Displaced, disliked and misunderstood: A systematic review of the reasons for low uptake of long-term care insurance and life annuities

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ABSTRACT

With aging populations, the role of private insurance in financing late-in-life risks is likely to grow. Yet, demand for long-term care insurance (LTCI) and life annuities (hereafter annuities) is very limited and lags behind economic projections. This systematic literature review surveys the large number of theoretical and empirical studies analyzing this contradiction. We examine the LTCI and annuity puzzles separately and show which factors limit demand for insurance against both late-in-life risks. Our systematic search rendered 3,945 unique hits and findings of 187 studies were integrated in our analyses. Results hereof suggest that holding of both insurance products is systematically impeded by substitution by social security, adverse selection, nonstandard preferences and limited rationality due to low financial literacy and risk unawareness. Furthermore, insurance holding is concentrated among wealthier and subjectively healthier individuals. A comprehensive approach addressing all four reasons for low uptake may increase insurance holding most effectively and may particularly empower people with lower socio-economic status to make well-informed decisions.

Introduction

Facing aging populations, many developed countries strive to protect against late-in-life risks through policies that ensure adequate elderly care and retirement income. Yet fiscal affordability of such policies is simultaneously impeded by these demographics. Consequently, the role of public policy in protecting against long-term care (LTC) and longevity risks remains small in countries where government policies have traditionally been limited and is decreasing in countries where extensive public programs are being constricted. Hence, social benefits for LTC and longevity risks often provide a minimalist safety net for the worst-off, while others need to buy private insurance to cover those risks.

Limited coverage of public programs and the considerable individual uncertainty about late-in-life risks provide a strong rationale for buying private insurance. Indeed, a market with limited government intervention offers ample freedom to deploy resources and smooth consumption over one’s life-cycle. Individuals can purchase a preferred amount of insurance coverage at a preferred point in time, e.g., when income and assets are high to protect against depleting assets due to late-in-life risks when income is lower. Yet in practice, private insurance against LTC and longevity risks lags behind economic projections. The uptake of long-term care insurance (LTCI) is much lower than predicted by standard economic (expected utility) theory (Pestieau and Ponthière, 2012). Similarly, economic theory judges that life annuities (hereafter annuities) should play a larger role in insuring against longevity risks than is observed in the current market (Modigliani, 1986).

In response, for both distinct but related markets a broad literature has emerged to explain why such underinsurance exists. This research has analyzed both the supply side of the market, where existing insurance products may suffer from design flaws and the demand-side, where people may fail to adequately purchase these products. We focus on demand-side analyses and group this literature into four explanations. First, people could substitute for private insurance with public insurance or family help (e.g., Brown et al., 2007b). Second, people could have private information about their LTC and longevity risk that risk-rated insurance premiums do not control for. Then primarily the worst risks adversely select into LTCI and annuities, driving up premiums and lowering demand among better risks (e.g., Sloan and Norton, 1997). Third, people could have different preferences than those assumed in expected utility models (e.g., Brown et al., 2007b). Second, people could have private information about their LTC and longevity risk that risk-rated insurance premiums do not control for. Then primarily the worst risks adversely select into LTCI and annuities, driving up premiums and lowering demand among better risks (e.g., Sloan and Norton, 1997). Third, people could have different preferences than those assumed in expected utility models (e.g., Brown et al., 2012). Fourth, behavior of limited rationality not reflected in expected utility evaluations could impact uptake. For example, when people are not perfectly rational, factors such as financial literacy may impact uptake (e.g., Brown, 2007).

To evaluate why uptake of LTCI and annuities is so low our paper...
provides an overview of all factors impacting LTCI and annuity purchase decisions. To date, the only extensive review in the fast growing field of literature on LTCI evaluates three major research areas (financing, demand, and insurability) by identifying the most significant paths in a citation network (Eling and Ghabibazoo, 2019). By contrast, our review provides a more in-depth analysis of the potential explanations for low uptake of LTCI – including more than twice as many empirical studies on LTCI uptake – while simultaneously providing a similar analysis for low uptake of annuities. Hence, our contribution to the literature is fourfold. First, we provide a systematic review of the literature on demand for LTCI and annuities with quality checks (rather than a structured review). Second, we provide overviews of the theoretical and empirical literature separately and for both fields of study. Third, we move beyond summarizing previous results by employing our descriptive results to unravel the underlying reasons for low uptake. Fourth, we compare the reasons for low uptake in both markets.

Our article continues as follows. Section “Background” gives an overview of the main LTCI and annuity markets and products. Section “Methods” describes the state-of-the-art methods of our systematic review. Section “Theoretical literature” integrates the findings of previous theoretical research. Section “Empirical literature” summarizes the findings of empirical research and uses these to explain why uptake of LTCI and annuities is so low. Section “Discussion” discusses to what extent the factors that lead to low uptake for LTCI and annuities overlap. Finally, our conclusion and recommendations follow in Section “Conclusion and recommendations”.

Background

The uptake of private LTCI differs greatly between countries, in part because there are large differences between social security schemes. Still, private LTCI markets do not necessarily thrive in countries with less generous social security schemes. In the US, for example, LTCI is the primary risk sharing mechanism for many individuals as Medicaid – the public insurance scheme – only provides a means-tested safety net for the lowest income groups. Nonetheless, the American LTCI market covers just a fraction of the total LTC expenditures (Brown and Finkelstein, 2007). In the UK, private LTCI is almost absent, notwithstanding the fact that LTC provided by local authorities is alsostringently means-tested.

Private LTCI in France and Germany is generally seen to be more successful (Doty et al., 2015; Rothgang, 2010). In these countries, LTCI is marketed as a supplement to (income adjusted) social insurance policies. Supplemental LTCI policies are also available in Israel and Singapore (Swiss Re, 2014). The downside is that these are bare-bone policies do not nearly cover the costs of LTC and offer limited relief from pressure on public expenditures. Nonetheless, such meagre policies are viewed to be more marketable. With social security protecting against tail-risks, supplemental policies are both more affordable and less prone to uncertain developments of future LTC costs than more comprehensive insurance products.

Similarly, annuity markets are hardly ever substantial, even in case of more extensive social security settings (Rusconi, 2008). Generally, we can distinguish two types of annuity products. First there are immediate annuities, in which annuitants are almost immediately entitled to receive annuity income after paying a lump-sum. Such policies are the predominant form of longevity insurance in e.g., the UK, the US and Australia. Second, there are deferred annuities, in which annuitants pay periodic premiums in advance and will start receiving annuity payments at some point in the future. These policies are the conventional type of longevity insurance in countries such as Germany, Denmark and the Netherlands. The main difference between both types is that, in the purchase of immediate annuities, (pension) savings are converted at once to buy an annuity which starts paying out immediately, whereas deferred annuities are purchased through iterative premiums that are converted to future entitlements. Although they differ, neither annuity product is particularly popular in a voluntary setting and when pension savings become available people seem inclined to opt for lump-sum payments rather than annuity payments (Brown et al., 2007a).

To some extent LTCI and annuity markets overlap, because of the availability of combined products. In the US, some products currently offer a LTC rider on top of an immediate annuity. LTC needs can be paid with this annuity and if not all annuity assets are depleted, the remainder will be paid out as death benefits (NAIC, 2016). Deferred annuity hybrids are also available, yet less popular. The uptake of these new products seems to outperform that of conventional annuities (NAIC, 2016). In Germany, similar products are available, yet their commercial success is unknown (Zhou-Richter and Gründl, 2011).

Methods

We performed a systematic literature review based on state-of-the-art methods (Higgins and Green, 2011). Thus, we (1) formulated a protocol with clear research questions and eligibility criteria beforehand; (2) approached an information specialist to develop a highly sensitive search string and search the relevant databases; (3) performed the study selection collaboratively; (4) searched relevant working paper databases manually, snowballed reference lists of all included publications and approached experts to ensure the integrity of the included studies; (5) used a data extraction form that was developed ex ante; (6) graded all included studies based on the strength of their methodology and study design in order to assess the risk of biased results; and (7) integrated the results. Below, we describe this process in-depth.

(1) In the protocol, we laid down the following research questions: (i) which factors impact the uptake of LTCI? and (ii) which factors impact the uptake of life annuities? To be included, publications should:

1. be explicitly about private LTCI, annuities and/or combined life care annuities;
2. focus on uptake and/or demand of these products;
3. identify factors that impact demand;
4. be either empirical or theoretical;
5. when empirical, be on high income countries as defined by the World Bank (2018);
6. when theoretical, be the most recent available applying the specific model;
7. be in English; and
8. be published in a peer-reviewed journal.

(2) A comprehensive search strategy was developed with the help of an information specialist of the Erasmus Medical Center Library. We defined keywords as well as Medical Subject Headings (MeSH) and Embase Subject Headings (Emtree terms) that captured the first two eligibility criteria: a focus on LTCI and/or annuity demand. In order to maximize the identification of potentially relevant publications, we designed the search string to be highly sensitive by including keywords with few (relevant) hits (see Appendix A).

This search string was then used to search a combination of general databases, namely: EMBASE, Medline Ovid, and Web of Science. A general search string was additionally entered in Google Scholar and the first 400 hits were recorded. This combination of database searches was suggested by Bramer et al. (2017b). Following their recommendations we also added the following subject specific databases: CINAHL EBSCOhost (nursing care), PsycINFO Ovid (psychology), ABI inform Proquest (general non-medical) and EconLit (economics). The search was performed on July 3rd 2018 and resulted in 3,945 records to be included in this literature review. A complete overview of the study selection process can be found in Figure B1.

(3) Titles and abstracts of the identified records were stored in EndNote and reviewed simultaneously by both authors following
Bramer et al. (2017a). We scanned the abstracts specifically to identify publications on factors impacting LTCI and annuity uptake decisions as defined in the eligibility criteria. This resulted in the inclusion of 341 publications for full text reading, in which the eligibility criteria from our protocol were applied.

(4) We employed three additional data collection sources to minimize the risk of overlooking potentially relevant publications. First, we manually searched the working-paper series of the NBER, Netnarp, Cepar, the Pension Research Council and SHARE from 2006 onwards to identify papers that met eligibility criteria 1 to 7, but which had not yet been published in a peer-reviewed journal. Second, we similarly snowballed reference lists of all articles and working papers included. Third, five experts reflected on the list of included publications and indicated whether any relevant studies were still missing. In this way, we ultimately included a total of 187 studies of which 106 empirical and 81 theoretical.

(5) Relevant data were extracted from the included studies using the predefined data extraction form. This data extraction – which focused on either the most extensive analyses performed or the preferred specification identified by the authors – derived the outcome variable used, the independent variables analyzed, the corresponding associations and whether these were significant at a 5 percent significance level. As our goal is to gain an overview of the directional associations found across different studies – and not to perform a meta-analysis – we do not report strength of association. For empirical studies, we also retrieved the dataset used, the sample size, and the sampling restrictions.

(6) We performed additional quality checks, in order to safeguard the quality of the included studies and incorporate quality aspects in our review. Publications were scored on a scale from A (best) to D (worst) using the relevant measures from the GRADE method (Schünemann et al., 2013). Specifically, an initial grade was based on study design, with quasi-experiments (B) ranking above observational studies (C) and other means of data collection (D). Points were then deducted for study limitations and publication biases. Studies that scored malus points in excess of rank D were excluded retrospectively. In total, 19 studies have been excluded because of quality issues (see Figure B1). The main reason for exclusion was that studies failed to (properly) apply multivariate analyses and hence reported monocausal results. As such, all studies included contained multivariate analyses.

(7) We combine findings of both theoretical and empirical literature as follows. For theoretical research, we integrate these by describing the main findings on LTCI (Section “Demand for LTCI”) and annuity uptake (Section “Demand for annuities”). This overview is not intended to compare theoretical predictions based on underlying assumptions, but rather to shed light on the different factors impacting insurance uptake that the theoretical literature provides. For empirical research, we employ a vote count to give an overview of the results of included studies (Section “Empirical literature”). We pay particular attention to the strongest level of evidence (B) that results from quasi-experimental studies evaluating causal relationships. For both theoretical and empirical papers we distinguish between individual level characteristics (e.g., age, gender and income) and contextual characteristics (e.g., social benefits and taxes) that could impact uptake. After presenting our integrated results, we discuss how the findings can explain low uptake through substitution, adverse selection, insurance preferences and limited rationality for LTCI (Section “Why is LTCI uptake so low?”) and annuities (Section “Why is annuity uptake so low?”). Finally, we show which factors impact uptake of both products in Section “Discussion”.

Theoretical literature

Demand for LTCI

Standard insurance theory in its simplest form posits that LTCI is valuable for those who are risk averse (i.e., with a concave utility function). Such a risk averse individual prefers the certainty provided by insurance coverage over the uncertainty of facing an uninsured risk and is willing to pay a premium to attain such certainty. However, uptake of LTCI as predicted by standard insurance theory is much higher than as observed in practice. Hence, researchers have sought to expand and adjust the model to fit actual market conditions better. Here we provide an overview of the main demand-side adaptions of the basic model.

