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FEATURE ARTICLE

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On the drivers of potential customers' interest in long-term care insurance: Evidence from Switzerland

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Abstract

As the risks associated with aging start to materialize, societies become more aware of the financial consequences of long-term care (LTC). While limited coverage is available through social insurance in many countries, attractive offers of private products barely exist and a lack of knowledge about LTC insurance persists. Based on a novel survey on aging, health, and dependence conducted in Switzerland, this study aims to comprehend the key drivers that make individuals interested in buying care insurance products for themselves. Using models that combine features from both classical statistics and machine learning techniques, we depict the characteristics of potential buyers based on key economic, social, demographic, and political factors. We find that factors relating to the awareness and understanding of LTC are extremely relevant. Self-perceived health, behavior, and trust relationships between customers and insurers are important. Socioeconomic factors only play a secondary role in the decision-making process. Our findings are relevant beyond the academic community and for policymakers and private insurers alike.

1 | INTRODUCTION

In most developed countries, societies are aging as medical breakthroughs allow individuals to extend their lifetime despite illnesses. However, living longer does not necessarily involve living in good health (AAE, 2019) and ailments may affect a person's capacity to perform daily living tasks that were once taken for granted. Expenses from long-term care (LTC) and assistance for older individuals are expected to increase (see, e.g., de La Maisonneuve & Martins, 2014) and considered the "greatest expenditure risk faced by the elderly" (Norton, 2000). Furthermore, uncertainty about the time spent in dependence before death adds uncertainty to future LTC expenditures (Fuino & Wagner, 2020). While the government and social health insurance are key financing agents in many countries (Colombo, 2012; Colombo et al., 2011; Swiss Re, 2014), an ever-increasing share of the financial burden remains with the dependent individuals (e.g., Kaye et al., 2010). Although unpaid informal caregivers by far outnumber formal LTC workers (Aylward et al., 2003; Colombo et al., 2011), some households end up with out-of-pocket payments for dependence costs that increase the risk of impoverishment (delPozo-Rubio et al., 2019). Consequently, developing additional sustainable financing solutions becomes essential (Costa-Font et al., 2015, 2019, 2017). In this context, LTC insurance (LTCI) policies that guarantee financial cover and partly pay the costs related to care and the help in activities of daily living (ADL; Katz et al., 1963).

This study aims to comprehend the key drivers that make individuals interested in buying care insurance products for themselves in Switzerland. The findings become particularly relevant because of the country's demographic context—characterized by a high life expectancy coming with an aging population (Federal Statistical Office, 2018). From 2010 to 2017, LTC expenditures expressed as a percentage of the gross domestic product have increased from 2.1% to 2.4% (OECD, 2020). Nevertheless, despite having a highly developed insurance market, the offer and the demand for LTCI is scarce. Private insurance policies have not been as commercially successful as expected in many markets, including the United States where policies have been available since 1974 (Ameriks et al., 2016; Cramer & Jensen, 2006; Lambregts & Schut, 2019; Rubin et al., 2014). In the case of Switzerland barely any product is offered, and the lack of knowledge about their potential persists (Fuino & Wagner, 2018a). The scarcity of supply reduces the options for the Swiss population to prepare for potential adverse outcomes at advanced ages (Fuino & Wagner, 2018b). In this study, we focus on the demand side and identify the main determinants triggering individuals' interest in LTCI to depict the characteristics of potential customers.

In the literature, many factors characterizing LTCI policyholders have been identified; however, some findings are rather contradictory, and the different findings come from various countries. Demographic factors such as sex and houshold size are often relevant. Women are more likely than men to buy insurance owing to their higher life expectancy (Brown & Finkelstein, 2008, 2009; He & Chou, 2020; Rudnytskyi & Wagner, 2019); however, household composition matters, as the partner can influence decision-making and is likely to be the first care provider (Barnett & Stum, 2013; Pinquart & Sörensen, 2011). Having relatives may also play an important role (Cramer & Jensen, 2006) as older adults living with children may feel that paying for an insurance policy is unnecessary as they could have easy access to informal help (Zhou-Richter et al., 2010). However, said help is subject to other factors, such as the distance from relatives (Courbage & Zweifel, 2011; Steinbeisser et al., 2018), and is still not viewed as a care insurance substitute (Lambregts & Schut, 2019; Mellor, 2001). Monthly income and wealth levels are typical relevant variables in these types of studies (Pollack et al., 2007). For instance, in the United States, the main difference stems from

