For

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<sup>9</sup> Despite these relatively modest income effects, it has been argued that many studies even overestimate the pension wealth effect on retirement (Van Ooijen et al., 2010). If individuals have at least some freedom of choice in their pension wealth, then a high preference for retirement will go together with high pension wealth. This combination of a parameter (preference) and explanatory variable (change in pension wealth) causes an endogeneity problem that is often not properly taken into account in empirical research.

instance, disability may lead to early retirement.<sup>10</sup> Women often leave the workforce early following the retirement of their older partners (Henkens and Van Solinge, 2002; Gustman and Steinmeier, 1994). In that case, the preference for leisure depends on the participation of the partner.

*Institutions* may affect retirement decisions, and may in some cases help explain retirement peaks. *Constraints on hours worked* may lead to peaks in labor market exit rates. Disallowing individuals to adjust their hours worked, so that they are forced to retire fully, may help to reconstruct the retirement peaks (Van der Klaauw and Wolpin, 2008).<sup>11</sup> A change in *employment protection* when reaching the pension age may also lead to retirement peaks. Older employees often have more employment protection. This leads to a stronger bargaining position, especially if the older workers have a larger vote in trade unions. This will lead to wage profiles increasing in age. In turn, these wage profiles distort the labor market for older employees, as their wage is less representative for their productivity (De Hek and van Vuuren, 2011). The lack of employment protection after the pension age will therefore lead to unemployment/retirement if wages are not downwardly flexible. Particular *institutions related to standard pension ages* may also partly explain retirement peaks. For instance, in the US the age of 65 implies health care coverage by Medicare (Rust and Phelan, 1997). US data show that workers retire significantly more often in January and at their birthday (Kopczuk and Song, 2008). The January effect reflects the impact of earning tests in the Social Security system.

*Imperfect financial markets* may limit the opportunity to lend against second-tier pension benefits and may help to reconstruct (a part of) the retirement peaks (French, 2005; Rust and Phelan, 1997; and De Hek and Van Erp, 2009). This may be magnified by the lack of a flexible retirement age. Van Vuuren (2011) argues that a flexible retirement age not only serves as insurance against health and productivity shocks of the individual but also provides a hedge for the risk of falling pension assets.

### 3.2.3 Alternative neoclassical models of retirement

The neoclassical life-cycle model is difficult to handle in empirical studies, both for its analytical and its numerical complexity. It typically requires some restrictive assumptions on the functional form of the utility function in order to obtain explicit solutions for consumption and leisure time paths. Most empirical studies have either used strongly simplified versions of the life-cycle model, or derived some indicators that are used as explanatory variables in a reduced-form model. In the context of retirement, a typical indicator relates the individual gain of immediate retirement to that of later retirement. Indicators such as the so-called ‘option value’ still have a strong link with the life-cycle model, whereas others are only weakly related to it. This section summarizes some of these studies and shows that, as with the life-cycle model, the alternative models of retirement can only partially explain the retirement behavior of individuals. It is again contended that financial indicators are just a part of the story.

Many empirical studies estimate simplified versions of the neoclassical life-cycle model. A common – often realistic – simplifying assumption is that the leisure variable is binary – corresponding with either retirement or continued work – and that retirement is irreversible. As a consequence of this assumption, the *retirement age* contains sufficient information to reconstruct the optimal leisure time path. In this simplified model, retirement is optimal to the individual if the expected lifetime utility given immediate retirement is higher than the expected lifetime utility given at least one extra period of continued work. Several authors have estimated parameterized versions of this simplified life-cycle model, including generalized versions for households, and taking into account health, and liquidity constraints (French, 2005; Gustman and Steinmeier, 2005; Blau, 2008; Van der Klaauw and Wolpin, 2008). This approach is still computationally very demanding, however, which has led to many studies making further simplifying assumptions. For instance, Rust (1989), Rust and Phelan (1997) and Heyma (2004) assume that households cannot borrow or save.

In the ‘option value model’, rather than maximizing expected lifetime utility, an agent chooses the retirement date for which the expected utility is at its maximum.<sup>12</sup> In the first empirical analysis based on the option value

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<sup>10</sup> Behncke, 2009 (page 2) contains a list of references.

<sup>11</sup> Fouarge et al. (2012) find a preference for partial retirement.

<sup>12</sup> Technically, this model results from interchanging the max and expectation-operators in the life-cycle model (Stock and Wise, 1990a; 1990b). Equivalence between the two decision models is only achieved in the last period prior to death. In earlier periods, the option value

model, Stock and Wise (1990a; 1990b) allow for individual specific random effects in both wage and retirement income. However, only very few authors have succeeded in estimating the original option value model. Therefore most studies use a simplified approach, such as using an (ex ante) option value measure as an explanatory variable in a reduced-form model. The most common application is to add such an option value measure as a variable in a probit model explaining retirement<sup>13</sup> (e.g., Samwick, 1998; Börsch-Supan, 2000; Berkel and Börsch-Supan, 2003; Asch et al., 2005). Lumsdaine et al. (1992) conclude that the life-cycle model and the option value model perform equally well in explaining and predicting the retirement behavior of individuals. In a different context (viz. the application for disability benefits in the United States), Burkhauser et al. (2004) even conclude that the option value model outperforms the life-cycle model.

Stock and Wise (1990b) underestimate the retirement peaks at the ages of 62 and 65 by 28 and 51 percent, respectively. Lumsdaine, Stock and Wise (1996) examine ‘excess retirement’ at the age of 65 more closely using the option value in a probit estimation and the employment records of three different firms. By eliminating other explanations such as Medicare availability at the age of 65, they conclude that the peak at age 65 is attributable to ‘the influence of custom or accepted practice’. Later studies used employment records at the firm level less often. Instead, the attention shifted more towards the usage of data sets at the household level to include characteristics such as health or household composition. Samwick (1998) was one of the first to use such a data set. Using the option value method, the author underestimates the retirement peaks at the ages of 62 and 65 by 64 and 19 percent, respectively. The more recent study of Coile and Gruber (2007), based on the Health and Retirement Study, also finds unexplained retirement peaks at the ages of 62 and 65.