First, people may rely on several substitutes for LTCI. At the individual level, private LTCI can be crowded out by informal care (De Donder and Pesteieau, 2017). Potentially, LTCI can be crowded out by home equity as well. If home equity is illiquid, individuals may have to sell their house in order to pay for LTC. If reverse mortgages ensure that home equity is more liquid, then individuals could use these assets to purchase LTCI without directly selling their house (Davidoff, 2010, 2009; Shao et al., 2017). At the contextual level, private LTCI can be crowded out by means-tested public LTCI (Fabel, 1996; Pauly, 1990). Brown and Finkelstein (2008) predict that this is particularly the case for individuals with lower wealth levels. Friedberg, Sun and Webb (2014) extend these findings.1 Still, policy interventions that protect against spending down – such as partnership programs – are predicted to barely increase LTCI uptake and to mostly benefit those who would purchase private LTCI anyway (Sun and Webb, 2013).

Second, it is argued that individuals with high LTC needs will adversely select into LTCI. For example, if young individuals have a low probability of needing LTC they will prefer to purchase LTCI later to avoid a loss in expected income (Meier, 1999). Consequently, only older individuals and those with high LTC risks will purchase LTCI. Even if insurers risk-rate premiums – by for example using age as a proxy of LTC risk – this will not reflect all private information on LTC risks that individuals possess and adverse selection could persist.

Third, individual preferences could deviate from those assumed in the standard bare bones insurance model based on expected utility theory. For example, it has been suggested – contrary to what is usually assumed – that marginal utility of consumption in a period of LTC needs is lower, than in a period of good health (Finkelstein et al., 2009). If that is the case, then LTCI is less attractive because it shifts consumption from a period with high marginal utility to a period with lower marginal utility (Meier, 1998). Furthermore, individuals may underestimate their LTC risk. Such probability underweighting (De Donder and Leroux, 2014) may ensure a lower valuation of insurance and decrease LTCI demand.

Additionally, family dynamics are expected to impact LTCI demand. Bequest motives can make LTCI more attractive, as these encourage individuals to protect their wealth (Lockwood, 2014). At the same time, buying LTCI can decrease informal caregiving and may therefore be unattractive even in view of bequest motives (e.g., Pauly, 1990; Zweifel and Strüwe, 1996, 1998). This suggests that if people prefer informal care they may strategically decide not to buy LTCI in order to increase informal caregiving.

Demand for annuities

For annuities, the seminal work of Yaari (1965) shows that an individual who (1) maximizes a time separable utility; (2) faces uncertainty about the timing of death only; and (3) has no bequest motive, should fully annuitize at actuarial fair prices. Subsequent theoretical research has analyzed whether different assumptions could explain why actual uptake is lower. For example, in a well-known extension Davidoff et al. (2005) show that the results of Yaari (1965) hold under less strict utility assumptions, but do not hold when insurance markets are incomplete. In this theoretical overview, we summarize the main

1 This is likely at least partly due to affordability. Ma and Sun (2017) show that cheaper policies that protect only against tail-risks would increase private LTCI coverage among those with lower wealth levels.
demand-side extensions on Yaari (1965).

First, just as for LTCI, substitution has been highlighted as an explanation for low uptake. At the individual level, multiple studies show that families can rely on various substitutes for formal annuities. Some identify couples as a potential group for whom annuities might be less valuable, because they inherently already pool risks between themselves (Brown and Poterba, 2000). Similarly, others show that longevity risks can be pooled efficiently by families (Schmeiser and Post, 2005; Stamos, 2008). At the contextual level, substitution can also occur: social benefits can crowd out private annuities (Pashchenko, 2013; Purcal and Piggott, 2008). Moreover, social benefits can particularly deter individuals with shorter life expectancy from entering the annuity market and thus aggravate adverse selection effects (Heijdra et al., 2015; Walliser, 2000).

In addition, a broad range of papers has argued that the design of current annuity products is suboptimal, which may encourage substitutional strategies. In addition, Kingston and Thorp (2005) show that – as annuitization is often irreversible – not annuitizing offers valuable flexibility through retention of the option to annuitize later on. Other studies show that annuitization is only valuable from a certain age (or wealth level). Moreover, self-annuitization (e.g., Milevsky, 1998; Stabile, 2006; Milevsky and Young, 2007b) or other investments (Di Gaicinto and Vigna, 2012) may better protect the liquidity of assets and may be optimal until a certain age (or wealth threshold) and depending on the returns offered by other investments (Hainaut and Devolder, 2006). Studies allowing for flexible investment portfolios over time derive qualitatively similar results (Horneff et al., 2008a,b; Milevsky and Young, 2007a).

Second, adverse selection can play a role just as for LTCI; if risk-rated premiums do not reflect private information, only those with the worst risks will purchase annuities. Indeed, it is argued that individuals infer such private information on their longevity risk from their health status (e.g., Gupta and Li, 2013). Mitchell et al. (1999) show that prices are higher due to adverse selection, but with realistic parameters this cannot explain low uptake for estimated loading factors. Ball (2006) draws qualitatively similar conclusions and shows that adverse selection based on health status both decreases the value of annuities on the market and shrinks the market size.

Third, people can have different preferences than those assumed in the Yaari (1965) model. As for LTCI, at the individual level a common extension has been to introduce bequest motives (e.g., Kotlikoff and Spivak (1981)), Davidoff et al. (2005) show that under fair premiums it is still optimal to annuitize all wealth, except for the part that one wishes to bequest. Still, under unfair premiums bequest motives can eliminate demand (Friedman and Warshawsky, 1990; Vidal-Mellá and Lejárraga-García, 2006, 2004). Bequest motives need not be strong; demand can be eliminated by modest bequest motives (Lockwood, 2012) or even by any positive bequest motive if an individual is sufficiently risk averse (Bommier and Grand, 2014). As for LTCI, it is also argued that parents may strategically purchase annuities (Bernheim et al., 1985). Specifically, parents may use bequests to influence behavior of their children. For example, they could decrease their bequest (or threaten to) by purchasing nonbequeathable annuities to stimulate their children to give them more attention.

Finally, uncertainty over future health costs may be important. Annuities may be used to hedge against the uncertain costs of health shocks when older (Ai et al., 2017; Pang and Warshawsky, 2008). Yet, health risks may also impose liquidity constraints by requiring extra savings or insurance spending at a younger age and limit the assets available for annuitizing (Peijnenburg et al., 2017; Reichling and Smetters, 2015). Moreover, if longevity and health costs are negatively correlated — i.e., if a negative health shock leads to higher health costs while decreasing longevity — this provides a hedge for both uncertainties and decreases annuitization (Zhao, 2015).

Empirical literature

Uptake of LTCI

An extensive empirical literature analyzes LTCI uptake in different countries. A descriptive overview of this research and the data analyzed is presented in Table 1. A large share of the LTCI literature analyzes one or more of the 12 waves of the US Health and Retirement Study (HRS). Moreover, many studies focus on the ‘near elderly’ — usually between 50 and 70 years old — who are not in need of care as those individuals should be preparing for later. Of the 62 studies included, most (42) are observational studies without serious limitations (graded C). 5 studies are quasi-experimental (B), and 15 are observational studies that suffer from some limitations or fail to comprehensively describe their methods for data collection (D).

As for the dependent variable of LTCI uptake, different measurements are used throughout the empirical literature. Large longitudinal surveys such as the HRS or the Survey of Health Aging and Retirement in Europe (SHARE) elicit revealed preferences by asking for ownership status which is occasionally used to determine changes in ownership status (both purchasing and lapsing). For example, the HRS asks respondents: “Not including government programs, do you now have any long-term care insurance which specifically covers nursing home care for a year or more or any part of personal or medical care in your home?” Other studies have measure stated preferences, through willingness to pay elicitation, discrete choice experiments (Brau et al., 2016; Brau and Bruni, 2006) or referendum-approaches (Costa-Font and Font, 2009; Costa-Font and Rovira-Forns, 2008). When revealed and stated preference analyses systematically lead to qualitatively different results, we reflect on this in our interpretation. Generally, however, this is not the case.

Individual factors

Table 2 summarizes the main findings of the empirical studies on individual factors associated with LTCI uptake. We refer to Table C8 for a granular insight into our data, as it shows exactly which studies have found which associations and distinguishes between revealed and stated preferences. Below we reflect on these factors one-by-one.

Most studies either find that women are more likely to buy or own LTCI (35 percent) or that there are no significant differences in uptake between men and women (54 percent). Notably, there are differences between studies that analyze stated preferences and those that analyze revealed preferences; most hypothetical studies find no association with gender, whereas studies analyzing actual uptake, ownership and lapsing do. This overall positive association matches with the fact that LTCI is of more value for women as they live longer than men and are more likely to outlive their partner. This especially applies since gender-based premium differentiation in insurance products is forbidden in the EU (European Union, 2004) and has only recently been introduced for LTCI in the US (Carrns, 2014).

The relationship between LTCI uptake and age is less straightforward, with 22 percent of the included studies finding negative associations and 30 percent reporting positive associations. Moreover, these results should be interpreted with caution as they may reflect cohort effects for studies that employ age-cohorts such as the HRS. Some studies additionally incorporate effects of age squared. These generally report a significantly positive (Konetzka and Luo, 2011) or negative sign (Bernet, 2004; Courbage and Roudaut, 2008; Gousia, 2016; Mellor, 2001, 2000), with only two studies finding no significant squared age
| Authors | # | Dataset | Country | N | Sample restrictions |
|---------|---|---------|---------|---|---------------------|
| Akaichi, Costa-Font and Frank (2019) | 1 | Survey of Long-term Care Awareness and Planning | US | 15,298 ind. | 40 – 70 years old and not institutionalized |
| Allaire, Brown and Wiener (2016) | 2 | Survey of Long-term Care Awareness and Planning | US | 12,936 ind. | 40 – 70 years old and not institutionalized |
| Ameriks, Briggy, Caplin, Shapiro and Tonetti (2018) | 3 | Survey | US | 1,086 ind. | over 55 years old with at least $10K in Vanguard accounts |
| Barnett and Stum (2013) | 4 | Survey | US | 803 ind. | Public employees eligible to purchase LTCI |
| Bergquist, Costa-Font and Swartz (2018)† | 5 | NAIC sales | US | n.a. | n.a. |
| Bernt (2004) | 6 | HRS (wave 5) | US | 16,851 ind. | over 53 years old |
| Boyer, De Donder, Fluet, Leroux and Michaud (2017) | 7 | Survey | Canada | 2,000 ind. | 50 – 70 years old |
| Brau and Bruni (2008) | 8 | Survey | Italy | 1,176 ind. | 25 – 70 years old |
| Brau, Bruni and Pinna (2010) | 9 | Survey | Italy | 1,176 ind. | 25 – 70 years old |
| Brown et al. (2007)b† | 10 | HRS (wave 3 – 5) | US | 12,402 ind. | 55 – 69 years old |
| Brown et al. (2012) | 11 | American Life Panel | US | 1,569 ind. | over 50 years old |
| Browne and Zhou-Richter (2014) | 12 | Socio-Economic Panel | Germany | 3,749 ind. | over 35 years old and not in need of care |
| Caro et al. (2011) | 13 | HRS (wave 6 – 7) | US | 2,747 couples | Having a direct experience with LTCI |
| Chatterjee and Fan (2017) | 14 | HRS (wave 11) | US | 21,696 ind. | over 52 years old |
| Coe et al. (2015b) | 15 | HRS (wave 4 – 8) | US | 8,349 ind. | 51 – 61 years old and not institutionalized |
| Cornell and Grabowski (2018)† | 16 | HRS (wave 3 – 11) | US | 13,285 ind. | 50 – 69 years old |
| Costa-Font and Font (2009) | 17 | Survey | Spain | 324 ind. | over 18 years old |
| Costa-Font and Rovira-Forns (2008) | 18 | Survey | Spain | 324 ind. | over 18 years old |
| Courtmanche and He (2009)† | 19 | SHARE (wave 2) | France | 2,530 ind. | over 50 years old |
| Cramer and Jensen (2006) | 20 | HRS (wave 4 – 7) | US | 8,566 ind. | 55 – 65 years old |
| Curry et al. and Kapp (2009) | 21 | HRS (wave 6 – 7) | US | 9,863 ind. | 55 – 69 years old and without LTCI |
| Cutler et al. (2008)a | 22 | Focus groups and in-depth interviews | US, CT | 6 focus groups of 9 and 32 interviews | Having a direct experience with LTCI |
| Doeringhaus and Gustavson (2002) | 23 | AHEAD (wave 2) | US | 7,183 ind. | 65 – 90 years old |
| Finkelstein and McGarry (2006) | 24 | HIAA, AARP and NAIC sales | US | 50 states + DC | n.a. |
| Friedberg et al. (2017) | 25 | AHEAD (wave 2) | US | 5,072 ind. | over 72 years old |
| Gan et al. (2015) | 26 | HRS (wave 3 – 5) | US | 5,000 ind. | over 73 years old |
| Goda (2011)† | 27 | HRS (wave 3 – 8) | US | 15,422 ind. | 50 – 69 years old |
| Gottlieb and Mitchell (2015) | 28 | HRS (wave 11) | US | 487 ind. | over 50 years old |
| Gousia (2016) | 29 | SHARE (wave 5) | Austria, Italy, France, Denmark, Israel and Czech Republic | 19,116 ind. | over 50 years old |
| He and Chou (2018) | 30 | Survey | Hong Kong | 1,613 ind. | over 40 years old |
| Jiménez-Martín et al. (2016) | 31 | SHARE (wave 1, 2 and 5) | Spain | 10,867 obs. | over 50 years old and owning either LTCI or private health insurance |
| Kennedy et al. (2016) | 32 | NHS | US | 14,393 ind. | 40 – 65 years old |
| Kitajima (1999) | 33 | Survey | Japan, Tokyo | 710 ind. | over 40 years old and owning LTCI in 2002 |
| Konetzka and Laro (2011) | 34 | HRS (wave 3 – 10) | US | 3,974 ind. | Over 50 years old and reporting LTCI ownership in at least one year |
| Kumar et al. (1995) | 35 | Survey | US | 10,489 ind. | Purchasing LTCI or being approached by an agent |
| Li and Jensen (2012) | 36 | HRS (wave 6 – 9) | US | 2,085 ind. | Over 50 years old and reporting LTCI ownership in at least one year |
| Lin and Prince (2013) | 37 | HRS (wave 6 – 10) | US | 12,695 ind. | Over 50 years old |
| Lin and Prince (2016) | 38 | HRS (wave 6 – 10) | US | 12,695 ind. | Over 50 years old |
| Lutzy and Alexch (1999) | 39 | Interviews | US | 110 ind. | Experts, insurance agents, consumer groups and regulators |
| McCall et al. (1998) | 40 | Survey | US | 1,626 ind. | 55 – 75 years old |
| McGarry et al. (2014) | 41 | NHATS (2011) | US | 8,245 ind. | Over 65 years old |
| McGarry et al. (2016) | 42 | HRS (wave 10) | US | 12,796 ind. | Over 50 years old |
| McGarry et al. (2018) | 43 | HRS (wave 10) | US | 15,963 ind. | Over 50 years old |
| McNamara and Lee (2004) | 44 | HRS (wave 3 – 5) | US | 6,220 ind. | Over 50 years old and reporting LTCI ownership in at least one year |
| Mellor (2000) | 45 | AHEAD (wave 1) | US | 8,021 ind. | Over 70 years old |
| Mellor (2001) | 46 | AHEAD (wave 1) | US | 7,775 ind. | Over 70 years old |
| Nixon (2014) | 47 | PHAROS and HRS (wave 5) | US and Canada | 7,356 ind. | Over 70 years old |
| Oster et al. (2010) | 48 | Survey | US | 1,305 ind. | 26 – 64 years old |
| Panci et al. (2017) | 49 | Survey | US | 150,123 ind. | 30 – 79 years old |
| Pinquet et al. (2011) | 50 | Insurance data | Spain | 509 ind. | State employees |