the lower assets of nonbuyers (LifeSpans, 2017); although, self-insuring could be more feasible among wealthier individuals who could bear the risk relying on personal savings (America's Health Insurance Plans, 2012; Cramer & Jensen, 2006). Further, lower education levels may yield higher functional limitations; for example, from workplace history, and increase the demand for insurance (Freedman & Martin, 1999; Fried et al., 2001). Individuals' perception of their own health and risk aversion trigger insurance uptake: risk-averse (vs. risky) individuals tend to have better health and are ready to buy more mortality insurance (Webb, 2009). However, the number of prospects is lower than expected from risk aversion levels (Lambregts & Schut, 2019). Furthermore, results suggest that LTCI is purchased less by individuals who tend to have a narrow frame of reference (i.e., do not base decisions on a comprehensive situation overview) or consider only isolated aspects of problems (Gottlieb & Mitchell, 2019). Finally, LTC literacy; that is, the level of understanding of dependence care as well as the related cost, is suspected to play an important role (Browne & Zhou-Richter, 2014; Coe et al., 2015). Specifically, individuals having cared for dependent older adults are said to buy more care insurance (Tennyson & Yang, 2014).

To study the relevant factors in the Swiss market, our study is based on the data collected through a novel survey with 1066 participants in Switzerland. The survey questions relate to LTC and LTCI opinions. We analyze the data regarding potential LTCI purchase using generalized linear models (GLMs) to assess variable importance and estimate the effect of relevant variables. We complement the modeling with random forest models (RFMs) to cross-check the variable importance and identify potential interaction terms to be added in the GLM. We find that the interest in buying LTCI is mostly driven by health, behavior, and LTC literacy factors. The concern for future dependence is the major determinant of the willingness to buy insurance with individuals worried about becoming dependent being more interested in insurance. Furthermore, we observe that those who have a better idea of the LTC costs and understand the purpose of LTCI are highly interested in buying insurance. As another result, we identify the socioeconomic and demographic factors that should be considered. In these factors, we observe that the age, sex, and risk aversion levels do not show clear patterns. Finally, the prevailing social security coverage and systemic incentives to resort to LTC modulate insurance uptake are analyzed. For example, we observe that the regional policies found in the different Swiss cantons play a key role. In conclusion, our results highlight the importance of making people aware of what dependence is and what financial costs are incurred to encourage individual financing solutions such as insurance policies.

This paper is structured as follows: Section 2 lays out information on the Swiss LTC system, presents our survey, and discusses the variables available for analysis; Section 3 highlights the descriptive statistics obtained from the original answers; Section 4 proposes the GLM framework relying on regression models; Section 5 presents and discusses the main results for effects, variable importance, and potential interactions; Section 6 concludes; and Supporting Information: Appendix A reports the survey questions, Supporting Information: Appendix B presents full descriptive data statistics, and Supporting Information: Appendix C reports the information on the complementary RFM analysis.

2 | LTC SYSTEM, SURVEY SETUP, AND VARIABLES

In this section, we first introduce how LTC is organized in Switzerland, detail the main characteristics of the system, and lay out the various regional schemes that coexist. We describe the three main stakeholders involved in the financing of care (Weaver et al., 2008) and review

the sharing of the costs. Indeed, the funding of both institutional and at-home LTC builds on the government, social health insurance, and households. Regional differences in LTC schemes are expected to impact the usage of LTC services and the interest in insurance solutions. We highlight the relatively high amounts borne by the households for motivating the development of private insurance. We then present the survey developed for this project, laying out the topics covered in the questionnaire and the main elements regarding the methodology and collection of information. Finally, we discuss the variables related to respondents' characteristics that we consider.

2.1 | Swiss LTC system and regional policies

The Federal State of Switzerland is divided into 26 cantons clustered along the French, German, and Italian linguistic regions.[1] Spreading over 19 cantons, the German linguistic region encompasses more than two-thirds of the population. Six cantons are located in the French-speaking region and devise approximately 25% of the Swiss population. The remainder live in the Italian-speaking region. Different indicators are used for measuring older adults in need of LTC. First, the Swiss social system defines six types of ADL: (1) dressing and undressing; (2) getting up, sitting, and lying down; (3) eating; (4) personal hygiene; (5) using the toilet; and (6) mobility (Swiss Federal Social Insurance Office, 2015; Swiss Federal Court, 1995, §3a). Second, the compulsory health insurance system accounts for 12 levels of care along a scale using the minutes of care required (Swiss Federal Department of Home Affairs, 1995, Art. 7a). Finally, the government provides nonmeans tested LTC allowances under the social insurance first pillar considering the three "mild," "moderate," and "severe" acuity levels. An older individual is defined as mildly dependent if they require regular assistance with at least two ADL or permanent personal supervision. Moderate acuity means needing assistance in at least two ADL and permanent personal supervision. Severely dependent persons need regular assistance with all ADL (Becker & Reinhard, 2018).