A potential drawback of the option value measure is that it is a function of not only the pension system, but also of the future wages of the individual (Coile and Gruber, 2000). The option value measures, for the most part, wage and other income effects rather than pension scheme effects. An alternative measure taking these drawbacks into account is the ‘peak value’, which is defined as the difference between total discounted pension wealth at its maximum expected value and total pension wealth if retirement occurs immediately. As discussed in Samwick (2001), the peak value is the same as the option value under the assumptions that (i) future wages do not affect the optimal retirement age, (ii) workers are not risk averse, and (iii) income in retirement has the same utility value as income before retirement. The peak value is usually used as an explanatory variable in a reduced-form probit model (see e.g., Coile and Gruber, 2000; Asch et al., 2005).

Both studies of Coile and Gruber (2000, 2007) underpredict the retirement peaks at age 62 and 65. These studies use the peak value in a reduced-form probit model. Interestingly, Asch et al. (2005) do not find retirement peaks at the ages of 62 and 65, but at the ages of 55 and 60. In their estimations they use a sample of employees for whom the regular provisions of Social Security do not apply.<sup>14</sup> They estimate their reduced-form models with option- and peak value separately. In their estimations with the option value they underpredict the retirement peak at the age of 55 by 21 percent and at the age of 60 by 9 percent. Estimations with the peak value give similar results: 22 percent and 13 percent, respectively.

### 3.3 Pension reform and retirement behavior

Life-cycle models typically predict a modest reaction in response to altered circumstances. Individuals ‘smooth’ the impact of a shock on consumption and labor supply among all periods of their residual lifetime. In case of a negative shock, consumption and leisure will fall. This implies an increase in labor supply through a rise in the hours worked (intensive margin) or postponement of the retirement age (extensive margin). For instance, a back-of-the-envelope calculation of the effect of a rise in the normal retirement age from 65 to 67 years results in a reduction in lifetime wealth of 0-5%. Individuals in their early sixties face a relatively strong impact on lifetime wealth due to their smaller remaining lifetime. The large residual lifetime horizon of younger age groups limits the (present value) effect of the lost pension benefits at ages 65 and 66 on lifetime wealth. For

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model predicts quicker retirement than the life-cycle model does. Technically, this is because the expected value of the maximum of a set of random variables is larger than the maximum of their expected values.

<sup>13</sup> This is equivalent to estimating the full option value model with fixed parameters and deterministic wages and retirement income (Lumsdaine et al., 1992).

<sup>14</sup> The data set is composed of permanent federal civil service personnel for the Department of Defense during the fiscal years of 1982 through 1996.

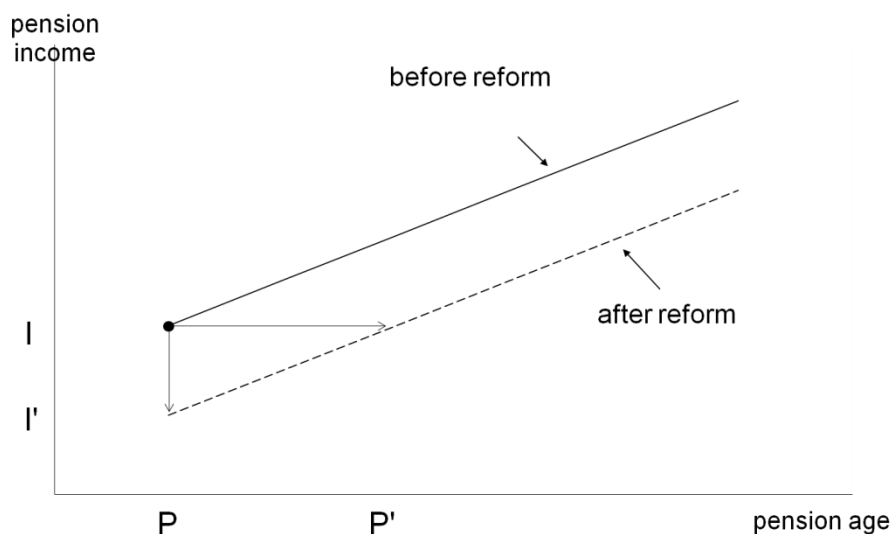


individuals facing this policy in their mid-sixties, the back-of-the-envelope calculation results in an increased annual labor supply of approximately two months, while youngsters increase labor supply by (approximately) one week.

The empirical literature and model simulations find a modest pension wealth effect on retirement. In 1983 the US government announced the increase in the normal retirement rate, starting in 2003. Applying empirical neoclassical economic models, Gustman and Steinmeier (1985, 2006) and Fields and Mitchell (1984) describe expected changes in labor supply and retirement age in response to this change in the normal retirement rate. Roughly speaking, these studies indicate an increase in the retirement age of about two months in response to a two-year rise in the normal retirement age (Van Erp and De Hek, 2009, pp. 93-94).

These models of retirement imply that increasing the statutory pension age is equivalent to (i) lowering pension wealth, or to (ii) lowering pension income. This is illustrated in Figure 9, where the statutory pension age is raised from  $P$  to  $P'$ . In an actuarially neutral pension scheme, the higher statutory pension age is financially equivalent to keeping the statutory pension age constant and lowering pension income to  $I'$ . Indeed, actuarial neutrality implies that pension wealth, defined as the present value of all future pension benefits, resulting from income  $I$  starting from age  $P'$  is precisely equal to pension wealth resulting from income  $I'$  starting from age  $P$ . The reform decreases pension wealth by the surface between the solid line and the dashed line. In traditional neoclassical models of retirement it is irrelevant which point on the dashed line is defined by the reform, as the wealth effect is equal in all cases, and this wealth effect is assumed to be the only driving force behind an adjustment in the retirement age. After the reform the individual will choose his own preferred combination of retirement age and income on the dashed line. So, these models indeed imply that statutory pension age reform leads to a wide range of individual reactions, with no specific clustering at particular retirement ages.

**Figure 9 Under rationality, raising the pension age is equivalent to lowering pension income**



Empirical evidence suggests, however, that the participation effect of a rise in the statutory pension age is not the same as the participation effect of lower pension wealth or lower pension income (Mastrobuoni, 2009; Blau and Goodstein, 2010). Using survey data, Liebman and Luttmer (2009) find that the way of framing Social Security benefits affects the individuals' (hypothetical) retirement decision. Behaghel and Blau (2010) reject the hypothesis that retirement behavior is solely driven by a wealth effect, and indeed find that the retirement peak moves along with the standard pension age. They find that about 20% of the claims occurring at the standard pension age are related to the mere fact that it is the standard pension age. Ex-post evaluations of the aforementioned US reform find a sharp decline in the peak of the retirement age at 65 (25-50%) (Behaghel and Blau, 2010; Blau and Goodstein, 2010; Mastrobuoni, 2009; Song and Manchester, 2008). This exceeds the predicted changes by neoclassical life-cycle models. This empirical evidence suggests that social and psychological issues also play an important role in the tendency of workers to retire at a specific



institutionalized age. Hanel and Riphahn (2009) achieve a comparable result based on a Swiss reform that entailed an increase in the normal retirement age in the (first-pillar) public pension scheme for women of ages 62 to 64 years. The empirical findings of Mastrobuoni (2009) and Hanel and Riphahn (2009) suggest that social norms and/or default retirement options play a significant role in the retirement decisions of individuals.