(continued on next page)
Of the 10 studies analyzing this, 1 finds a positive association (Kennedy and Norton, 1997). This relationship is even more clear for bequest expectations, as all studies examining the impact of reaching the age 65 on LTCI uptake find mixed directional effects (Allaire et al., 2016; Pinquet et al., 2011; Van Houtven et al., 2015).

Many studies also analyze the association of ethnicity with LTCI uptake. Although a dichotomous comparison between white and non-white as reported in Table 2 reveals no clear uptake pattern, comparisons with specific ethnicities do. These show that uptake of LTCI is markedly lower amongst Hispanics. At the same time, being black or having another non-white ethnicity does not seem to be associated with LTCI coverage.

Different aspects of socio-economic status seem to be important determinants of LTCI uptake. Specifically, some studies find a positive association of subjective social class (He and Chou, 2018) or subjective economic condition (Kitajima, 1999) and LTCI uptake. More generally, Table 2 shows that a majority of the studies finds a positive association between education, income or wealth and LTCI uptake. Evidence suggests that unaffordability of LTCI products may at least partially drive these associations (Brown et al., 2012; Schaber and Stum, 2007). Zooming in on income effects, all studies find negative income squared effects (Bernet, 2004; McNamara and Lee, 2004; Mellor, 2001, 2000). Together, these findings suggest that income initially enables purchase of LTCI, but above a certain income level people rely more on self-insurance. For squared wealth, the same association is found by two studies (Bernet, 2004; McNamara and Lee, 2004), while two other studies find no significant squared effects (Mellor, 2001, 2000). Additionally, home ownership is associated with lower uptake (Boyer et al., 2017; Costa-Font and Rovira-Forns, 2008; Stevenson et al., 2009; Wu et al., 2017), although studies that analyze the home value in addition to wealth do not find theoretically predicted lower LTCI uptake associated with LTCI coverage.

Interestingly, risk aversion does not seem to be associated with insurance decisions. At the same time, LTCI uptake increases with ownership of health insurance (Brau and Zhou-Richter, 2014), drug usage (Bernet, 2004), various existing conditions (e.g., Brau and Zhou-Richter, 2014; Gousia, 2016) and BMI (Jiménez-Martín et al., 2016) reveals no evidence that objective health or subjective longevity is related to demand for LTCI.

Table 2 shows that the number of impairments in ADLs is not associated with LTCI uptake, despite the fact that ADL impairments are used for both underwriting and determining benefits eligibility (Cornell et al., 2016). Similarly, other measures of objective health such as the number of hospitalizations in the previous year (Brau and Bruni, 2008; Browne and Zhou-Richter, 2014), drug usage (Bernet, 2004), various existing conditions (e.g., Browne and Zhou-Richter, 2014; Gousia, 2016) and BMI (Jiménez-Martín et al., 2016) are not systematically associated with uptake.

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### Table 2 (continued)

| Authors                          | # | Dataset                 | Country       | N         | Sample restrictions |
|----------------------------------|---|-------------------------|---------------|-----------|---------------------|
| Sloan and Norton (1997)          | 53| AHEAD (wave 1 – 2)      | US            | 5,292 ind.| over 70 years old   |
| Sperber et al. (2017)            | 54| Focus groups            | US            | 13,312 ind.| 51 – 61 years old   |
| Stevenson et al. (2009)          | 55| NAIC sales              | US            | 80 ind.   | elderly parents and adult children |
| Stum (2008)                      | 56| Survey                  | US            | 50 states + DC | n.a.   |
| Swamy (2004)                     | 57| Survey                  | US, MD        | 446 ind.  | state employees     |
| Tennyson and Yang (2014)         | 58| CRWB                    | US, NY        | 1,394 ind.| 40 – 70 years old   |
| Unruh et al. (2016)              | 59| AHIP/LifePlan           | US            | 693 ind.  | 50 – 72 years old   |
| Van Houtven et al. (2015)        | 60| HRS (wave 3 – 10)       | US            | 22,742 ind.| over 50 years old   |
| Wu, Bateman et al. (2017)        | 61| Survey                  | Australia     | 1,008 ind.| 55 – 64 years old   |
| Zhou-Richter et al. (2010)       | 62| Survey                  | Germany       | 914 ind.  | adult children      |

1 Quasi-experimental study (highest level of evidence available).

2 Also analyzes annuity uptake.

3 Of the 10 studies analyzing this, 1 finds a positive association (Kennedy et al., 2016), 5 find a negative association (Caro et al., 2011; Konetzka and Luo, 2011; McGarry et al., 2016, 2014; McNamara and Lee, 2004), and 4 find no association (Cramer and Jensen, 2006; Li and Jensen, 2012; McGarry et al., 2018; Stevenson et al., 2009). Of the 12 studies analyzing this, 4 find a positive association (Kennedy et al., 2016; McGarry et al., 2018; Stevenson et al., 2009; Van Houtven et al., 2015), 3 find a negative association (Caro et al., 2011; Konetzka and Luo, 2011; Li and Jensen, 2012), and 5 find no statistically significant association (Cramer and Jensen, 2006; McGarry et al., 2016, 2014; McNamara and Lee, 2004; Swamy, 2004).

4 Of the 8 studies analyzing this, 2 find a negative association (McGarry et al., 2018, 2016) and 6 find no statistically significant association (Konetzka and Luo, 2011; Li and Jensen, 2012; McNamara and Lee, 2004; Stevenson et al., 2009; Swamy, 2004; Van Houtven et al., 2015).

5 Of the 8 studies analyzing this, 2 find a negative association (McGarry et al., 2018, 2016) and 6 find no statistically significant association (Konetzka and Luo, 2011; Li and Jensen, 2012; McNamara and Lee, 2004; Stevenson et al., 2009; Swamy, 2004; Van Houtven et al., 2015).

6 This relationship is even more clear for bequest expectations, as all studies that analyze bequest expectations find a positive association with LTCI uptake (Courbage and Roudaut, 2008; Konetzka and Luo, 2011; McGarry et al., 2018, 2016), Yet, this could also be driven by reverse causality.
Of course the actual insurance value is also important. Increases in daily
and married.

suggests that although risk aversion is unrelated with LTCI uptake, real life
Gottlieb and Mitchell, 2015; Jiménez-Martín et al., 2016). Altogether, this
However, other risk behaviors (smoking, drinking and exercising) are not
et al., 2015; Gottlieb and Mitchell, 2015; McGarry et al., 2018, 2016).

g Three studies report different associations for different proxies of LTC ex-
experience and have been counted under “none”.

f Two studies reporting different associations for home care and nursing home

available evidence suggests that this may be
positively associated with LTCI uptake (Finkelstein and McGarry, 2006; Gan
et al., 2015; Gottlieb and Mitchell, 2015; McGarry et al., 2018, 2016).
However, other risk behaviors (smoking, drinking and exercising) are not
found to have an effect on uptake (e.g., Courbage and Roudaut, 2008;
Gottlieb and Mitchell, 2015; Jiménez-Martín et al., 2016). Altogether, this
suggests that although risk aversion is unrelated with LTCI uptake, real life
measures of more general insurance preferences or risk behaviors may be
associated with LTCI uptake.

Furthermore, there is evidence that LTCI uptake varies with in-
dividual perceptions of the value of LTCI7 and preferences for LTC. That
is, people who dislike informal care are more likely to take out LTCI, as
displayed in Table 2. People who prefer to stay home to going to a
nursing home are less likely to buy LTCI (McCall et al., 1998; Tennyson
and Yang, 2014). And people who have a negative view of public care
may buy more LTCI (Brau and Bruni, 2008), although another study
finds no significant association (Ameriks et al., 2018). Similarly, people
may well prefer freedom offered by private LTCI with voluntary cov-
rage to public insurance with mandatory coverage (Akaichi et al.,
2019). In line with this, Sperber et al. (2017) find that LTCI is perceived
to support autonomy in arranging LTC and that expectations of future
autonomy influence uptake decisions. This may also be reflected in the
fact that valuing planning may increase uptake (Unruh et al., 2016),
even though other studies find no significant effect (Gousia, 2016; He
and Chou, 2018). Finally, Table 2 shows that people who trust their
insurer to pay out future claims, are more likely to take out LTCI.

Measures of product understanding seem to be strongly associated
with LTCI uptake according to Table 2. Financial literacy – measured as
knowledge of percentages, compound interest, inflation and/or risk
diversification – appears to be positively associated with LTCI demand.
Also, having a financial planner (Kumar et al., 1995; McCaill et al.,
1998)8 or working in finance (Lin and Prince, 2016) seems to be as-
associated with uptake. At the same time, measures of cognitive intact-
ness such as the ability to count backwards or remember the current
president are not associated with different levels of uptake, nor is
knowledge of the LTC system (e.g., knowledge of nursing home costs
(Boyer et al., 2017; Unruh et al., 2016)). Finally, two qualitative studies
highlight the importance of access to information on LTC in decision
making for LTCI (Curry et al., 2009; Lutzyk and Alecxih, 1999).

Salience of LTC risks is also important in LTCI uptake. A risk is said
to be salient when one has been previously confronted with it and is
more aware of the risk because of that experience. Most studies show
that various proxies of awareness – such as having discussed LTC, being
adequately informed and knowing of LTCI existence – are associated
positively with demand. However, it is unclear whether these results
imply a causal relationship or show that people who purchase LTCI are
simply more aware of LTC risks because of that purchase. An indirect
way of analyzing this relationship further, is by looking at LTC ex-
périence, e.g., providing informal care to others or having close rela-
tives needing LTC. The available evidence suggests that this may be
positively associated with LTCI uptake, as 42 percent of the studies find
a positive association and 47 percent find no significant association.
Moreover, individuals who have experienced health shocks – whether
positive or negative – are more likely to own LTCI (Konetzka and Luo,
2011), which may also suggest that awareness of LTC risks increases
uptake. In addition, over or underweighting the risk of needing LTC
could further impact uptake (Boyer et al., 2017).

Contextual factors

At the contextual level, Table 3 highlights the importance of both
generosity of social benefits and tax incentives for LTCI uptake (see
Table C9 for an in-depth overview). The evidence – including one quasi-
experimental study – shows that more lenient means-tested social
benefits schemes either decrease LTCI demand or have no effect.9 On
the contrary, tax incentives10 (and consequently lower prices) lead to
greater willingness to insure, according to three quasi-experimental

7 Of course the actual insurance value is also important. Increases in daily
benefits and benefit periods, as well as decreases in the deductible period
are associated with higher LTCI uptake according to a recent stated-preferences
study (Akaichi et al., 2019).