The old-age social insurance law recognizes two types of facilities for delivering professional LTC. At-home care services are provided to older adults wishing to be cared for at home while institutional care offers accommodation and 24-h supervision in addition to medical care. Swiss federalism gives way to different care usage behavior influenced by local (cantonal) policies. In fact, we observe three LTC policy models throughout Switzerland. The *institutional care* model that sets nursing homes as the main providers of LTC and leaves at-home care as a back-end option is implemented in the cantons of AI, AR, GL, LU, NW, OW, SZ, and UR. Contrastingly, *at-home care* is fostered in the cantons of GE, JU, NE, TI, and VD by allowing caregivers to provide a comprehensive list of services that are reimbursed by health insurance. Such a policy coincides with the wish of being cared for at-home rather than in an institution (Helmchen & Lo Sasso, 2015; Kaye et al., 2009). As a combination of the two previous models, a *mixed model* appears in the cantons of AG, BE, FR, GR, SG, SO, TG, ZG, and ZH. Finally, no clear LTC

[1]Three linguistic regions are distinguished in Switzerland. These regions are (1) the *German*-speaking region comprising the cantons of Aargau (AG), Appenzell Innerrhoden (AI), Appenzell Ausserrhoden (AR), Bern (BE), Basel-Landschaft (BL), Basel-Stadt (BS), Glarus (GL), Graubünden (GR), Lucerne (LU), Nidwalden (NW), Obwalden (OW), St.Gallen (SG), Schaffhausen (SH), Solothurn (SO), Schwyz (SZ), Thurgau (TG), Uri (UR), Zug (ZG), and Zurich (ZH); (2) the *French*-speaking region comprising the cantons of Fribourg (FR), Geneva (GE), Jura (JU), Neuchâtel (NE), Vaud (VD), and Valais (VS); and (3) the *Italian*-speaking region formed by the canton of Ticino (TI).

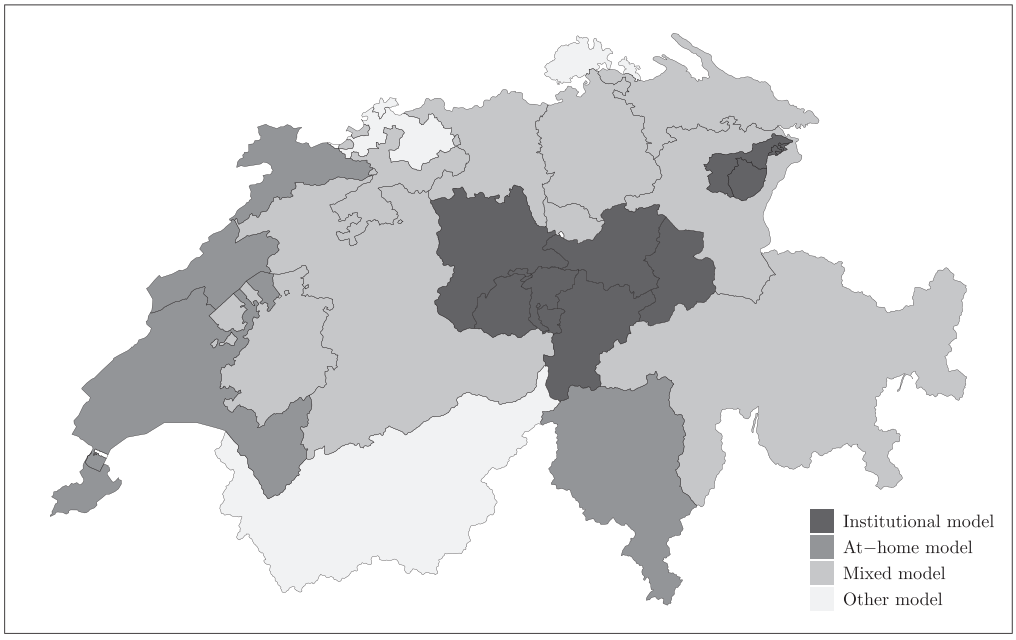


FIGURE 1 Overview of LTC policy models found across cantons of Switzerland

model appears in the cantons of BL, BS, SH, and VS. In Figure 1, we lay out the geographic distribution of the three LTC models in Switzerland. The prevalence of such models is relevant to understand the usage of care services (e.g., Courbage et al., 2020b; Fuino, Rudnytskyi, et al., 2020).