### 3.4 Conclusion

It is virtually impossible to reconstruct the observed trends in retirement peaks within a traditional neoclassical life-cycle model. Moreover, such models predict moderate labor supply responses to increases in the statutory pension age, whereas empirical studies find larger responses. So, traditional neoclassical life-cycle models focusing on financial incentives are not sufficient for predicting the retirement behavior of individuals. Heterogeneity of individuals does not, in general, produce peaks in exit rates. Institutional factors, such as age-related compulsory dismissal, may result in peaks.

## 4. Bounded rationality

### 4.1 Introduction

The distinction between defaults, reference dependence and social norms is not entirely straightforward.<sup>15</sup> In this section, the description ‘defaults’ refers to cases where individuals do not (have to) make an active choice. By not taking action, the individual passively chooses the ‘default option’. ‘Reference points’ have to do with decision-making whereby gains and losses are related to the particular points of departure of individuals. Financial illiteracy is not separately mentioned in this list as it does not provide a standalone explanation of retirement peaks. However, financial illiteracy challenges the neoclassical assumption of individuals who are able to collect and process properly all available information—and it might explain why people are guided by defaults, reference points or social norms.

With bounded rationality as a common feature, this section discusses three potential explanations for the residual retirement peak: default options (section 4.2), reference dependence (section 4.3), and hyperbolic discounting (section 4.4). For each, the main difference compared to the traditional neoclassical framework is briefly addressed, followed by a discussion of the empirical literature. A brief survey of the literature on financial illiteracy is presented in a separate box. The discussion on social norms is left for section 5. Of the explanations involving bounded rationality, default options and reference dependence seem to be particularly promising candidates for explaining retirement peaks. Empirical evidence is still very scarce, however, and much more research is needed to fully understand their precise importance in explaining individual retirement behavior.

### 4.2 Default options

The availability of large micro data sets has resulted in an extensive literature on the influence of default options. According to this literature, individuals often prefer the (implicit) choice for which no further action is required. This is referred to as the tendency to choose a ‘default option’, to focus at a ‘reference point’, or ‘status quo bias’ (see, e.g., Kahneman et al., 1991). This may play a role in the retirement decision, where loss-averse individuals prefer to choose the standard option rather than taking up their pension benefits earlier or later. In addition, financially illiterate workers may be unable to judge whether early or late take-up of pension benefits is beneficial to them, and therefore stick to the standard retirement age.<sup>16</sup> Empirical evidence on the effect of the default retirement option on the retirement age is still scarce. Recent results suggest that its relevance is limited (Behaghel and Blau, 2010). On the other hand, a great deal of evidence from other fields – including pension savings decisions – suggests that it may be too early to reject the default option explanation for retirement behavior.

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<sup>15</sup> Defaults, reference points and social norms sometimes overlap. For instance, the standard renewal of insurances acts as a default, but also as a reference point.

<sup>16</sup> The fiscal regimes before and after the Dutch state pension age differ. This makes retirement-age decisions even more complicated and increases the relevance of financial illiteracy.

### *Main difference compared to traditional neoclassical framework*

Within the neoclassical framework, an individual chooses between different options by comparing their costs and benefits. Individual choices are not affected by an external context (such as preceding decisions or presentation of choice). Following the default means that individuals do not actively search for an optimal result—and hence they do not make an explicit choice. This attitude conflicts with the first assumption of the traditional neoclassical model in which an individual is self-interested and makes choices that give him the best possible outcome. With default options, the individual attaches some additional costs to deviation from the default.<sup>17</sup> A well-known example is organ donation. The Belgian system labels individuals as donor (default) unless they explicitly opt out. In the Netherlands, individuals are not labeled as donor (default) unless they explicitly subscribe in the donor register.<sup>18</sup> It has been shown that the “yes, unless” system results in a larger amount of donors than the “no, unless” case (Johnson and Goldstein, 2003). Apparently, some people do not make an explicit and an environment-independent decision, and merely accept the default. The effective amount of donors is 13 per million inhabitants in the Netherlands and 24 per million inhabitants in Belgium (Baillon and van Dolder, 2011). Thus, the country with the ‘donor default’ has an 85% higher score. A second example of defaults is the automatic renewal of contracts such as insurances, periodicals and memberships.

One of the explanatory factors of the influence of defaults on financial decisions is a limited capability to decide properly on financial issues. During the past decade this ‘financial illiteracy’ has been extensively investigated (see textbox ‘Financial literacy’), and it challenges the neoclassical assumption of individuals who are able to collect and process properly all available information. This lack of ability may lead people to make decisions on defaults in the confidence that those defaults will in general be good for them. The way of presenting choices to individuals also affects their decisions (see textbox ‘Framing’).

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<sup>17</sup> This may be rational to the extent that transaction costs are involved.

<sup>18</sup> The non-registration default actually leaves the decision to the relatives of the deceased.

## **Financial literacy**

In recent decades economists have addressed the issue of the capability and knowledge of financial decision-making of households. Much research in the past decade has focused on assessing this capability. Household surveys were extended with questions on financial literacy, such as the capacity to conduct interest rate calculations (single, compound), to understand the impact of inflation, and to assess knowledge about risk. This literature directly tests the neoclassical assumption of individuals who are able to collect and process properly all available information.

Recently, Lusardi and Mitchell (2011) published a survey on financial illiteracy around the world. They conclude that many people do not understand basic economic concepts such as inflation and risk. A significant majority is unable to conduct simple interest rate calculations and make projections of future income and consumption in order to determine the required amount of pension saving and/or the optimal retirement decision. There is a strong correlation between indexes of financial literacy and the educational level. Women are less financially literate than men, and they are aware of this. Younger people know very little about financial issues, and acknowledge it. Older people overestimate their knowledge. Most workers have not planned or even given much thought to their retirement.