8 Only one study (Swamy, 2004) finds that having a financial advisor does not
significantly change LTCI ownership.
9 This does not hold for Federal Partnership programs that protect a portion of
an individual’s assets that would otherwise need to be spent down in order to
become eligible for Medicaid. Most research shows that these programs do not
change coverage and are de facto a tax benefit for those who would have bought
LTCI in any case (e.g., Bergquist et al., 2018).
10 There may be a differential effect of tax deductions and tax credits. Most
studies explicitly focusing on tax deductions report a positive impact on uptake,
whereas studies focusing on tax incentives in general do not.
Friedberg et al. (2017) find LTC expectations not to be a significant pre-
of LTCI products is suggested to play a role in these decisions (Gottlieb
important as uptake is generally lower among individuals who perceive
(Gottlieb and Mitchell, 2015; Pincus et al., 2017).

Finally, Table 3 shows that expected availability of informal care may
negatively impact LTCI uptake, although a majority of the studies
finds no significant association. At the same time, Courbage and
(2018) individuals. Perceptions also seem to be
important as uptake is generally lower among individuals who perceive
coverage to be more extensive (Kumar et al., 1995; McCall et al.,
1998; Unruh et al., 2016), with only two studies reporting no sig-
nificant effects (Brown et al., 2012; Swamy, 2004). Similarly, framing
of LTCI products is suggested to play a role in these decisions (Gottlieb
and Mitchell, 2015; Pincus et al., 2017).

Why is LTCI uptake so low?
From our theoretical (Section “Demand for LTCI”) and empirical
overview (Sections “Individual factors” and “Contextual factors”) we infer four general explanations for the low uptake of private LTCI: (i)
substitution by public LTCI or informal care; (ii) adverse selection; (iii)
individual preferences that differ from those assumed in standard eco-
nomics models of consumer behavior; (iv) financial illiteracy; and (v)
discuss how these may relate to the distribution of LTCI uptake over the
population.

(i) In line with theoretical predictions, there is strong evidence that
private LTCI is to some extent substituted by public LTCI. LTCI may also
be substituted with informal care, but this relationship is less clear cut.
Our results suggest that both the number of children and the expected
availability of informal care givers may decrease LTCI uptake, whereas
marital status seems to have no impact on uptake. Potentially, these
results reflect the fact that these measures are quite generic: if you have
a partner or children this does not necessarily mean that they are able
(and willing) to provide informal care. Alternatively, Coe et al. (2015a)
have shown that LTCI ownership by parents, can induce children to live
further away from their parents and to work more. In other words,
purchasing private LTCI may lower ex-post informal care ex-
pectations and the negative relationship may also reflect reverse caus-
ality.

(ii) As theoretically predicted, adverse selection could also play a
role on the LTCI market, as the existence of private information has
been proven both directly (Finkelstein and McGarry, 2006) and ind-
directly (Gan et al., 2015) and as people seem fairly responsive to the
price of LTCI (Cornell and Grabowski, 2018; Costa-Font and Font, 2009;
Cramer and Jensen, 2006; Goda, 2011).

The empirical literature highlights three potential sources of private
information: objective knowledge of LTC risks, subjective knowledge of
LTC risks and subjective knowledge of health. First, some individuals

know that they are objectively likely to have high LTC costs, for ex-
ample because they suffer from a genetic diseases associated with
higher LTC needs. These individuals are more likely to purchase LTCI
(Oster et al., 2010). Second, individuals who expect to have LTC needs
in the future take out more private LTCI. If this subjective risk assess-
ment is accurate this would lead to adverse selection, but it is unclear
whether this is actually the case.11 Third, one would expect adverse
selection to concentrate uptake among subjectively less healthy in-
dividuals, yet our review finds the opposite. Hence, some authors
conclude that people do not realize that poor health can lead to LTC
needs later in life (Browne and Zhou-Richter, 2014). Another potential
explanation is that subjectively healthier people may expect to live
longer and associate longevity with LTC needs (Cramer and Jensen,
2006), but it is unclear whether this is indeed the case.

In addition, some studies have analyzed whether dynamic adverse
selection (i.e., individuals adversely select when receiving new in-
formation on their risk status) drives lapsing. These studies find higher
LTC utilization among non-lapsers (Finkelstein et al., 2005; Konetzka
and Luo, 2011). However, this could also be due to ex-post moral ha-
azard. Moreover, Konetzka and Luo (2011) argue that such lapsing re-
ffects personal finances and the availability of informal caregivers ra-
ther than private information.

Although adverse selection is taking place at the individual level,
Finkelstein and McGarry (2006) show that the LTCI risk pool does not
have a larger LTC risk than the population at large. This is unlikely to be
a result of a successful underwriting, since our review shows that ADL
impairments – which are the main objective health factors used in
underwriting – are not significantly associated with LTCI uptake. In-
stead, Finkelstein and McGarry (2006) show that adverse selection is
compensated by the advantageous selection of low risk individuals with
strong insurance preferences.

(iii) Low uptake could also be driven by preferences that deviate
from those typically assumed in economic models. For example, our
results highlight that risk aversion does not unambiguously increase
insurance, which contrasts with standard economic theory. Possibly,
people perceive LTCI as a risky investment rather than as a risk-redu-
cing insurance product. In other words, if LTCI is not needed then pre-
miums do not 'pay off' (Kunreuther et al., 2012). Additionally, our re-
view shows that preferences for formal care impact LTCI uptake.12
Specifically, preferences for informal care over formal care may de-
crease LTCI uptake.

Moreover, people may fear that insurers will not pay out, as distrust
of insurance companies is associated with lower LTCI uptake. Such a
trust relationship may be especially important as LTCI provides cov-
verage against risks that are often in the far future. The fact that LTCI
may only pay out in the future, may also trigger nonstandard time
preferences or state-dependent utility preferences. Nonetheless, we
found no empirical evidence about the impact of time preferences on
insurance uptake.

Finally, most evidence for the theoretically suggested impact of
state-dependent utility remains indirect. For example, using the HRS
Finkelstein et al. (2013) show that marginal utility decreases when
health decreases, but they do not directly link this to LTCI uptake. One
study suggests that people who prefer to spend resources on care when
ill over spending them on other goods and services when healthy are
indeed more likely to purchase LTCI (Brown et al., 2012). Still, this
result should be interpreted with caution as by explicitly referring to

11 Friedberg et al. (2017) find LTC expectations not to be a significant pre-
dictor of actual LTC use later in life, whereas Finkelstein and McGarry (2006)
find the opposite.
12 Bequest motives have also been left out of some standard economic pre-
dictions, even though they work to increase uptake, as is described theoretically
and found empirically. As such, bequest motives only increase the discrepancy
between prediction and actual uptake.
spending resources on LTC, this study may to some extent have measured preferences for LTCI itself rather than state dependent preferences.

(iv) People may find it difficult to make decisions on purchasing LTCI, which may cause them to deviate from expected utility maximization. This may be loss so for more financially literate individuals, who are consequently more likely to take out private LTCI. Additionally, in line with theoretical predictions of probability underweighting, our review shows that those who are aware of LTCI risks purchase more insurance than those who do not. Finally, Lin and Prince (2016) show that wealthier individuals are also better able to make use of sponsored LTCI plans, indicating that socio-economic status may to some extent reflect such decision-making ability.

(v) From our review it follows that uptake of LTCI differs across different subgroups of the population, and that it is likely to be concentrated among individuals with higher education, income and wealth. This may well be seen as a byproduct of the causes for low uptake. First, as most social benefit schemes are means-tested, crowding out should theoretically take place predominantly among individuals with low income and wealth (Brown and Finkelstein, 2008). This is also what is observed empirically (Brown et al., 2007b) and works to increase relative uptake among wealthier individuals. Second, if people use subjective health as a proxy for LTC and longevity risks, adverse selection can work to concentrate uptake among individuals with high socio-economic status individuals as these are relatively healthy. Third, it has been shown that preferences for insurance differ and are an important determinant of LTCI uptake (Brown and Zhou-Richter, 2014; Cutler et al., 2008; Gan et al., 2015). These preferences are at least partially related to wealth, as research shows that wealthier individuals (Finkelstein and McGarry, 2006) are more likely to own LTCI, yet much less likely to enter a nursing home. Fourth, financial literacy could be correlated with socio-economic status and could thus lead to increased uptake among those with a higher socio-economic status.

**Uptake of annuities**

Table 4 provides an overview of all 44 included empirical studies on annuity uptake decisions. Clearly, these studies are more diverse than those analyzing LTCI decisions. Datasets consist of experimental data, survey data (often from independently developed surveys) and administrative datasets. This variety in empirical methods is also reflected in the GRADE quality of the studies: 6 studies are graded ‘B’, 27 ‘C’ and 11 ‘D’. Moreover, sample restrictions concerning age are generally much more inclusive than for LTCI, as they may compromise all adult age groups.

Annuitization itself is measured in two ways. Many studies measure revealed preferences. Such studies either follow cohorts of individuals that retire and measure their annuitization decisions (e.g., Brown and Previdero, 2014; Büttler and Teppa, 2007; Hurd and Panis, 2006) or use a survey to ask whether individuals own annuities (e.g., Pfarr and Schneider, 2013; Schreiber and Weber, 2016). Another strand of research uses hypothetical annuitization measures to elicit stated preferences (e.g., Knoller, 2016; Wu et al., 2017). Occasionally, associations found by stated and revealed preferences point to different directions. When suited, we reflect on this.

**Individual factors**

Table 5 displays the main findings of the empirical studies on individual factors associated with annuity uptake. Below we reflect on these factors one-by-one. Table D10 shows exactly which associations were found by which studies and distinguishes between the results of revealed and stated preferences.

As to gender and age, uptake patterns displayed in Table 5 are broadly similar to those of LTCI, including the differences between stated and revealed preference studies. Women may be more likely to opt for annuities than men, although the majority of included studies finds no significant difference. Again this may highlight the fact that without gender-based pricing annuities are effectively cheaper for women, who on average live longer. Gender-based risk differences are currently not allowed to be translated into premiums in the EU (European Union, 2004) and in employer-sponsored plans in the US (Arizona Governing Committee for Tax Deferred Annuity and Deferred Compensation Plans v. Norris, 1983). The impact of age on uptake remains difficult to interpret. To some extent, age effects may reflect cohort effects of studies employing age-cohorts, although there are admittedly fewer doing so for annuities than for LTCI. Even so, there is no clear pattern in the effects summarized in Table 5, and the two studies analyzing squared age effects retrieve different results: one reports a positive effect of age squared (Clark et al., 2014), whereas the other finds no significant effect (Teppa, 2011). Finally, ethnicity may impact uptake. Yet, we find only one study (Hurd and Panis, 2006) that reports a positive association between being black and annuitization.

Table 5 also shows that wealth is generally positively associated with annuity uptake, even though a large share of the stated preference studies find no significant association. At the same time, income and annuity uptake may be positively associated, but the majority of the studies reports no significant association. This effect is driven by stated preference studies, suggesting that although stated preferences may be similar, actual uptake may differ along income and wealth. Education and homeownership are found to be of limited relevance in explaining annuitization. The low number of studies finding any effect of education is markedly different from the strong association found with LTCI uptake and consistent between stated preferences and revealed preference studies.

As to the impact of family characteristics, Table 5 shows that most studies do not find any effect of either having children, being married or having bequest motives. This is clearly different from theoretical predictions that families could offer efficient risk pools. Still, our results do not rule out that some individuals pursue theoretically predicted strategic bequest motives. If some individuals have strategic negative bequest motives (increasing uptake) this could on average offset other people’s positive bequest motives (decreasing uptake) such that the aggregate effect of bequest motives is indistinguishable from zero.

In addition, Table 5 highlights the potential importance of subjective and objective risk factors in annuity decisions. One third of the included studies find that individuals with better subjective health and subjective longevity are more likely to purchase annuities, but the majority of studies does not find evidence of a significant relationship. Particularly, none of the revealed preference studies included reports a significant association. Few studies analyze the relationship between objective longevity risks and annuity uptake. One study notes that the number of chronic illnesses has no impact on annuity uptake (Chou et al., 2016). Studies analyzing realized longevity for historic annuity uptake all find that those who purchased annuities lived longer. Additionally, there is some evidence that the longevity of parents is also

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13 As well as individuals who use preventive health services and individuals who always wear their seatbelts (Cutler et al., 2008; Finkelstein and McGarry, 2006).

14 One study looking into the impact of home equity rather than home ownership finds that increases in home equity may decrease annuity uptake among the lowest home equity quintiles (Guillemette et al., 2016).