Owing to the expansion of the old-age population, LTC costs have significantly increased over the years. Based on data records from the Federal Statistical Office in years 2012 and 2017, we observe that overall LTC costs have increased from CHF 10.8 billion to CHF 12.6 billion, representing approximately 2% of the Swiss gross domestic product. Various stakeholders are involved in the financing of LTC. Using both direct and indirect financing, the State takes over approximately 10% of expenditures. Direct financing is provided through allowances paid to older adults in need of care, while indirect financing comes from covering parts of the institutional care costs. Another 30% of the costs are under the responsibility of social health insurance. This second source of financing is responsible for medical care costs but does not account for accommodation costs (e.g., lodging and meals). Finally, households are responsible for covering the remaining 60% of the costs (Swiss Re, 2014). In the case of at-home care, this share includes household and family assistance, monitoring and assistance, meals on wheels, and reduced mobility transportation. For institutional care, the remaining costs are mostly related to accommodation services (lodging, feeding, and laundry).

2.2 | Survey setup

To investigate on the potential of LTCI development, we base our study on unique and novel survey data. The objective of the online survey is to question participants on LTC and LTCI. Handled by a professional polling agency, the survey conducted in 2019 accounts for responses

($N = 1066$) collected from individuals aged 40–65 years, living in the German- and French-speaking regions of Switzerland, representing more than 90% of the population.[2] Part of the survey comprises 30 questions on the individuals' socio-demographic and family-related characteristics, their perception of dependence, their personal evaluation of LTC costs, and stakeholders concerned with financing, and a comprehensive set of background variables. Specifically, we assess participants' knowledge about care costs, care financing, and insurance in Switzerland. While the survey has been executed in both German and French, we provide an English translation of the set of questions relevant for this study in Supporting Information: Appendix A.

2.2.1 | Respondents' characteristics

The first questions of the survey were about sex (Question A1),[3] age (A2), the region (postal code) of the main residence (A3), and the dependence of and help to parents in the last 12 months (A4 and A5). The next set of questions investigates the respondents' family: their marital status (B1), if their parents are alive (B3), and their contact frequency with them (B4). We evaluate formal care exposure through Question D5, in which we consider the activities for which and from whom dependent parents(-in-law) received care. Then, the survey explores respondents' perception of dependence and questions their current self-perceived health (E1). The questions in (E2) concern respondents' personality traits including foresight and risk-taking behavior. Then, we ask about their concern about becoming dependent as they age (E3) and demand to assess the probability of becoming dependent (E5). The next questions regard care preferences (E4) and the thoughts about how care would be financed (E6). Further questions (F1–F6) consider the financing of care that we lay out in more detail below. The last part of the survey collects further covariates related to individuals' economic situations: professional (G1), education (G2), household composition (G3), income and overall wealth (G4 and G5), housing type (G6), and nationality (G9). Finally, Questions G11 and G12 explore respondents' interest in politics and political orientation; while G14 investigates their opinion on the role of the State, the citizen, and insurers in the financing of care. In Section 2.3, we review the various variables of interest and group them along topics.

2.2.2 | Understanding financing and costs of dependence and interest in "care insurance"

A core part of the questionnaire (Questions F1–F6) focuses on how to finance the care of dependent older adults and to what extent individuals understand the costs and would be interested in buying insurance. At the beginning, participants are presented the idea of care

[2]Respondents to the panel are selected among the population in Switzerland with the following targets: balance among men and women; a homogeneous distribution of 40%, 40%, and 20% individuals in the age classes 40–49, 50–59, and 60–65 years, respectively; and representative of the German- and French-speaking regions (67% and 33%, respectively). Further, one-third of the participants have not had parents (or stepparents) with dependence in the last 12 months, while the other two-thirds had dependent parents. In the last group, half of the respondents have helped their parents, while the other half have not.