These findings may help in explaining two empirical observations: the lack of pension wealth accumulation in countries like the US and the modest changes in labor supply in response to a change in pension wealth. If people are unable to predict future consumption, to assess the impact of the inflation rate on future consumption and the present value of future income and consumption, then it will be impossible to develop a proper savings plan to obtain the required amount of pension wealth at the desired retirement age. (Here, we ignore the commitment issue to savings, which is left for section 4.4.) In other countries, like The Netherlands, many employees are obliged to participate in company retirement plans. In that case, wealth accumulation is to a large extent guaranteed. Participants still overestimate their replacement rate (Van Els et al., 2007), however, which indicates certain deficiencies in pension scheme knowledge. Dutch employees are allowed to determine their own retirement age, but only a small fraction gives serious thought to retirement planning (Van Rooij et al. 2011).

## *Empirical applications*

Default options have been studied mainly in the context of savings and pension portfolio decisions of individuals and households rather than retirement age. In that context, there is overwhelming evidence that default options play an important role (see, e.g. Thaler and Benartzi, 2004; Madrian and Shea, 2001; Carroll et al., 2009). Thaler and Benartzi (2004) investigated the impact of a savings program in which individuals commit themselves to savings rates in the near future. Instead of a commitment to save today, individuals participate in programs of committed future savings. The commitment to future savings and the possibility to opt out in the future induces the individual to join the program (see also hyperbolic discounting). The individual in the future, however, faces the default of remaining in the program. In short, the individual must make an active choice to quit this program. The empirical results show that 71 percent of those who were offered the plan joined the program and that 80 percent of those who enrolled were still in the program after the fourth pay rise. This program was introduced in several US companies and in different forms. Pension savings rates increased in systems with automatic enrollment (*i.e.* ‘participation unless’). Among others, Madrian and Shea (2001) investigated the impact of automatic enrollment in the US 401(k) pension plans. They conclude that 401(k) participation is significantly higher under automatic enrollment compared to non participation as default. Furthermore, the results show that participants hardly adjust the savings rate, even if it is in their own interest. With respect to pension savings, active decisions are preferred over default options if (i) people have a strong propensity to procrastinate savings decisions, (ii) (savings) preferences are heterogeneous and (iii) people are financially literate (Carroll et al., 2009). In the case of homogenous preferences, the tailor-made advantage disappears, and the financial literacy of individuals determines the preference for standard enrollment or automatic enrollment.

Regarding the influence of defaults on the retirement decision, less empirical research has taken place so far. Only recently Behaghel and Blau (2010) looked at the impact of the US Social Security reform of 1983. This reform implied an increase in the full retirement age from 65 to 66 years of age in two monthly increments per year of birth for cohorts born from 1938 to 1943. The authors find strong evidence that the peak in retirement at age 65 moved along with the full retirement age instead of smoothing the income shock over the residual lifetime.<sup>19</sup> Taking into account the educational level of respondents, the data of Behaghel and Blau (2010, p. 23) suggest “that wealthier and more cognitively skilled workers are more behavioral in the sense of following the Full Retirement Age more closely. This seems to go against a bounded rationality explanation whereby workers with lower cognitive skills would follow the FRA as a default solution, or consider it as advice from the Social Security Administration.”

The impact of a default option is probably larger in case of the retirement decision than with savings decisions. The retirement decision is a once-in-a-lifetime decision for most individuals, whereas savings decisions are made for many years, and individuals are able to learn from their earlier mistakes.

### **Framing**

Choice problems and policy reforms can be presented in many ways. Framing can influence decision-making by presenting one or more reference points. We consider framing complementary to other behavioral economics mechanisms. Brown et al. (2011) studied retirement behavior using framing experiments. In a survey, participants are asked to state their preferred retirement age within a given frame. The frames differ in wording across three dimensions: age anchors, consumption versus investments and gains versus losses. The monthly benefits associated with a retirement age are the same in every frame. Results show respondents claiming retirement significantly later when faced with a higher age anchor. The consumption frame presents the monthly benefits as insurance against longevity risk and the investment frame focuses on the illiquid nature of the monthly benefits and the low returns. Retirement behavior is not significantly different between these frames. Finally, the authors find a significant effect on retirement behavior of framing in terms of gains and losses. Individuals prefer to delay claiming retirement benefits when the benefits are framed as a gain instead of a loss.

## **4.3 Reference dependence with loss aversion**

Kahneman and Tversky’s (1979) prospect theory is often mentioned as the starting point of behavioral economics. Although originally developed to explain decisions under uncertainty, elements of prospect theory also seem relevant for decisions in a riskless environment. This has resulted in so-called reference dependence models. We conclude that it is difficult to assess the relevance of reference dependence for the retirement decision, as there is scant empirical research. The model is not inconsistent with recent data, but competing explanations, such as social norms, might be valid as well.

### *Main difference compared to traditional neoclassical framework*

Neoclassical models can allow for uncertainty. The individual decision is then based on maximum *expected* utility instead of maximum utility. Expected utility is a weighted average of the utilities of all possible circumstances, where the weight equals the probability of each circumstance. This way of dealing with uncertainty in individual decision-making, however, has its drawbacks. The concept of maximum expected utility assumes that the utility of a possible outcome is independent of the probability. The violation of this assumption has been known since the 1950s (Allais, 1953). Applying experimental economics in which individuals choose repeatedly between two gambles, Allais proved the inconsistency of observed preferences with the probability weighting of utilities. Since the 1950s, many other authors have confirmed this so-called Allais-paradox in other experiments.

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<sup>19</sup> The underlying identifying assumption relies on the attribution of changes in the claiming hazard to changes in the Full Retirement Age (FRA). The authors test for other changes during the period such as the Delayed Retirement Credit and abolition of the earnings test of Social Security at the FRA. They conclude that the impact of reaching the FRA itself is much larger than these other factors.

There seem to be more violations of expected utility theory. The Ellsberg paradox (Ellsberg, 1961) and the seminal paper of Kahneman and Tversky (1979) on prospect theory showed a large set of discrepancies between observed human behavior and predicted behavior by the neoclassical expected utility framework. Among those discrepancies, Kahneman and Tversky mentioned the reflection effect, according to which decision-makers act as risk seekers if they face losses, and risk-averse agents if they face gains. In other words, individual behavior seems to depend on the reference point. In this respect, observed behavior conflicts with the first assumption of the traditional neoclassical model on independence between the optimal outcome and the external context.<sup>20</sup> Apart from its application to decisions under uncertainty, the possible impact of reference points on economic decisions may also exist in riskless circumstances. These models are known as reference dependence models (Tversky and Kahneman, 1991). A recent study based on survey data in the Netherlands suggests that workers are much more responsive to a deterioration of pension income than to an increase (Henkens et al., 2009).