15 One study shows a positive impact of having dependent children on annuity uptake (Büttler and Teppa, 2007).

16 There are no systematic differences when married individuals are compared to single, divorced or widowed individuals.
| Authors | Dataset | Country | N | Restrictions |
|---------|---------|---------|---|--------------|
| Agnew, Anderson, Gerlach and Szykman (2008) | Experiment | US, VA | 845 ind. | 10 – 89 years old nonstudents |
| Ai et al. (2017) | Focus group | US, TX | n.a. | n.a. |
| Bateman et al. (2017) | Survey | Australia | 923 ind. | gender and age quota |
| Benartzi, Previtero and Thaler (2011) | Administrative dataset | US | 103,516 ind. | 50 – 75 years old with over 5 years of job tenure and balance over $5K retired between 2002 and 2008 |
| Bernheim (1991) | LRHS (1975 wave) | US | 2,093 ind. | 64 – 69 years old with wealth under $500,000 not widowed not eligible for government pensions |
| Beshears, Choi, Laibson, Madrian and Zeldes (2014) | Survey | US | 5,130 ind. | 50 – 75 years old |
| Bockweg, Ponds, Steenbeek and Vonken (2016) | Survey | Netherlands | 3,161 ind. | members of an occupational pension plan |
| Brown (2001) | HRS (wave 1) | US | 869 ind. | 51 – 61 years old employed and with a defined contribution plan |
| Brown et al. (2017b) | Survey | US | 4,549 ind. | over 18 years old |
| Brown et al. (2007a) | Survey | US | 2,112 ind. | over 18 years old |
| Brown et al. (2013) | Survey | US | 4,055 ind. | over 50 years old |
| Brown and Previtero (2014) | Administrative dataset | US | 27,231 ind. | between 2002 and 2008 |
| Bütler and Teppa (2007) | Administrative dataset | Switzerland | 4,544 ind. | retired between 1996 and 2006 |
| Butcher, Chaloupka, Madziar and Zahled (2004) | Survey | US | 3,000 ind. | under 65 years old |
| Cappelletti et al. (2013) | SHWI (2008 wave) | Italy | 4,750 ind. | 15 – 65 years old |
| Chalmers and Reuter (2012) | Administrative dataset | US, OR | 31,809 ind. | retired between 1992 and 2000 with a balance of over $200,000 |
| Charupat and Milevsky (2001) | Data on annuity quotes and mortality | Canada | n.a. | n.a. |
| Chou et al. (2016) | Survey | Hong Kong | 1,066 ind. | 40 – 64 years old working full-time |
| Clark et al. (2014) | Administrative dataset | US, NC | 46,913 ind. | over 18 years old |
| Cutler et al. (2008) | AHEAD (wave 2) | US | 7,180 ind. | 65 – 90 years old |
| Doyle et al. (2004) | Data on mortality, annuity payments and interest rates | Singapore and Australia | n.a. | n.a. |
| Finkelstein and Poterba (2002) | Data on mortality, annuity payments and interest rates | US | 5,664 ind. | 50 – 75 years old |
| Friedman and Moore (1991) | Data on mortality, annuity payments and interest rates | US | 7,551 ind. | 50 – 75 years old |
| Hagen (2015) | Data on annuity payments and interest rates | US | 3,651 ind. | 50 – 75 years old |
| Kooi et al. (2016) | Data on mortality, annuity payments and interest rates | US | 1,535 ind. | 50 – 75 years old |
| Mitchell et al. (1999) | Data on mortality, annuity payments and interest rates | US | 1,401 ind. | 50 – 75 years old |
| Nosi et al. (2017) | Survey | Italy | 7,840 ind. | 25 – 35 years old without private pension |
| Payne et al. (2013) | Survey | US | 1,556 ind. | over 18 years old |
| Pfarr and Schneider (2010) | Data on mortality, annuity payments and interest rates | Germany | 3,077 ind. | 40 – 65 years old |
| Schreiber and Weber (2016) | Data on mortality, annuity payments and interest rates | Germany | 2,102 ind. | 40 – 65 years old |
| Schreiber and Weber (2013) | Data on mortality, annuity payments and interest rates | Germany | 8,204 ind. | 40 – 65 years old |
| Teppa (2011) | DNB Household Survey (2005) | Netherlands | 816 ind. | 16 – 65 years old |
| Van der Cruijsen and Jonker (2016) | Survey | Netherlands | 2,082 ind. | over 25 years old |
| Wuppermann (2017) | ELSA (wave 0 – 4) | UK, England | 8,204 ind. | over 25 years old |
| Ziegelmeyer and Nick (2013) | SAVE (wave 2010) | Germany | 1,431 ind. | over 25 years old |

*Quasi-experimental study (highest level of evidence available)."
Two studies looking at job mortality find a positive association\(^1\) with annuity uptake. Moreover, one of the studies that note a negative impact of financial literacy find that these are associated with lower uptake of annuity products (Bateman et al., 2017; Bockweg et al., 2016) or have no effect (Knoller, 2016; Shu et al., 2018; Van der Cruysjen and Jonker, 2016). Potentially because these measures indicate financial (over) confidence, rather than actual financial literacy (Bateman et al., 2017).

Finally, Table 5 displays risk awareness as a relevant factor in annuity uptake. Two studies highlight that such awareness associated positively with annuity uptake. In addition, two quasi-experimental studies show that salience of longevity risks – achieved by asking respondents about their subjective longevity (Payne et al., 2013) or by showing a mortality graph (Beshears et al., 2014) before making an annuity uptake decision – increases uptake as well.

### Contextual factors

Contextual factors that are associated with annuity uptake are summarized in Table 6 (see Table D11 for a more in-depth overview). Contrary to theoretical predictions, not all evidence shows that social benefits may decrease annuity uptake. That such substitution is not observed here, may be due to the fact that in many countries social benefits are additional to other pension rights, thus offering basic financial security for the majority of the population (Schreiber and Weber, 2016). Public policy seems to mainly impact uptake through setting annuitization rules. First, Cannon et al. (2016) show that flexibilization of mandatory annuitization led to lower annuity uptake in the UK. Clearly, annuitizing by default increases uptake, potentially because it decreases procrastination and makes annuitizing more simple. Second, tax incentives can also increase annuity uptake as shown in Table 6.\(^2\)

Annuity equivalent wealth is also positively associated with uptake, as shown in Table 6.\(^3\) Similarly some studies have argued that uptake is low because policies have too little value compared to their costs (Brown, 2001; Doyle et al., 2004; Mitchell et al., 1999). One study analyzing the perceived fairness of a policy reports similar results for subjective policy value (Shu et al., 2018). The relative value of annuities can also impact uptake. Table 6 shows that a higher return on investment for other investment products can decrease the uptake of annuities. Although other investments can indeed serve as investment substitutes, overreliance on recent stock market developments in determining investment portfolios induces individuals to underinvest in annuities and leads to welfare losses (Previtero, 2014).

In addition, Table 6 shows that framing can be of great importance in uptake decisions. Multiple studies show that framing annuities as investment, rather than as insurance of consumption, decreases uptake. This is likely because investment framing emphasizes the possibility that people pay more annuity premiums than they will receive in terms of benefits, thus triggering loss aversion (Brown et al., 2008). Consequently, evidence including one quasi-experimental study suggests that annuities

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\(^{1}\) Two studies looking at job mortality find a positive association (Cutler et al., 2008) and no association (Hurwitz and Sade, 2017) with annuity uptake.

\(^{2}\) One study analyzing the impact of objective financial strength of a company finds no association (Chou et al., 2016).

\(^{3}\) A hypothetical study that corrects for survey attention also finds that survey attention increases hypothetical annuity uptake (Bateman et al., 2017).

\(^{4}\) Procrastination is associated with lower uptake (Brown and Previtero, 2014), whereas two studies find that simplicity of the product is associated with higher uptake (Brown, Kaptyn, Luttmer, Mitchell, et al., 2017) or not associated with uptake (Bockweg et al., 2016).

\(^{5}\) Design of incentives is important, as poorly designed incentives can decrease the relative attractiveness of annuities (Charupat and Milevsky, 2001).

\(^{6}\) One study suggests that this relationship is non-linear, as it finds a statistically significant positive squared effect (Clark et al., 2014)

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**Table 5**

Overview of findings by studies on individual factors associated with annuity uptake.

| Factor                        | Association          | Total |
|-------------------------------|----------------------|-------|
|                               | Negative | None  | Positive | #      |
| Demographics                  |          |       |          | #      |
| Female\(^a\)                  | 4        | 17%   | 12       | 52%    | 7      | 30%   | 23     |
| Age                           | 8        | 36%   | 7        | 32%    | 7      | 32%   | 22     |
| Non-white                     | 0        | 0%    | 0        | 1      | 50%    | 1      | 50%    | 20     |
| Socio-economic status         |          |       |          | #      |
| Education                     | 0        | 0%    | 0        | 14     | 82%    | 3      | 18%    | 17     |
| Income\(^b\)                  | 1        | 7%    | 9        | 64%    | 4      | 29%   | 14     |
| Home ownership                | 0        | 0%    | 0        | 4      | 100%   | 0      | 0%     | 4      |
| Wealth\(^c\)                  | 1        | 7%    | 5        | 33%    | 9      | 60%   | 15     |
| Family                        |          |       |          | #      |
| Number of children\(^b\)      | 1        | 8%    | 12       | 92%    | 0      | 0%    | 13     |
| Married\(^c\)                 | 2        | 12%   | 15       | 88%    | 0      | 0%    | 17     |
| Bequest motive                | 1        | 14%   | 5        | 71%    | 1      | 14%   | 7      |
| Subjective risk               |          |       |          | #      |
| Subjective health             | 0        | 0%    | 6        | 67%    | 3      | 33%   | 9      |
| Subjective longevity\(^a\)    | 1        | 8%    | 7        | 58%    | 4      | 33%   | 12     |
| Objective risk                |          |       |          | #      |
| Longevity\(^d\)               | 0        | 0%    | 2        | 50%    | 2      | 50%   | 4      |
| Preferences                   |          |       |          | #      |
| Risk aversion                 | 3        | 27%   | 5        | 45%    | 3      | 27%   | 11     |
| Stock market participation    | 1        | 17%   | 3        | 50%    | 2      | 33%   | 6      |
| Patience                      | 0        | 0%    | 0        | 0%     | 4      | 100%  | 4      |
| Trust insurer                 | 0        | 0%    | 1        | 50%    | 1      | 50%   | 2      |
| Understanding                 |          |       |          | #      |
| Financial literacy\(^a\)      | 2        | 20%   | 4        | 40%    | 4      | 40%   | 10     |
| Salience                      |          |       |          | #      |
| Awareness of longevity risk   | 0        | 0%    | 0        | 0%     | 2      | 100%  | 2      |

\(^a\) Discrepancy in results of stated and revealed preferences studies.

\(^b\) Three studies report having children (or not) rather than the number of children.

\(^c\) Three studies report different associations for married individuals compared to individuals who are single, divorced, or widowed and have been counted under “none”.

\(^d\) One study reports different associations for two measures of ex-ante mortality and has been counted under “none”.

\(^*\) One study reports different associations for three different measures of financial literacy and has been counted under “none”.

pospositively associated with annuity uptake.\(^\text{17}\) All in all, the evidence available suggests that experienced health and objective longevity are positively associated with annuity uptake.

Furthermore, there is no convincing evidence that risk preferences are associated with uptake decisions. First, the evidence we map in Table 5 does not show clear association of risk aversion or stock market participation with annuity holding. Second, another indicator of risky behavior, namely smoking, does not seem to be associated with annuity uptake (Guillemette et al., 2016; Hurwitz and Sade, 2017). Third, even though some studies find a positive relationship between annuity uptake and health insurance ownership (Hurd and Panis, 2006) or LTCI ownership (Pfarr and Schneider, 2013), others do not (Chou et al., 2016). Additionally, several studies found patience and personal trust in the insurance company\(^\text{18}\) positively associated with annuity uptake.

Next, Table 5 shows that financial literacy – again measured as knowledge of probabilities, inflation, compound interest and risk diversification – may increase annuity uptake.\(^\text{19}\) In addition, two other studies find a positive association between a principal component of education, financial literacy and cognitive intactness on the one hand and annuity valuation on the other (Brown et al., 2017a,b). Using a financial advisor is also associated with higher uptake (Pfarr and Schneider, 2013). Even so, studies using subjective measures of financial literacy find that these are associated with lower uptake of annuity products (Bateman et al., 2017; Bockweg et al., 2016) or have no effect (Knoller, 2016; Shu et al., 2018; Van der Cruysjen and Jonker, 2016). Potentially because these measures indicate financial (over) confidence, rather than actual financial literacy (Bateman et al., 2017).