[3]The numbering of the questions is taken from the original questionnaire.

insurance for future financial protection. The information about "care insurance" is given as follows:

> *Imagine that a new type of "care insurance" is proposed to cover care costs related to dependence. In exchange for a premium payment, such a policy would ensure its buyer future financial protection if they have difficulties to independently performing one of the following tasks: take a bath or a shower, go to the toilet, get out of bed or go to bed, get dressed, eat, or walk a 50-meter distance. Such an insurance would partially cover the costs of professional help at home or of a stay in a care institution.*

To assess the importance of understanding how LTCI works, respondents are asked about their level of understanding of the financial protection of such insurance with options on a four-point Likert scale ranging from not clear at all to very clear (see Question F1). Participants are asked about their general level of interest in purchasing such a policy, again on a scale with four options from *not at all interested* to *very interested* (see Question F2). The answer to that question is important to us and allows for a classification of potential buyers.

To investigate whether respondents have a good idea about the costs of LTC dependence and incidence of dependence, the questionnaire provides the following additional information on care costs:

> *At ages older than 80 years, one person out of three has difficulties to independently perform ADL and thus resorts to professional help at home or to a stay in a care institution. After receiving the social insurance benefits, the costs that remain with the assisted person are the following: professional help at home requires an out-of-pocket payment of on average CHF 1000 per month while a stay in a care institution requires more than CHF 4500 per month. In case of dependence, such burden has to be borne during three years on average.*

Upon receiving the above additional information, survey participants are asked about their understanding of the costs to be borne in case of dependence (Question F3), and they are asked again whether they are interested in buying insurance (Question F4). We will use the answer to Question F4 as the response variable in our models.

Finally, we gather information on participants' motives for being or not being interested in care insurance. Respondents interested or very interested in insurance are asked to indicate their degree of agreement on a list of five statements in Question F5. The reasons for the interest include worries about financial consequences, insufficient savings, sparing the family the burden of taking care of them, not being able to count on family, and protecting future inheritance. Conversely, individuals who state no or little interest in insurance report on the reasons (Question F6) ranging from having enough savings, preference to get care from family, the absence of trust in insurance companies, difficulty understanding the insurance product, to not thinking to become dependent.

2.3 | Individual characteristics

From the survey questions and answers, we derive 30 variables that we group along six topics: demographic factors, socioeconomic factors, health and behavior, LTC literacy, political factors,

and other background variables. We not only focus on understanding the relevance of stand-alone characteristics. Indeed, we also aim to better comprehend the role of these topic groups. While some variables are self-explanatory in their construction, others require a closer look on how we build their categories.

2.3.1 | Demographic factors

All demographic factors are directly retrieved from individual questions. This is the case for sex (variable *GE*) and the age (*AG*), which are grouped in classes of 5 years, covering the range from 40 to 65 years. Similarly, we code the size of household (*SH*) into three categories: households of one individual, two people, and three members or more.

2.3.2 | Socioeconomic factors

Individuals indicate their highest attained education level (*ED*) in the Swiss system from three categories: mandatory school, high school, and higher education. Respondents also provide information about their professional situation (*PS*), detailing whether they are employed (or independent workers, either part-time or full time), retired, or in another situation (e.g., unemployed or without a paid job). Further, participants choose among six monthly income levels (*MI*) in CHF: ≤3000, 3001–5000, 5001–7000, 7001–9000, ≤9001, and do not want to share this information. Furthermore, individuals indicate their perception about the overall wealth (*OW*): unwealthy, below average, above average, and wealthy. Extra information includes the marital status (*MS*, *married/registered partnership*, or *other*) and housing type (*HT*), where we consider groups of owners, renters, and others. This variable accounts for the possible effect that real estate can have as a substitute to insurance; for example, through mechanisms such as reverse mortgages.