### *Empirical applications*

In an attempt to reconcile the empirics on economic behavior and predictions of theoretical economics, many authors have extended the traditional approach with a weighting function of the probabilities and/or a benchmark as a reference point. Although frequently tested within laboratories, application of the prospect theory on actual economic issues is still limited. A first exception was the application to the equity premium puzzle. This puzzle was raised by Mehra and Prescott (1985), who concluded that a large and implausible rate of risk aversion was required to reconcile the observed portfolio shares of bonds and stocks, expected utility theory and historical yields on bonds and stocks. Benartzi and Thaler (1993) used the insights of prospect theory to introduce an annual assessment of the portfolio performance by investors instead of a long-term assessment. The shorter horizon results in an additional risk aversion and so a larger reward for stock investments.

The structure of the lifetime wage profile was another application. Many wage profiles show an upward pattern that seems to exceed productivity growth. In addition to other possible explanations, Loewenstein and Sicherman (1991) showed the influence of reference dependence. Respondents were asked to choose between seven different wage profiles during the next few years. Without discounting, each profile returns a similar amount of total income, while the present value of the decreasing wage profile exceeds that of the increasing profile. Despite the profile's loss in terms of the present value of wages, the majority of respondents prefer the increasing profile with arguments such as "pleasure of increase" and "aversion to decrease". In terms of reference dependence, historical wages might serve as a reference point and positive deviations have a larger value.

Regarding the influence of reference dependence on the retirement decision, less empirical research has taken place so far. Quite recently, Behaghel and Blau (2010) looked at the impact of the US Social Security reform of 1983. This reform implied an increase in the full retirement age from 65 to 66 years of age by increments of two months per year of birth for cohorts born from 1938 to 1943. The authors find strong evidence that the peak in retirement at age 65 moved along with the full retirement age instead of smoothing the income shock over the residual lifetime. Although they conclude that loss aversion has a huge impact on the change in the retirement age, it is not enough to explain the occurring changes in the retirement age (pp. 32-33).

An unexpected loss in retirement wealth may affect the wellbeing of individuals. De Grip et al. (2009) consider the effects of a policy reform involving a reduction of pension rights of public sector employees born after 1 January 1950 on their retirement age, amount of savings and depression rates. Public sector employees born before 1 January 1950 retained their pension rights. The authors conclude that employees born after 1 January 1950 had higher depression rates, saved more and retired later. A possible explanation is that employees born shortly after 1 January 1950 implicitly assumed to have the same retirement benefits as the employees born shortly before 1 January 1950. The policy reform with its discontinuous assignment rule introduced a loss for these employees with respect to their reference point.

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<sup>20</sup> This does not mean that each neoclassical framework excludes an external context. As a synthesis, individuals could optimize (neoclassical framework) conditionally on their reference points. In that case, deviations from the reference point determine utility.

## 4.4 Hyperbolic discounting

Hyperbolic discounting has provided valuable insights into some empirical puzzles with respect to consumption and saving. It is now one of the most elaborate branches of behavioral economics. Policy simulations with life-cycle models show that, compared with exponential discounters, hyperbolic discounters react not very differently to a change in the retirement age. It is therefore concluded that hyperbolic discounting is not the most important answer to the ‘retirement peak puzzle’.

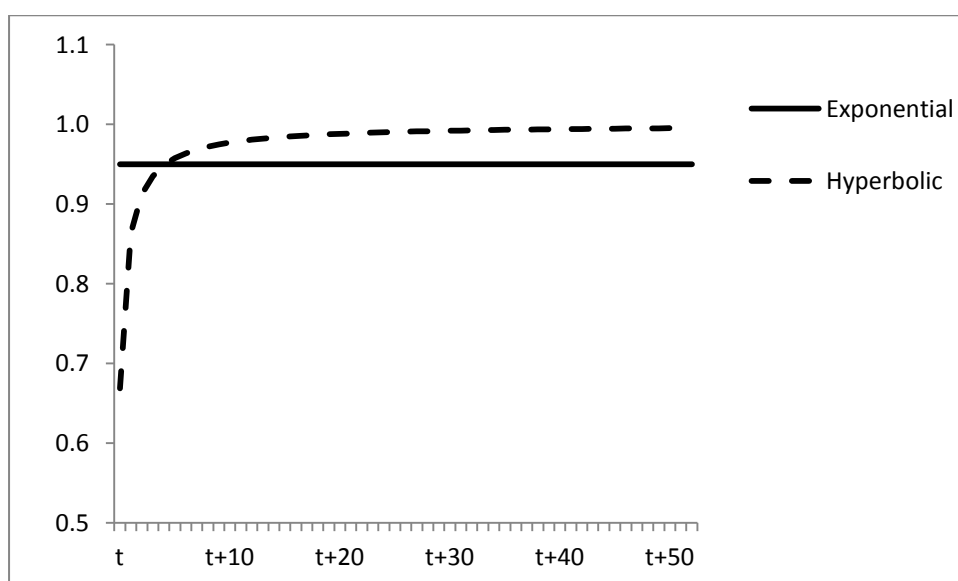
### *Main difference compared to traditional neoclassical framework*

Contrary to the neoclassical approach, hyperbolic discounting results in time-inconsistent decisions. The issue of time-inconsistency was first mentioned by Strotz (1957). The breakthrough in the economic literature started in the 1990s with seminal papers of Ainslie (1992), Loewenstein and Prelec (1992), and Laibson (1996).

Compared to the neoclassical analysis, hyperbolic discounting implies an altering preference for future consumption as the future comes closer to today. For example, people may have the intention to start soon with fitness training, to start savings, to stop smoking, or to stop eating fast food. However, after one period people regret their earlier plans and adjust their plans in favor of continuing spending, smoking and/or eating fast food.