Finally, Table 5 displays risk awareness as a relevant factor in annuity uptake. Two studies highlight that such awareness associated positively with annuity uptake. In addition, two quasi-experimental studies show that salience of longevity risks – achieved by asking respondents about their subjective longevity (Payne et al., 2013) or by showing a mortality graph (Beshears et al., 2014) before making an annuity uptake decision – increases uptake as well.
with additional protections – such as period guarantees, principal protections, or inflation coverage – can increase uptake. In line with this, one quasi-experimental study shows that framing annuities in terms of lack of flexibility and control significantly reduces uptake (Beshears et al., 2014). Other framing aspects may also be of importance, as another quasi-experimental study shows that using a “live to” (rather than “die by”) frame (Payne et al., 2013) increases uptake. Framing a specific annuity goal may (Knoller, 2016) or may not (Brown et al., 2013) increase uptake. Finally, one study shows that people annuitize less when risks are more ambiguous and when the choice tasks is more complex (i.e., more information is offered) (Brown et al., 2017b).

| Factor                          | Association | Total |
|--------------------------------|-------------|-------|
|                                | Negative (% | None (%) | Positive (%) | # |
| Social benefits\(^a\)          | 1 (0)       | 0 (0)  | 3 (0)        | 0 (0) |
| Tax incentives                 | 0 (0)       | 0 (0)  | 3 (0)        | 3 (0) |
| Annuity equivalent worth       | 1 (0)       | 0 (0)  | 3 (0)        | 3 (0) |
| Return on investments          | 3 (0)       | 2 (0)  | 0 (0)        | 0 (0) |
| Annuity as defaults            | 0 (0)       | 0 (0)  | 0 (0)        | 0 (0) |
| Framing as investment          | 4 (0)       | 1 (0)  | 0 (0)        | 0 (0) |
| Protections\(^b\)              | 0 (0)       | 0 (0)  | 0 (0)        | 0 (0) |

\(^a\) One study reports different associations of different social benefit schemes and has been counted under “none”.

\(^b\) One study reports a positive association with period guarantees and a negative association with inflation protection and has been counted under “none”.

Why is annuity uptake so low?

From our theoretical (Section “Demand for annuities”) and empirical overview (Sections “Individual factors” and “Contextual factors”) we infer the same explanations for low uptake of annuities as those inferred earlier for LTCI: (i) substitution by social benefits; (ii) adverse selection; (iii) individual preferences that differ from those assumed in standard economic models of consumer behavior; and (iv) financial illiteracy. Subsequently, (v) we discuss how these may relate to the distribution of annuity uptake over the population.

(i) As theoretically predicted, substitution by social benefits can decrease annuity uptake. Whether it actually does, however, seems to depend crucially on the design of the social benefit system. If social benefits are used only as a safety net for those worst off, then it may substitute for annuity uptake. If social benefits provide a base consumption for all retirees, substitution does not seem to take place.

In addition, other investments have theoretically been proposed to substitute for annuity uptake (Hainaut and Devolder, 2006). In practice, we find evidence that people purchase annuities less when stock indices are high. However, this does not seem to indicate that stock market investments actually substitute for annuities. Rather, overreliance on recent stock price increases induces people to overestimate returns on annuities and to underannuitize for retirement altogether (Previtero, 2014). Hence, although stock prices are associated with lower uptake, it is not clear to what extent this is driven by substitution and to what extent by limited rationality.

(ii) Adverse selection seems to play a role in the annuity market, as predicted theoretically. Our results highlight that those who take up annuities have a higher longevity risk; they may be subjectively healthier, may have a higher subjective longevity risk and they live objectively longer. Additionally, studies analyzing annuity equivalent worth – or policy value – have shown that this is lower due to adverse selection (Brown, 2001; Doyle et al., 2004; Mitchell et al., 1999).

(iii) Nonstandard preferences may also explain lower than expected annuity demand. In line with theoretical predictions, our overview of empirical studies suggests that higher levels of patience are associated with higher levels of annuity. However, our overview also highlights discrepancies between theoretical and empirical studies. First, there is no evidence that risk aversion or any proxy thereof is associated with higher annuity uptake. Second, bequest motives do not seem to increase annuity uptake, although this may indicate that some parents use bequests to strategically influence behavior of their children.

(iv) As for LTCI, it seems that annuity uptake decisions are difficult. Specifically, higher financial literacy and greater salience of longevity risks lead to increased annuity uptake, suggesting that those with greater knowledge or risk awareness are better protected against longevity risks. Additionally, one study has highlighted that people who are prone to procrastinate are less likely to own annuities (Brown and Previtero, 2014). Moreover, uptake decisions seem to be guided by contextual defaults and framing, rather than by expected utility maximization. Finally, trust in insurance companies is associated with higher annuity uptake and lack thereof may thus contribute to low uptake levels.

(v) From our review it follows that uptake of annuities differs across different subgroups of the population, as does the uptake of LTCI. Even though substitution by social benefits (among lower income individuals) plays a role in annuity uptake, we find that uptake is concentrated among individuals with high wealth (and likely also high income). Following our other explanations for low uptake we infer that these individuals may (a) have better subjective health and higher longevity and adversely select into the annuity market; (b) simply have other preferences than those with lower wealth, although this is not supported by stated preference studies; and/or (c) be better able to judge the value of those products.

Discussion

Our study provides an overview of the evidence from revealed preference studies, stated preference studies and theoretical models of demand for LTCI and annuities, integrating the limited quasi-experimental research available. Altogether, the evidence consistently suggests that low uptake follows from substitution, adverse selection, nonstandard preferences and limited rationality. Hence, our findings are unlikely to reflect measurement errors that are specific to these research methods. Rather, we show that employing different methods to answer the pressing LTCI and annuity puzzles renders qualitatively similar results on aggregate.

In addition, combining our results may provide valuable insight into the factors that impact insurance decisions for late-in-life risks in general. Particularly, this may elucidate to what extent groups with low LTCI and annuity uptake may overlap. Therefore, Table 7 summarizes which specific aspects limit uptake for both LTCI and annuities. Uptake of both LTCI and annuities is lower for individuals that (i) are eligible for public policies that can substitute for private insurance; (ii) that are subjectively less healthy; (iii) that have lower trust in insurance companies; and (iv) that are less financially literate or risk aware.

These results may contain lessons for integrated products that insure simultaneously against LTC and longevity risks. Such life-care annuities (LCAs) have been proposed on a theoretical basis to diminish adverse selection by combining negatively correlated LTC and longevity risks in one product (Murgaugh et al., 2001).\(^{24}\) Although in the US uptake of annuities with LTC riders seems promising, it is unclear whether these products indeed broaden the market. Currently, only one study has analyzed demand for LCAs directly (Wu et al., 2018). This study finds no evidence of selection effects in purchase decisions for hypothetic integrated products, but also highlights that uptake is impacted by risk awareness as well as by ease of financial knowledge acquisition.

\(^{24}\) This has been disputed by Zhou-Richter and Gründl (2011) who argue that long-term care and longevity risks are positively correlated and that LCAs hence may offer even more room for adverse selection.
In particular, we speculate that integrated products are unlikely to substantially expand the market as a whole for three reasons. First, uptake is not only limited by adverse selection, but also impacted by substitution, nonstandard preferences and limited rationality. Second, all these explanations seem to result in a concentration of demand among healthy individuals with higher wealth, making it difficult to expand the market for LTCI and longevity insurance products to a broader population. Third, an integrated product may turn out to be more complex than two separate products and may thus work to decrease uptake amongst the least financially literate. Nonetheless, future work remains necessary to better understand the viability of such integrated products.

Conclusion and recommendations

Our systematic literature review shows that similar factors hinder the uptake of both LTCI and annuities. Specifically, we find that uptake is lowered by substitution by social security, adverse selection, nonstandard preferences and limited rationality due to low financial literacy and risk unawareness. Moreover, these factors may also explain why insurance holding is concentrated among individuals with high wealth and good subjective health. An integrated product – only focusing on solving adverse selection issues – is unlikely to solve other aspects that limit uptake. Particularly, our results show that uptake for integrated products is likely to remain concentrated among wealthier and subjectively healthier individuals.

Further research is warranted to better understand the dynamics of LTCI and annuity uptake. Specifically, it is worth analyzing to what extent our findings can indeed explain the concentration of uptake among individuals with good subjective health and high wealth. The fact that uptake of private insurance is unequally distributed also has important consequences for policy makers. In so far as low uptake reflects an active choice to substitute for private insurance or reflects a dislike of private insurance, it echoes individual preferences and requires no action. However, to the extent that it reflects adverse selection or limited rationality, lower uptake is a product of underlying inequalities in health or longevity and related unequal capabilities, and that may warrant policy interventions.

If the goal is to increase insurance uptake on private LTCI or annuity markets, policy makers and insurers could undertake several actions to create a more inclusive insurance market. First, individuals with low financial literacy should be empowered to make their own insurance decisions. This may not only be achieved through educational policies that increase financial literacy and hence understanding of LTCI and annuity products. In addition, complexity of the choice environment should be reduced by making insurance policies easier to comprehend and by reducing the number of policy options. Second, risk awareness increases insurance uptake; policy makers and insurers could thus focus on raising awareness of LTC and longevity risks. Particularly, governments should be clear about what social benefits do and do not reimburse and about what contribution is expected from citizens themselves. Even though large-scale awareness campaigns sometimes have limited impact (Iwasaki et al., 2010), such campaigns are easy and relatively cheap to implement. Third, since our results show that distrust of insurers additionally drives low uptake, government regulation or insurance standards that protect insured persons by guaranteeing the pay out of fair claims may help to increase uptake. Fourth, evidence on the importance of perceptions, framing and defaults suggests that these may provide effective nudges for increasing insurance uptake (for an illustration, see: Bonsang and Costa-Font, 2019). In addition, offering products with guaranteed pay-outs when the insured risk does not (fully) materialize may prove particularly effective.

Finally, the fact that those with lower subjective health, risk awareness or financial literacy buy predictably less protection against late-in-life risks may provide an argument for stronger government intervention. Particularly, governments may aim not only to safeguard individual freedom of choice, but also to protect their citizens from major financial risks. Hence, compulsory coverage – through an individual mandate for those not-covered by social insurance schemes or through an extension of social insurance schemes – may be warranted.

CRediT authorship contribution statement

**Timo R. Lambregts**: Conceptualization, Methodology, Investigation, Formal analysis, Data curation, Writing - original draft, Project administration. **Frederik T. Schut**: Investigation, Writing - review & editing, Supervision, Funding acquisition.

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Appendix A. Search string Embase.com

(((longevity/de OR 'long term care'/de OR 'elderly care'/exp OR retirement/de OR pensioner/de OR 'nursing home'/de) AND (insurance/de OR 'social insurance'/de OR 'social security'/de)) OR (((longevity* OR long-term-care OR longterm-care OR life OR ltc OR pension* OR retirement* OR nursing-home*) NEAR/6 (insur* OR annuit* OR Social-securit*)) OR ltc):ab,ti) AND (decision making/de OR 'purchasing'/de OR 'attitude'/de OR 'attitude to ageing'/de OR 'attitude to disability'/de OR 'attitude to death'/de OR 'attitude to life'/de OR 'attitude to illness'/de OR 'attitude to health'/de OR 'consumer attitude'/de OR 'family attitude'/exp OR motivation/de OR decision support system/de OR consumer/de OR ((decision* OR decid* OR uptake OR nonuptake OR purchase* OR nonpurchase* OR why OR buy OR buying OR reason* OR motivation* OR take-up OR choos* OR choice* OR procure OR willing* OR persua* OR selling OR crowd*-out* OR puzzle* OR obtain* OR select OR selecting OR selection OR take OR taking OR get OR getting OR interes* OR acquire* OR acquisition* OR afford* OR abilit* OR able OR pay OR paying OR preference* OR substi* OR exchange* OR replac* OR self-control* OR discount* OR invest* OR reference* OR consum* OR Participat* OR attai* OR wtp OR value* OR worth OR utilit* OR attitude* OR belief* OR confidence* OR overconfiden* OR confident OR trust* OR expectation* OR estimate* OR probabil* OR weighting OR weighing OR bias* OR predispos* OR prejudice* OR approximat* OR guess OR assess* OR evaluat* OR uncertain* OR ambigu* OR attention* OR focus* OR sensitivit* OR concern OR concerns OR behav* OR perception* OR perceive* OR factor* OR salien* OR capac* OR access* OR framing OR emotion* OR default OR familiar* OR pressure OR market* OR incentiv* OR disincentiv* OR barrier* OR facilitator*) NEAR/6 (insur* OR long-term-care-insurance* OR annuit*)):ab,ti) NOT ([Conference Abstract]/lim OR [Letter]/lim OR [Note]/lim OR [Editorial]/lim) AND [english]/lim

Appendix B. PRISMA flow diagram

Figure B1
Appendix C. Individual and contextual level empirical evidence on LTCI uptake

### Table C8
Overview of findings by studies on individual factors associated with annuity uptake.

| Factor       | Negative | None | Positive |
|--------------|----------|------|----------|
| Female       | 4        | 20   | 13       |

- **Stated preferences**
  - 3 papers mention female
  - Allaire et al. (2016)
  - Swamy (2004)
  - Stevenson et al. (2009)
  - 7 papers mention stated preferences
  - Ameriks et al. (2018)
  - Brau et al. (2010)
  - Costa-Font and Font (2009)
  - Costa-Font and Rovira-Forns (2008)
  - He and Chou (2018)
  - Kennedy et al. (2016)
  - Wu et al. (2017)

- **Revealed preferences**
  - 1 paper mentions revealed preferences
  - Brau and Bruni (2008)
  - 13 papers mention revealed preferences
  - Caro et al. (2011)
  - Courbage and Roudaut (2008)
  - Cramer and Jensen (2006)
  - Friedberg et al. (2017)
  - Gousia (2016)
  - Gottlieb and Mitchell (2015)
  - Jiménez-Martín et al. (2016)
  - McGarry et al. (2014)
  - Mellor (2000)
  - Schaber and Stum (2007)
  - Sloan and Norton (1997)
  - Stum (2008)

| Age          | 8        | 18   | 11       |
|--------------|----------|------|----------|