2.3.3 | Health and behavior

Factors in this group include participants' self-perceived current health state (*CH*, *very bad*, *bad*, *good*, or *very good*), and their level of concern for future dependence (*CD*). For the latter, respondents choose among four options: *not concerned at all* to *very concerned*. Individuals were assigned to two groups: those who are worried and those who are not. We also collect details about the contact frequency (*CO*) with which respondents interact with their parents. Individuals answer using a scale of seven levels going from *daily* to *never*, which we grouped into *very often*, *often*, *not very often*, *never*, and a group for those whose parents are deceased. Their risk-taking (*RT*) and foresight (*FO*) tendencies are recorded by a scale using 10 levels: *low* (levels 1–3), *mid* (4–7), and *high* (8–10). The variable about care preferences (*CP*) is built from several survey questions: individuals had to choose, for different tasks, whether they would prefer informal or formal care services, if required. Finally, we ask about a rough estimate of their own probability of becoming dependent (*PD*), providing insight on what individuals think about their chances of losing independence in the future; that is, whether they view the event as *improbable*, *unlikely*, *likely*, or *very likely*.

2.3.4 | LTC literacy

The following variables relate to a person's knowledge about dependence and LTCI. Variables related to the understanding of care insurance (*UI*) and care costs (*UC*) are directly obtained from the survey questions. We classify answers into two categories: *unclear* (those who claim their understanding is *not clear at all* or *unclear*), and *clear* (those who claim their understanding is *clear* or *very clear*). Then, we are interested in people's beliefs about the share of the costs that would be covered by their private insurance (*PI*), social insurance (*SI*), possible governmental subsidies (*GS*), and on their own dependent's participation (*DP*). Further, formal care exposure (*FC*) is a binary variable that contains information indicating if individuals have witnessed relatives receive professional help in a list of nine tasks, including ADL, household tasks, administrative tasks, and support and regular company (see Question D5). We finally distinguish three groups of individuals based on previous exposure to LTC linked to dependent parents(-in-law) and own help (*EX*): the first group (*no exposure*) consists of those who have never been exposed to dependent parents(-in-law); the second group (*exposure but not helped*) are those with dependent parents(-in-law) but who did not help them; and the last group (*exposure and helped*) refers to the ones that have helped their dependent parents(-in-law).

2.3.5 | Political factors

Respondents indicate their political orientation (*PO*) using 11 levels from left to right that allow us to generate the categories *left* (levels 1–5), *center* (level 6), and *right* (levels 7–11). We capture their political opinions on LTCI-related issues through statements on the roles of the State (*SR*), citizens (*CR*), and insurers (*IR*) in the financing of care. Participants' opinions on a five-level scale are consolidated into *disagree* (levels 1 and 2), *indifferent* (level 3), and *agree* (levels 4–5) (see Question G14 in the Supporting Information: Appendix for the detailed statements).

2.3.6 | Other background variables

Two other variables enrich the analysis. We derive the LTC policy model region (*PM*) from each respondent's postal code of the main residence. We expect the local policy model to affect the behavior. Indeed, Swiss cantons encourage different types of LTCI models (see Section 2.1 and Figure 1). We also account for the nationality (*NB*) of the individual, distinguishing Swiss nationals at birth, and all others. In Table 1, we recap all the variables, including a brief description, their categories, and to which survey questions they refer.

3 | DESCRIPTIVE STATISTICS

Our study strives to understand the characteristics of potential insurance buyers. In this section, with the help of descriptive statistics, we provide first insights on individuals that reported themselves interested in LTCI.

TABLE 1 Summary of the 30 variables grouped along six topics

Variable	Label	Description	Categories	Question
Demographic factors				
AG	Age	Age class in years (from numeric age)	40–45, 46–50, 51–55, 56–60, 61–65	A2
GE	Gender	Gender of the respondent	Male, female	A1
SH	Size of household	Number of people in the household (from numeric answer)	1, 2, 3+	G3.1
Socioeconomic factors				
ED	Education	Highest level of education (from 5 classes)	Mandatory school, high school, higher education	G2
PS	Professional situation	Current employment situation (from 5 classes)	Employed, retired, other	G1
MI	Monthly income	Monthly net income in CHF (from 7 classes)	≤3000, 3001–5000, 5001–7000, 7001–9000, ≥9001, no info	G4
OW	Overall wealth	Overall evaluation of income and wealth	Modest, below average, above average, wealthy	G5
MS	Marital status	Marital status	Married/registered partnership, other	B1
HT	Housing type	Main residence ownership (from 5 classes)	Owner, renter, other	G6
Health and behavior				
CH	Self-perceived health	General health rating	Very bad, bad, average, good, very good	E1
CD	Concern for future dependence	Degree of concern for future dependence (from 4 classes)	Not worried, worried	E3
CO	Contact with parents	Frequency of contact with parents (from 7+1 classes)	Very often, often, not very often, never, no parents alive	B3, B4
RT	Risk-taking	Assessment of willingness to take risks (from 10 classes)	Low, mid, high	E2.2
FO	Foresight	Assessment of interest in planning for the future (from 10 classes)	Low, mid, high	E2.1
CP	Care preference	Type of care for help with ADL (from 4 types of help)	Informal care, formal care	E4
PD	Probability of dependence	Probability to lose independence	Improbable, unlikely, likely, very likely	E5
LTC literacy				
UI	Understanding of care insurance	Understanding of insurance protection (from 4 classes)	Unclear, clear	F1