The difference between time-inconsistent hyperbolic discounting and time-consistent exponential discounting is illustrated in Figure 10. Both lines reflect the relative value of a one-period postponed action compared to a present transaction. The solid line depicts the case of standard exponential discounting. Consumption with a dollar in 2012 ( $t+1$ ) has a value of 95% of consumption with the same dollar in 2011 ( $t$ ). As the horizontal line illustrates, the same relative importance occurs between consumption in 2013 ( $t+2$ ) and 2012 ( $t+1$ ). This unaltered relative preference implies that if New Year’s eve has passed and 2012 becomes the new present year  $t$ , the relative importance of transactions in 2013 ( $t+1$ ) to 2012 ( $t$ ) is unchanged compared to the relative preferences announced in 2011. With hyperbolic discounting, the ratio of successive discount rates is never constant. In 2011 ( $t$ ) the relative importance of consumption of one dollar in 2012 ( $t+1$ ) is about 67% of the similar consumption in 2011, while consumption in year 2013 ( $t+2$ ) is about 86% of consumption in 2012 ( $t+1$ ). Again entering 2012 ( $t$ ), the relative value of consumption in 2013 ( $t+1$ ) compared to consumption in 2012 shifts from 86% to 67%. So, compared to the intentions expressed in 2011, the allocation of consumption between the years 2012 and 2013 shifts in favor of consumption in 2012. So, hyperbolic discounting results in a change in time preferences which lead to a different actual consumption in 2012 than intended in 2011.

**Figure 10**      **Hyperbolic discounters dislike consumption postponement to the next period more than exponential discounters do**

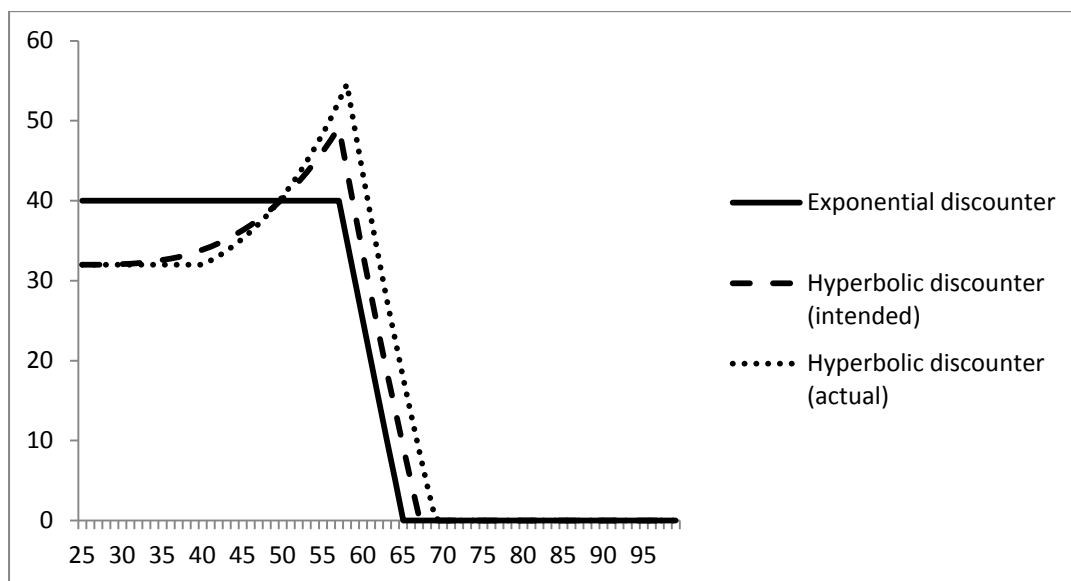


Note: The exponential discounter makes time-consistent decisions for trading consumption between  $t+1$  and  $t$ , whereas for the hyperbolic discounter this is a function of the time of decision  $t$ .

In practice, the concept of hyperbolic discounting is often refined to quasi-hyperbolic discounting. Moreover, some studies distinguish between naïf and sophisticated hyperbolic discounters. Instead of assuming different discount rates for all successive periods, quasi-hyperbolic discounting assumes only a high discount rate between the current and next period and (lower) constant discount rates between all successive future periods (see, e.g., Laibson, 1996 and Diamond and Köszegi, 2003). In fact, the exponential discounting of the neoclassical model is applied for all future periods, while hyperbolic discounting is only relevant between the present and the next period. This (rather simple) concept of hyperbolic discounting is elaborated by distinguishing naïf and sophisticated hyperbolic discounting (see, e.g., O’Donoghue and Rabin, 1999). In contrast to naïf agents who behave as described just before, sophisticated discounters are aware of the time-inconsistency and take it into account. With respect to the savings example mentioned above, sophisticated discounters know that future intended savings will not occur and in response will now save slightly more than naïf discounters.

The retirement decisions of exponential and hyperbolic discounters differ (Figure 11). Intended and actual labor supply of the exponential discounter coincide, but not for the hyperbolic discounter. Compared to exponential discounters, hyperbolic discounters prefer additional leisure at younger ages and more work in the future. The hyperbolic discounters will however not supply the intended amount of labor. After a few years the actual labor supply (dotted line) is less than earlier intended labor supply (dashed line) as again individuals prefer leisure at their current age and intend to increase labor supply in the near future. This altering preference for current consumption and leisure results in lower actual financial wealth than intended at younger ages. Older hyperbolic discounters thus have to work more hours and/or postpone retirement than was their intention at younger ages.

**Figure 11** Intended and actual labor supply and retirement behavior of exponential and hyperbolic discounters



### Empirical applications

The concept of hyperbolic discounting is already quite successful in explaining individual behavior that does not fit within the neoclassic model. Application of the concept in relation to the retirement age has, however, hardly taken place.<sup>21</sup> Popular topics are consumption and (pension) savings (see, e.g., Laibson, 1996, 1997; Angeletos et al., 2001). Discussion of these studies is beyond the scope of this paper. In general, the hyperbolic

<sup>21</sup> An exception is Diamond and Köszegi (2003), which is a theoretical attempt to introduce the retirement decision within a quasi-hyperbolic discounting framework of a three-period model.

discounting framework seems capable of describing some of the empirical anomalies in consumption and savings patterns implied by the neoclassic model.

Model simulations suggest that the effect of a policy reform does not differ that much between exponential and (sophisticated) hyperbolic discounters (Gustman and Steinmeier, 2010). Similar to the neoclassical model, policy shocks result in an altered lifetime wealth—and this change is smoothed among all periods of the lifespan. Taking into account a life-span of 75 years, even a significant policy change around age 65 will only have modest effect on lifetime wealth. This has to do with the fact that limited changes in lifetime wealth imply small changes in consumption and leisure in each particular period of the residual lifetime—and so only minor changes in the retirement age.