- **Stated preferences**
  - 3 papers mention age
  - Brau and Bruni (2008)
  - Brau et al. (2010)
  - Costa-Font and Font (2009)
  - 2 papers mention stated preferences
  - Ameriks et al. (2018)
  - Wu et al. (2017)

- **Revealed preferences**
  - 5 papers mention revealed preferences
  - Caro et al. (2011)
  - Chatterjee and Fan (2017)
  - Courtemanche and He (2009)
  - Gottlieb and Mitchell (2015)
  - Jiménez-Martín et al. (2016)
  - Li and Jensen (2012)
  - McGarry et al. (2014)
  - McGarry et al. (2016)
  - McNamara and Lee (2004)
  - Mellor (2001)
  - Sloan and Norton (1997)
  - Stum (2008)
  - Unruh et al. (2016)
  - Van Houtven et al. (2015)

| Non-white    | 1        | 13   | 2        |
|--------------|----------|------|----------|

- **Stated preferences**
  - 1 paper mentions non-white
  - Kennedy et al. (2016)
  - 12 papers mention stated preferences
  - Allaire et al. (2016)
  - Cramer and Jensen (2006)
  - Gottlieb and Mitchell (2015)
  - Konetzka and Luo (2011)
  - Li and Jensen (2012)
  - McGarry et al. (2014)
  - McGarry et al. (2016)
  - McGarry et al. (2018)
  - McNamara and Lee (2004)
  - Sloan and Norton (1997)
  - Stevenson et al. (2009)
  - Swamy (2004)

(continued on next page)
| Factor         | Negative | None | Positive |
|---------------|----------|------|----------|
| Education     | 2        | 10   | 18       |
| Stated preferences | 0  | 4    | 2        |
| Revealed preferences | 2  | 6    | 16       |
| Income        | 0        | 14   | 22       |
| Stated preferences | 2  | 5    |          |
| Revealed preferences | 0  | 12   | 17       |
| Home equity   | 2        | 2    | 0        |
| Stated preferences | 1  | 1    | 0        |
| Revealed preferences | 1  | 1    | 0        |
| Wealth        | 1        | 10   | 16       |
| Stated preferences | 0  | 2    | 2        |
| Revealed preferences | 1  | 8    | 14       |
|                  |          |      | (continued on next page) |

Table C8 (continued)
| Factor                | Negative | None | Positive |
|-----------------------|----------|------|----------|
|                       |          |      |          |
| Number of children    | 7        | 13   | 1        |
| Stated preferences    | 1        | 3    | 0        |
| • Brau and Bruni (2008) |          |      |          |
| Revealed preferences  | 6        | 10   | 1        |
| • Cramer and Jensen (2006) |          |      |          |
| • Gousia (2016)       |          |      |          |
| • Jiménez-Martín et al. (2016) |          |      |          |
| • McGarry et al. (2016) |          |      |          |
| • McGarry et al. (2018) |          |      |          |
| • Schaber and Stum (2007) |          |      |          |
| Married               | 3        | 25   | 4        |
| Stated preferences    | 1        | 5    | 0        |
| • Brau and Bruni (2008) |          |      |          |
| Revealed preferences  | 2        | 20   | 4        |
| • McNamara and Lee (2004) |          |      |          |
| • Schaber and Stum (2007) |          |      |          |
| Bequest motive        | 0        | 4    | 3        |
| Stated preferences    | 0        | 1    | 0        |
| • He and Chou (2018)  |          |      |          |
| Revealed preferences  | 0        | 3    | 3        |
| • Schaber and Stum (2007) |          |      |          |
| • Sloan and Norton (1997) |          |      |          |
| Subjective health     | 2        | 19   | 10       |
| Stated preferences    | 0        | 4    | 2        |
| • Ameriks et al. (2018) |          |      |          |
| • Allaire et al. (2016) |          |      |          |
| • Brau et al. (2010)  |          |      |          |
| • Costa-Font and Font (2009) |          |      |          |
| Factor                  | Negative | Association | Positive |
|------------------------|----------|-------------|----------|
|                       |          | None        |          |
| Revealed preferences   | 2        | 15          | 8        |
|                        | Li and Jensen (2012) | Barnett and Stum (2013) | Bernet (2004) |
|                        | Stum (2008) | Browne and Zhou-Richter (2014) | Cramer and Jensen (2006) |
|                        | Caro et al. (2011) | Chatterjee and Fan (2017) | McCall et al. (1998) |
|                        |          | Courtemanche and He (2009) | McGarry et al. (2014) |
|                        |          | Friedberg et al. (2017) | McNamara and Lee (2004) |
|                        |          | Gottlieb and Mitchell (2015) | Mellor (2001) |
|                        |          | Gousia (2016) | Unruh et al. (2016) |
|                        |          | Konetzka and Luo (2011) | Van Houven et al. (2015) |
|                        |          | McGarry et al. (2016) |          |
|                        |          | McGarry et al. (2018) |          |
|                        |          | Mellor (2000) |          |
|                        |          | Schaber and Stum (2007) |          |
|                        |          | Sloan and Norton (1997) |          |
| Subjective LTC risk    | 0        | 5           | 14       |
| Stated preferences     | 0        | 3           | 1        |
|                        |          | Ameriks et al. (2018) | He and Chou (2018) |
|                        |          | Costa-Font and Font (2009)a |          |
|                        |          | Wu et al. (2017)a |          |
| Revealed preferences   | 0        | 2           | 13       |
|                        |          | Friedberg et al. (2017) | Brown et al. (2012) |
|                        |          | Kumar et al. (1995)a | Caro et al. (2011) |
|                        |          |          | Chatterjee and Fan (2017) |
|                        |          |          | Costa-Font and Rovira-Forns (2008) |
|                        |          |          | Finkelstein and McGarry (2006) |
|                        |          |          | Gottlieb and Mitchell (2015) |
|                        |          |          | Kitajima (1999) |
|                        |          |          | McGarry et al. (2016) |
|                        |          |          | McGarry et al. (2018) |
|                        |          |          | Schaber and Stum (2007) |
|                        |          |          | Sloan and Norton (1997) |
|                        |          |          | Swamy (2004) |
|                        |          |          | Unruh et al. (2016) |
| Subjective longevity   | 0        | 6           | 0        |
| Stated preferences     | 0        | 3           | 0        |
|                        |          | Costa-Font and Font (2009)a |          |
|                        |          | Costa-Font and Rovira-Forns (2008) |          |
|                        |          | Wu et al. (2017) |          |
| Revealed preferences   | 0        | 3           | 0        |
|                        |          | Caro et al. (2011) |          |
|                        |          | Cramer and Jensen (2006) |          |
|                        |          | Sloan and Norton (1997) |          |
| ADL impairments        | 1        | 14          | 3        |
| Stated preferences     | 0        | 1           | 1        |
|                        |          | Ameriks et al. (2018) | Kennedy et al. (2016) |
| Revealed preferences   | 1        | 13          | 2        |
|                        | Konetzka and Luo (2011) | Bernet (2004) | Courbage and Roudaut (2008) |
|                        |          | Caro et al. (2011) | Nixon (2014) |
|                        |          | Chatterjee and Fan (2017) |          |
|                        |          | Courtemanche and He (2009) |          |
|                        |          | Friedberg et al. (2017) |          |
|                        |          | Gottlieb and Mitchell (2015) |          |
|                        |          | Li and Jensen (2012) |          |
|                        |          | McCall et al. (1998) |          |
|                        |          | McGarry et al. (2016) |          |
|                        |          | McGarry et al. (2018) |          |
|                        |          | Mellor (2000) |          |
|                        |          | Mellor (2001) |          |
|                        |          | Sloan and Norton (1997) |          |

(continued on next page)
| Factor                          | Association          | Negative | None | Positive |
|--------------------------------|----------------------|----------|------|----------|
| Risk aversion                  |                      | 2        | 3    | 2        |
| Stated preferences             |                      | 0        | 1    | 0        |
| Revealed preferences           |                      | 2        | 2    | 2        |
| • Costa-Font and Rovira-Forns (2008) |                    |          |      |          |
| • Gousia (2016)                |                      |          |      |          |
| Preference for formal care     | 0                    | 0        |      | 3        |
| Stated preferences             | 0                    | 0        | 0    | 1        |
| Revealed preferences           | 0                    | 0        | 0    | 2        |
| • He and Chou (2018)           |                      |          |      |          |
| • Boyer et al. (2017)          |                      |          |      |          |
| • Brown et al. (2012)          |                      |          |      |          |
| • Gousia (2016)                |                      |          |      |          |
| • Gottlieb and Mitchell (2015)|                      |          |      |          |
| • Sloan and Norton (1997)      |                      |          |      |          |
| Trust insurer                  | 0                    | 0        | 0    | 2        |
| Stated preferences             | 0                    | 0        | 0    | 0        |
| Revealed preferences           | 0                    | 0        | 0    | 2        |
| • Brown et al. (2012)          |                      |          |      |          |
| • Curry et al. (2009)          |                      |          |      |          |
| Financial literacy             | 1                    | 0        |      | 4        |
| Stated preferences             | 0                    | 0        | 0    | 1        |
| Revealed preferences           | 1                    | 0        | 3    | 0        |
| • Boyer et al. (2017)          |                      |          |      |          |
| • He and Chou (2018)           |                      |          |      |          |
| System knowledge               | 0                    | 4        |      | 1        |
| Stated preferences             | 0                    | 0        | 0    | 1        |
| Revealed preferences           | 0                    | 4        |      | 0        |
| • Boyer et al. (2017)          |                      |          |      |          |
| • Schaber and Stum (2007)      |                      |          |      |          |
| • Swamy (2004)                 |                      |          |      |          |
| • Unruh et al. (2016)          |                      |          |      |          |
| Cognitive intactness           | 0                    | 3        |      | 1        |
| Stated preferences             | 0                    | 0        | 0    | 1        |
| Revealed preferences           | 0                    | 3        | 1    | 0        |
| • Friedberg et al. (2017)      |                      |          |      |          |
| Awareness                      | 0                    | 3        |      | 5        |
| Stated preferences             | 0                    | 1        |      | 0        |
| Revealed preferences           | 0                    | 2        | 5    | 0        |
| • Allaire et al. (2016)        |                      |          |      |          |
| • Barnett and Stum (2013)      |                      |          |      |          |
| • Browne and Zhou-Richter (2014)|                     |          |      |          |
| LTC experience                 | 2                    | 9        |      | 8        |
| Stated preferences             | 1                    | 2        | 3    | 0        |
| • Kitajima (1999)              |                      |          |      |          |
| • Allaire et al. (2016)        |                      |          |      |          |
| • Wu et al. (2017)             |                      |          |      |          |
| • Brau and Bruni (2008)        |                      |          |      |          |
| • Kennedy et al. (2016)        |                      |          |      |          |
| • Tenayson and Yang (2014)     |                      |          |      |          |
### Table C8 (continued)

| Factor                  | Negative | None | Positive |
|-------------------------|----------|------|----------|
| Revealed preferences    | 1        | 7    | 5        |
|                         | Kumar et al. (1995) | Barnett and Stum (2013) | Courbage and Roudaut (2008) |
|                         |          | Coe et al. (2015b) | Jiménez-Martín et al. (2016) |
|                         |          | Cramer and Jensen (2006) | Koneztka and Luo (2011) |
|                         |          | Li and Jensen (2012) | McCall et al. (1998) |
|                         |          | Schaber and Stum (2007) | Stum (2008) |
|                         |          | Swamy (2004) |                      |
|                         |          | Unruh et al. (2016) |                      |

- Reports different associations in equivalent analyses and is therefore counted under “none”.
- Reports two different age associations and is therefore counted under “none”.
- Reports different associations for “black”, “Hispanic” and/or “other” and is therefore counted under “none”.
- Reports household size and is therefore counted under both children and married.
- Reports having children (or not) rather than number of children.
- Reports different associations for married individuals compared to individuals that are single, divorced or widowed and is therefore counted under “none”.
- Reports an interaction of LTC risk and longevity risk.
- Reports different associations for home care and nursing home expectations and is therefore counted under “none”.
- Reports different associations for different proxies of LTC experience and is therefore counted under “none”.