TABLE 1 (Continued)

Variable	Label	Description	Categories	Question
UC	Understanding of care costs	Understanding of the costs in case of dependence (from 4 classes)	Unclear, clear	F3
PI	Private insurance participation	Complementary health and life insurance participation in costs	Nothing, small share, significant share, almost all, don't know	E6.2
DP	Dependent's participation	Personal or family participation in costs	Nothing, small share, significant share, almost all, don't know	E6.4
SI	Social insurance participation	Health insurance and helplessness allowance participation in costs	Nothing, small share, significant share, almost all, don't know	E6.1
GS	Governmental subsidies	Pension supplements, cantonal and municipal subsidies to costs	Nothing, small share, significant share, almost all, don't know	E6.3
FC	Formal care exposure	Having parents(-in-law) who received formal care	No, yes	A4, D5
EX	Dependent parents and help	Exposure to dependent parents(-in-law) and personal help	No exposure, exposure but not helped, exposure and helped	A4, A5
Political factors				
PO	Political orientation	Political orientation rank (from 11 classes)	Left, center, right	G12
SR	State's role	Role of the State in financing of care (from 5 classes)	Disagree, indifferent, agree	G14.1
CR	Citizens' role	Role of citizens in financing of care (from 5 classes)	Disagree, indifferent, agree	G14.2
IR	Insurers' role	Role of private insurers in financing of care (from 5 classes)	Disagree, indifferent, agree	G14.3
Other background variables				
PM	LTC policy model region	Region of main residence (from postal code)	At-home care model, institutional care model, mixed model, other	A3
NB	Nationality	Nationality at birth	Swiss, non-Swiss	G9

3.1 | Interest and motives for insurance take-up

3.1.1 | Interest in "care insurance"

As it is not possible to analyze real LTCI purchases given the lack of a range of products in the country, we consider both Questions F2 and F4 in which survey respondents express their

TABLE 2 Statistics on the interest in LTCI with information on "care insurance" (Question F2) and additional information on care costs (Question F4)

Question	Information on ...	Interest (%)	Difference (%)
F2	"Care insurance"	396 (37%)	
F4	"Care insurance" and care costs	449 (42%)	+53 (+5%)

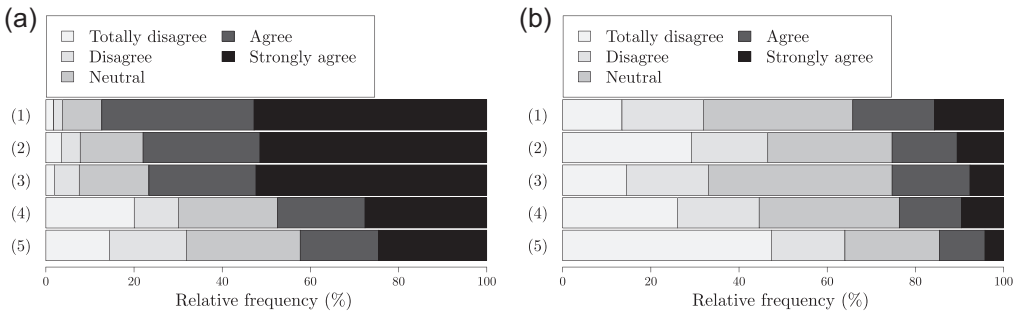
interest in care insurance. We interpret the answer options *not at all interested* and *not really interested* as negative outcomes for buying (*no interest*), while we group the answers *interested* and *very interested* toward a positive outcome: *interest*. When providing only the information on a hypothetical "care insurance" product for financing care, we identify 396 out of the 1066 respondents as potential buyers, leaving approximately two-thirds (670) as nonbuyers. In Table 2, we also lay out the number of individuals interested in insurance after indicating further information on current dependence-related care costs, the expected period of such costs, and how frequently people have been affected by dependence (see the information given before Questions F2 and F4). We document that the number of interested individuals changes to 449, yielding an increase of five percentage points. Therefore, we observe initial evidence that information on care costs could be an important trigger for a person's interest in LTCI.