A similar result was obtained by Van Erp (2011). Using the original hyperbolic discounting functions published by Loewenstein and Prelec (1992), Van Erp investigated the impact of naïf hyperbolic discounting on retirement. Similar to the neoclassical model, the shift in the pension entitlement age reduces lifetime wealth. Although the change in the present value of future income is similar for both types of discounters,<sup>22</sup> for hyperbolic discounters the value of already accumulated savings is in general less favorable than for exponential discounters. Therefore, an identical reduction in the present value of future income leads to a larger relative decline in lifetime wealth for hyperbolic discounters. Usually, and in particular for older age groups, the net effect of this larger relative fall in lifetime wealth dominates the lower baseline value of leisure of hyperbolic discounters, which leads to a net increase in hours worked and to a greater postponed labor supply, compared to exponential discounters. However, even taking into account the less favorable age profile of wealth, the impact of a shifted entitlement age on lifetime wealth remains small and the resulting shift in the postponed retirement age is too small to explain recent developments in the retirement peak.

## 4.5 Conclusion

Traditional neoclassical models are not always successful at predicting the individual retirement age. This section examined the influence of additional explanations that are not part of such models: defaults, reference points and hyperbolic discounting. Default retirement ages and reference points seem important for the explanation of retirement behavior. The way the pension scheme is presented (‘framed’) to the individual in terms of default retirement ages may influence retirement behavior. Individuals also show a tendency to stick to their original retirement income and thus respond by working longer to avoid deterioration of pension wealth. Hyperbolic discounting may have some effect on individual retirement behavior, but does not seem crucial in explaining the retirement peaks.

## 5. Social norms

Social norms affect consumption and labor supply decisions of individuals, and are important for the welfare state. The social norm makes a person's preferences depend on the behavior of others, either directly by affecting taste or indirectly via social pressure. A social norm can be defined as “a behavioral regularity; that is [...] based on a socially shared belief how one ought to behave; which triggers [...] the enforcement of the prescribed behavior by informal social sanctions” (Fehr and Gächter, 2000). Economists often model a social norm as a reference point in the individual's utility function. Deviation from the reference point results in disutility (Lindbeck et al., 1999).

Social norms may change over time. For instance, older generations may at first be hesitant to claim social insurance or early retirement benefits, to avoid stigma. Younger generations may, however, become used to the availability of social insurance and pensions, experience less stigma, and make more use of benefits (Lindbeck et al., 2003; Ljunge, 2010). It is therefore possible that institutional changes endogenously change social norms in the longer run. The causality between institutional changes and social norms goes both ways: institutional reform may in the longer run change social norms, and social norms may obviously also impact policy. The feedback effects of social norms often amplify shocks. For instance, as an extreme example, an unemployment

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<sup>22</sup> In both cases the interest rate, and not the rate of time preference, is applied to determine the present value of current and future income.



shock may become permanent if the social norm on unemployment is adjusted together with the shock. In that case, there are multiple equilibria in the economy, depending on the size of the unemployment shock. Another example is that increasing the pension age may in the longer run have a stronger effect than implied by financial incentives alone. The reason is that social norm development will generate a feedback effect. Social norms need not be uniform across different groups in society. Some regions or groups may well develop their own norms (see, e.g., Krauth, 2006). This is relevant in the context of heterogeneous pension schemes across sectors and firms, where employees in each different sector or firm may develop their own retirement norms (section 2).

Social norms are not necessarily beneficial to society, and may in fact even be harmful. Akerlof (1980) refers to the ‘norm’ that employers should not hire unemployed persons at a lower wage rate than the current wage rate. Such a social norm leads to higher unemployment, which makes both unemployed persons and the employer worse off. It is certainly possible that a similar norm has played a role in the early retirement preferences of many European workers. Early retirement was for a long time considered something ‘good’, not only for the large amounts of leisure received at a ‘low price’, but also because it was believed by many that it would help to lower youth unemployment (Van Dalen and Henkens, 2005; Kalwij et al., 2009). According to De Vroom (2004), this has led to a strong ‘early exit culture’ in the Netherlands. Doubts have arisen about the effectiveness of early retirement as a means to save jobs for the young (Barr and Diamond, 2009; Gruber and Wise, 2010), and governments are nowadays encouraging the participation of older workers in order to improve their fiscal sustainability in the face of the graying of the population. The norm of early retirement seems to be disappearing in most western countries. As a result, the participation effects of increasing the pension age are probably much larger now than they would have been in the 1980s and ‘90s.

#### *Main difference compared to traditional neoclassical framework*

It is likely that social norms play a relatively important role within the context of retirement. People cannot learn from their own experience, as retirement is a typical once-in-a-lifetime event. Therefore, they look at the experiences of friends and colleagues in order to get some idea about a ‘proper’ age of retirement. More generally, the determination of one’s optimal age of retirement is quite complicated. The life-cycle model discussed in section 2 is not easy to solve for most individuals, and even this intricate model is a simplified version of reality. This might again be a reason for workers to be inspired by retirement decisions in their environment. Financial illiteracy may strengthen the social norm effect. People who are not able to evaluate financial information will more likely take advice from their social environment. This way, it is likely that workers are sensitive to a social norm on retirement if there is one – be it at the national level or in the direct environment of the worker. Traditional neoclassical models of retirement, however, do not allow for interdependencies between different agents or between an individual and some external group of agents (possibly society as a whole).

Interdependencies between different actors may affect their retirement decisions. Van Solinge and Henkens (2007) distinguish between direct interdependencies, which they term ‘social embeddedness’, and indirect interdependencies, also known as the ‘social norm on the timing of retirement’. *Direct interdependencies* are typically linked to the preferences of persons in the worker’s direct environment, such as his/her spouse, coworkers and supervisor.<sup>23</sup> It has been shown in the sociological literature that low levels of coworker and supervisor support increase the likelihood of early retirement. It is important to mention that this effect cannot be fully explained from the classic lifecycle model. People seem to weigh the preferences of some close individuals within their own utility, and sometimes even seem to act against their own personal preferences. *Indirect interdependencies* occur when the worker is influenced by a more abstract social norm that is not tied to a physical person. People have a feeling about the ‘right’ time for a transition out of paid work, and attach negative utility to deviations from this ‘norm age’.