### Table C9

Overview of findings by studies on individual factors associated with LTCI uptake.

| Factor                  | Association |
|-------------------------|-------------|
|                         | Negative | None | Positive |
| Social benefits         | 4        | 6    | 0        |
| Stated preferences      | 0        | 1    | 0        |
| Revealed preferences    | 4        | 5    | 0        |
|                         | Brown et al. (2007b)† | Kumar et al. (1995)a | Courbage and Roudaut (2008) |
|                         | Doerrpinghaus and Gustavson (2002) | Li and Jensen (2012) | Jiménez-Martín et al. (2016) |
|                         | Jiménez-Martin et al. (2016) | McGarry et al. (2018) | Koneztka and Luo (2011) |
|                         | Konetzka and Luo (2011) | Sloan and Norton (1997)b | Stevenson et al. (2009)a |
| Tax incentive           | 0        | 4    | 5        |
| Stated preferences      | 0        | 0    | 0        |
| Revealed preferences    | 0        | 4    | 5        |
|                         | McGarry et al. (2018) | Nixon (2014) | Cornell and Grabowski (2018)† |
|                         | Stevenson et al. (2009)a | Stum (2008) | Cramer and Jensen (2006) |
| Informal care availability | 4      | 7    | 2        |
| Stated preferences      | 0        | 3    | 0        |
| Revealed preferences    | 4        | 4    | 2        |
|                         | Bernet (2004) | McGarry et al. (2016) | Boyer et al. (2017) |
|                         | Brown et al. (2012) | Mellor (2001) | Coe et al. (2015a,b) |
|                         | McCall et al. (1998) | Schaber and Stum (2007) |                      |
|                         | McGarry et al. (2018) | Stum (2008) |                      |

- Quasi-experimental study (highest level of evidence available).
- Reports different associations of various measures of social benefit generosity and is therefore counted under “none”.
- Reports different associations in equivalent analyses and is therefore counted under “none”.
- Reports different associations of tax deductions and tax credits and is therefore counted under “none”.

Appendix D. Individual and contextual level empirical evidence on annuity uptake
Table D10
Overview of findings per study on individual factors associated with annuity uptake.

| Factor          | Association | Negative | None | Positive |
|-----------------|-------------|----------|------|----------|
| Female          |             | 2        | 7    | 1        |
| Stated preferences |            | • Nosi et al. (2017) | • Bateman et al. (2017) | • Beshears, Choi et al. (2014) | • Bockweg et al. (2016) |
|                 |             | • Teppa (2011) | • Bockweg et al. (2016) | • Cappelletti et al. (2013) | • Chou et al. (2011) |
|                 |             |          |      |          | • Pfarr and Schneider (2013) |
|                 |             |          |      |          | • Shu et al. (2018) |
| Revealed preferences |          | 2        | 5    | 6        |
|                 |             | • Büscher and Teppa (2007) | • Hagen (2015)* | • Hurd and Panis (2006) | • Hurwitz and Sade (2017) |
|                 |             | • Inkmann et al. (2011) | • Schreiber and Weber (2016) | • Ziegelmeyer and Nick (2013) |
| Age             |             | 8        | 7    | 7        |
| Stated preferences |            | 4        | 3    | 4        |
|                 |             | • Brown et al. (2017a) | • Beshears et al. (2014) | • Shu et al. (2018) |
|                 |             | • Guillemette et al. (2016) | • Teppa (2011) |
|                 |             | • Schooley-Pettis and Worden (2013) | • Schreiber and Weber (2016) |
|                 |             | • Schreiber and Weber (2016) |
| Revealed preferences |          | 4        | 4    | 3        |
|                 |             | • Bernheim (1991) | • Inkmann et al. (2011) | • Pfarr and Schneider (2013) |
|                 |             | • Clark et al. (2014) | • Previtero (2014)* | • Ziegelmeyer and Nick (2013) |
|                 |             | • Hurd and Panis (2006) | • Schreiber and Weber (2016) |
|                 |             | • Hurwitz and Sade (2017) | • Van der Cruijsen and Jonker (2016) |
| Non-white       |             | 0        | 1    | 1        |
| Stated preferences |            | 0        | 0    | 0        |
| Revealed preferences |          | 0        | 1    | 1        |
|                 |             |          |      |          |
| Education       |             | 0        | 14   | 3        |
| Stated preferences |            | 0        | 8    | 2        |
|                 |             |          |      |          |
| Revealed preferences |          | 0        | 6    | 1        |
|                 |             |          |      |          |
| Income          |             | 1        | 9    | 4        |
| Stated preferences |            | 0        | 8    | 0        |
| Revealed preferences |          | 1        | 1    | 4        |
| (continued on next page)
| Factor          | Association | None | Positive |
|-----------------|-------------|------|----------|
|                 | Negative    | 0    | 4        | 0        |

| Home ownership |              |      |          |
|----------------|--------------|------|----------|
| Stated preferences | 0   | 2    | Beshears et al. (2014) |
| Revealed preferences | 0   | 2    | Van der Cruissen and Jonker (2016) |
| Weath            |              |      |          |
| Stated preferences | 0   | 5    | Bateman et al. (2017) |
| Revealed preferences | 1   | 7    | Bernheim (1991) |
| Children         |              |      |          |
| Stated preferences | 1   | 6    | Schreiber and Weber (2016) |
| Revealed preferences | 0   | 6    | Bernheim (1991) |
| Married          |              |      |          |
| Stated preferences | 0   | 9    | Bateman et al. (2017) |
| Revealed preferences | 2   | 6    | Bernheim (1991) |

(continued on next page)
| Factor                      | Association | Negative | None | Positive |
|-----------------------------|-------------|----------|------|----------|
| Bequest motive              |             | 1        | 5    | 1        |
| Stated preferences          |             | 1        | 4    | 1        |
| • Bateman et al. (2017)     |             |          |      |          |
| • Schooley-Pettis and Worden (2013) |          |          |      |          |
| • Shu et al. (2018)         |             |          |      |          |
| • Teppa (2011)              |             |          |      |          |
| • Van der Cruisen and Jonker (2016) |          |          |      |          |
| Revealed preferences        |             | 0        | 1    | 0        |
| • Brown (2001)              |             |          |      |          |
| Subjective health           |             | 0        | 6    | 3        |
| Stated preferences          |             | 0        | 5    | 1        |
| • Cappelletti et al. (2013) |             |          |      |          |
| • Chou et al. (2016)        |             |          |      |          |
| • Schooley-Pettis and Worden (2013) |          |          |      |          |
| • Shu et al. (2018)         |             |          |      |          |
| • Van der Cruisen and Jonker (2016) |          |          |      |          |
| Revealed preferences        |             | 0        | 1    | 2        |
| • Wuppermann (2017)         |             |          |      |          |
| • Hurd and Panis (2006)     |             |          |      |          |
| • Brown (2001)              |             |          |      |          |
| Subjective longevity        |             | 1        | 7    | 4        |
| Stated preferences          |             | 1        | 3    | 4        |
| • Chou et al. (2016)        |             |          |      |          |
| • Bateman et al. (2017)     |             |          |      |          |
| • Bockweg et al. (2016)     |             |          |      |          |
| • Shu et al. (2018)         |             |          |      |          |
| • Payne et al. (2013)       |             |          |      |          |
| • Schreiber and Weber (2016) |             |          |      |          |
| • Teppa (2011)              |             |          |      |          |
| • Van der Cruisen and Jonker (2016) |          |          |      |          |
| Revealed preferences        |             | 0        | 4    | 0        |
| • Hurwitz and Sade (2017)   |             |          |      |          |
| • Inkmann et al. (2011)     |             |          |      |          |
| • Pfarr and Schneider (2013) |             |          |      |          |
| • Brown (2001)              |             |          |      |          |
| Objective longevity         |             | 0        | 2    | 2        |
| Stated preferences          |             | 0        | 0    | 0        |
| Revealed preferences        |             | 0        | 2    | 2        |
| • Hurwitz and Sade (2017)   |             |          |      |          |
| • Wuppermann (2017)         |             |          |      |          |
| • Chalmers and Reuter (2012) |             |          |      |          |
| • Lee (2016)                |             |          |      |          |
| Risk aversion               |             | 3        | 5    | 3        |
| Stated preferences          |             | 3        | 4    | 3        |
| • Guillemette et al. (2016) |             |          |      |          |
| • Knoller (2016)            |             |          |      |          |
| • Shu et al. (2018)         |             |          |      |          |
| • Agnew et al. (2008)       |             |          |      |          |
| • Cappelletti et al. (2013) |             |          |      |          |
| • Chou et al. (2016)        |             |          |      |          |
| • Schreiber and Weber (2016) |             |          |      |          |
| Revealed preferences        |             | 0        | 1    | 0        |
| • Pfarr and Schneider (2013) |             |          |      |          |
| Stock market participation  |             | 1        | 3    | 2        |
| Stated preferences          |             | 1        | 2    | 1        |
| • Cappelletti et al. (2013) |             |          |      |          |
| • Chou et al. (2016)        |             |          |      |          |
| • Guillemette et al. (2016) |             |          |      |          |
| Revealed preferences        |             | 0        | 1    | 1        |
| • Inkmann et al. (2011)     |             |          |      |          |
| • Pfarr and Schneider (2013) |             |          |      |          |
| Patience                    |             | 0        | 0    | 4        |
| Stated preferences          |             | 0        | 0    | 3        |
| • Bockweg et al. (2016)     |             |          |      |          |
| • Cappelletti et al. (2013) |             |          |      |          |
| • Van der Cruisen and Jonker (2016) |          |          |      |          |
| Revealed preferences        |             | 0        | 0    | 1        |
| • Brown (2001)              |             |          |      |          |
| Table D10 (continued) |
|-----------------------|
| **Factor**            | Association |          |          |
|                       | Negative    | None     | Positive |
| Trust in insurers     | 0           | 1        | 1        |
| Stated preferences    | 0           | 1        | 1        |
|                      |             |          |          |
| Revealed preferences  | 0           | 0        | 0        |
| Financial literacy    | 2           | 4        | 4        |
| Stated preferences    | 2           | 4        | 3        |
|                      |             |          |          |
| Revealed preferences  | 0           | 0        | 1        |
| Awareness             | 0           | 0        | 2        |
| Stated preferences    | 0           | 0        | 2        |
|                      |             |          |          |
| Revealed preferences  | 0           | 0        | 0        |

*a* Reports different associations in equivalent analyses and is therefore counted under “none”.

*b* Reports having children (or not) rather than number of children.

*c* Reports different associations for married individuals compared to individuals that are single, divorced or widowed and is therefore counted under “none”.

*d* Reports ex-ante mortality.

*e* Reports different associations for two measures of ex-ante mortality and is therefore counted under “none”.

*f* Reports ex-post mortality.

*g* Reports different associations for three different measures of financial literacy and is therefore counted under “none”.

| Table D11 |
|-----------|
| Overview of findings by studies on contextual factors associated with annuity uptake. |
| **Factor** | Association |          |          |
|           | Negative    | None     | Positive |
| Social benefits | 1        | 2        | 0        |
| Stated preferences | 0        | 2        | 0        |
|                      |          |          |          |
| Revealed preferences | 1        | 0        | 0        |
| Tax incentive        | 0         | 0        | 3        |
| Stated preferences    | 0        | 0        | 0        |
|                      |          |          |          |
| Revealed preferences  | 0        | 0        | 5        |
| Annuity equivalent worth | 1        | 0        | 5        |
| Stated preferences    | 0        | 0        | 0        |
|                      |          |          |          |
| Revealed preferences  | 1        | 0        | 5        |

(continued on next page)
Table D11 (continued)

| Factor                        | Association | Negative | None | Positive |
|-------------------------------|-------------|----------|------|----------|
| Return on investments         |             | 3        | 1    | 0        |
| Stated preferences            |             | 0        | 0    | 0        |
| Revealed preferences          |             | 3        | 1    | 0        |
|                               |             | • Brown and Previtero (2014) | 0    | • Lee (2016) |
|                               |             | • Chalmers and Reuter (2012) | 0    | • Bockweg et al. (2016) |
|                               |             | • Prechter (2014)           | 0    | • Bouter et al. (2013) |
| Annuity as default            |             | 0        | 1    | 4        |
| Stated preferences            |             | 0        | 1    | 2        |
| Revealed preferences          |             | 0        | 0    | 2        |
|                               |             | • Agnew et al. (2008)       | 0    | • Bate et al. (2017) |
|                               |             | • Bockweg et al. (2016)     | 0    | • Bouter et al. (2013) |
|                               |             | • Bouter et al. (2016)      | 0    | • Bouter and Teppa (2007) |
| Framing as investment         |             | 4        | 1    | 0        |
| Stated preferences            |             | 0        | 1    | 2        |
| Revealed preferences          |             | 0        | 0    | 4        |
|                               |             | • Bockweg et al. (2016)     | 0    | • Bouter et al. (2016) |
|                               |             | • Bouter et al. (2016)      | 0    | • Bouter et al. (2016) |
| Protections                   |             | 0        | 1    | 4        |
| Stated preferences            |             | 0        | 1    | 3        |
| Revealed preferences          |             | 0        | 0    | 1        |
|                               |             | • Chou et al. (2016)        | 0    | • Brown et al. (2013) |
|                               |             | • Brown et al. (2013)       | 0    | • Knoller (2016) |
|                               |             | • Chalmers and Reuter (2012)| 0    | • Lee (2016) |
|                               |             | • Prechter (2014)           | 0    | • Knoller (2016) |

† Quasi-experimental study (highest level of evidence available).

a Reports different associations for different social benefit schemes and is therefore counted under “none”.
b Reports a lump sum value rather than annuity equivalent worth.
c Reports a negative association with framing annuities as investment with potential loss, but not with framing annuities as investment with potential gain.
d Reports a positive association of period guarantees and a negative association of inflation protection and is therefore counted under “none”.
e Reports the association with principal protection or guarantees.
f Reports the association with fixed interest rates.

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