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<sup>23</sup> For instance, Duflo and Saez (2005) show that an individual’s participation in a retirement plan is affected by the participation of his or her direct colleagues.

It is important to note that social norms may also be important at the demand side. That is, employers may stimulate retirement at particular ‘norm ages’. The retirement peaks observed in section 2 may also in part be caused by such norms on the demand side.

### *Empirical findings*

A problem with the empirical analysis of social norms is that they are difficult to measure. Norms cannot be directly observed, so that empirical studies either use proxy variables or interview individuals directly. An example of directly questioning respondents on their retirement norms is Van Solinge and Henkens (2007). Based on a panel survey of 778 respondents, they find empirical evidence for both direct and indirect interdependencies. In the first wave — which occurred before retirement — their sampled individuals were asked about their retirement preferences and the ‘social embeddedness’ of their retirement decision. The second wave was collected after retirement. Individuals’ behavior depends on their environment, even to the extent that their retirement decision is characterized as ‘involuntary’. Involuntary retirement may result from employer- or spousal influences. The authors conclude, however, that “robust social norms exist about the appropriate time for retirement”.

In the economic literature, direct empirical evidence on social norms in retirement is absent. There is some empirical evidence, however, on the relevance of social norms on the use of welfare benefits (Bertrand et al., 2000), unemployment insurance (Clark, 2003; Stutzer and Lalive, 2004) and sickness benefits (Ljunge, 2010). These studies all confirm that social norms are relevant for the use of social insurance. The residual ‘retirement peak’ discussed in section 2, together with Mastrobuoni’s findings, however, suggest that social norms play a role in retirement behavior. Moreover, in a recent survey Brown (2006) finds that many individuals tend to retire at the age which they consider the “usual retirement age”. About half of the (American) individuals in his sample consider the ages 62 or 65 as the ‘usual’ retirement ages, one-sixth consider another age as the usual retirement age, and the remaining one-third does not consider any retirement age to be usual.

The relevance of a uniform social norm in the retirement decision may have decreased since the 1960s and 1970s. At that time, the life course of workers and their spouses was more ‘standardized’ — and this included a uniform timing of retirement. According to Han and Moen (1999), the age-graded norm in retirement “has become blurred” during the past decades as a result of three trends: institutional, economic and demographic. Institutions have gradually facilitated more flexible retirement decisions. Important examples in the US are the elimination of mandatory retirement and the facilitation of early retirement by private pension funds. The economic trend refers to changes in the labor market, which—according to the authors— has moved away from the ‘implicit contract’ to more flexible relationships between employer and employee. Finally, the demographic trend refers to health and life-expectancy. A wider range of retirement ages was made possible as a result of improvements in both health and life-expectancy. These three trends have probably weakened the society-wide social norm on retirement. This of course does not exclude the persistence of sector- or region-specific social norms on retirement.

Behaghel and Blau (2010) find that workers with higher cognitive skills respond more strongly to a change in the ‘standard pension age’ than do others. Presuming that low-cognitive workers are more sensitive to social norms, they speculate that the social norm effect is not the main driver of the retirement peaks at standard pension ages.

### *Assessment with regard to the retirement age*

Many economists are aware of the relevance of social norms in individual decision-making. Empirical analyses have demonstrated that social norms matter in the context of western welfare states. However, hardly any empirical evidence is available yet on social norms in retirement. Some ‘circumstantial evidence’ indicates that social norms are potentially a very important explanation for the retirement peaks at standard pension ages, but there are competing explanations as well (Behaghel and Blau, 2010). Given the results available for unemployment insurance, social assistance and sickness insurance, and given that there are some a priori

reasons to believe that workers are open to ‘retirement advice’ from their environment, it seems likely that social norms play a significant role in the retirement decisions of workers.

## 6. Conclusion

The retirement pattern in the Netherlands shows peaks at ‘standard retirement ages’ in pension schemes. These peaks coincide with the standard early retirement ages and have remained in place even after the introduction of actuarially neutral schemes. Before the introduction of these schemes, the correlation of the individual retirement age with the standard early retirement age was 0.96. After the change to actuarial neutrality this was lowered to 0.80. The latter figure is still much higher than what would have been predicted by traditional neoclassical economic models focusing on financial incentives. In financial terms, the ages surrounding the standard early retirement age are equivalent, and therefore not much difference would be expected in the exit rates at these ages. These retirement peaks provide an indication that non-financial determinants of retirement are also important.

Retirement peaks are also observed in the US at the standard early retirement age and the normal retirement age, whereas the US Social Security system is close to actuarial neutrality. In Sweden, there are no standard early retirement ages, and indeed, no early retirement peaks are observed in that country.

More precise evidence on the unexplained retirement peaks is provided in micro-econometric studies. Classic models of retirement, based on the life-cycle model or the option value model, are not able to explain the individuals’ retirement precisely at standard retirement ages. Evaluations of the effect of pension age reform on the retirement age are also not able to align estimated responses with income and substitution elasticities found in the empirical literature. For instance, the increase in the US Social Security age has led to an increase in the participation rate of senior citizens that is much higher than predicted by the income elasticities commonly found in the empirical literature.

The default retirement age and reference points seem important psychological factors for explaining retirement behavior. The same holds true for social norms. The way the pension scheme is presented to the individual in terms of default retirement ages may have an important effect on the individual’s retirement age. Moreover, individuals show a tendency to stick to their originally planned retirement income (i.e. their reference point). Social norms are likely to be important. Individuals are open to ‘retirement advice’ by their direct environment and more abstract social norms (e.g. from the media). In empirical studies, it is typically difficult to distinguish between a ‘social norm effect’ and a ‘default effect’. It may be concluded, however, that reference points play an important role—regardless of whether the underlying mechanism has a psychological or sociological nature.

Hyperbolic discounting may have some effect on individual retirement behavior, but does not seem crucial in explaining the retirement peaks. Institutional factors—such as age-related compulsory dismissal—and capital market imperfections may lead to retirement peaks. It is unlikely that the distribution among the population of individual factors (like health and spousal influences) results in retirement peaks.

In conclusion, there is still a large gap between the observed retirement peaks and the part explained by traditional economic analyses. We know by now that some non-financial determinants of retirement are important, but their precise has not been determined yet. While this paper has sketched the potential of psychological and sociological arguments to fill up this gap, it is clear that much research still needs to be done. The incremental increase of the statutory retirement age in the Netherlands starting in 2013 provides a promising opportunity for future empirical research.

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