3.1.2 | Reasons for buying LTCI

We outlined that 42% of the respondents show interest in LTCI. Those individuals are strongly motivated to buy insurance as they (1) are worried by the financial consequences, (2) want to avoid being a burden to their family, and (3) believe that their savings would not be sufficient to cover care costs. More than 50% of them strongly agree on these three motives (see Figure 2a). Potential insurance buyers tend to be individuals who feel concerned about the dependence costs (approximately 90% agree or strongly agree on item 1) and their budget to cover them (item 3). Specifically, our results also make clear that the Swiss population is not really comfortable with the idea of being a burden for their relatives, either financially or through informal care (item 2). A smaller subgroup considers that they could not rely on family members to look after them (item 5). We also find that bequest motives are not the strongest argument. Approximately one-third are strongly agreeing on the motive to protect the inheritance of their children (item 4). This statement has received the highest amount of *strongly disagree* responses.

3.1.3 | Reasons for not buying LTCI

For approximately one-third of the respondents not interested in LTCI, a lack of trust in insurance impedes their interest (see the answers *agree* and *strongly agree* on item 1 in Figure 2b). Further, approximately 25% of respondents indicate that they have difficulties understanding the insurance product (item 4). Building trust and explaining the features of their products will be key for insurers. Indeed, Courbage and Nicolas (2020) observe that experiences with insurance are an important factor influencing trust. They find that trust is higher among women, younger, and less educated individuals, while being lower among



Reasons for buying LTCI ($N = 449$).
(1) Worries from financial consequences
(2) Avoid being burden to family
(3) Insufficient savings to cover costs
(4) Protect inheritance of children
(5) Cannot count on family help

Reasons for not buying LTCI ($N = 617$).
(1) No trust in insurance companies
(2) Preference to count on family
(3) Will not become dependent
(4) Difficulty understanding insurance product
(5) Sufficient savings to cover costs

FIGURE 2 Distribution of the reasons for (a) buying and (b) not buying LTCI. The items in graphs (a) and (b) stem from Questions F5 respectively F6 and are ordered by level of agreement (sum of shares "agree" and "strongly agree").

individuals with higher insurance literacy, as compared to their counterparts. Answers also make evident that preference for care from family is not the main driver for the absence of interest in insurance. In fact, only around a quarter agree to prefer relying on family (item 2). The same share believes that they will not become dependent (item 3). However, more than 40% of the subgroup are neutral on the statement, *I do not think I will become dependent*, highlighting the uncertainty about future dependence felt by a large portion of the respondents. They would not buy LTCI, and they appear unsure about whether they may need it. Less than 5% strongly believe that their savings would suffice if they had to cover the costs of dependence (item 5). Indeed, nearly half of them strongly disagree with this statement, suggesting that the lack of interest goes beyond pure financial factors. When comparing the answers to those of the potential buyers in Figure 2a, there is no single key statement where a majority of those not interested in LTCI agree on.

3.2 | LTCI interest along categories

In Table 3, we report the highlights of the descriptive statistics on our data. In each category, we indicate the share of individuals that declared interest in care insurance (column "Interest"). Thereby, as in the sequel, we refer to Question F4; that is, the interest declared by respondents after receiving information on both the hypothetical "care insurance" product and care costs. We provide more detailed descriptive statistics in Table 11 of the Supporting Information: Appendix B, including all variables and the distribution of the respondents along their respective categories.

Regarding the interest in care insurance, we note that the share of interested individuals rarely reaches 50% or more in any category. Through the categories in the overall wealth (OW) and monthly income (MI) variables, we observe a pattern of increasing interest in insurance with higher wealth and income, respectively. Indeed, the share of potential LTCI buyers is

TABLE 3 Distribution of the share of interested respondents in LTCI (Question F4, $N = 449$) per category of variable

	Interest		Interest		Interest
Demographic factors					
Gender (*GE*)		**Size of household** (*SH*)			
Male	45.04	1	37.32		
Female	39.30	2	42.28		
		3+	45.13		
Socioeconomic factors					
Education (*ED*)		**Overall wealth** (*OW*)		**Monthly income** (*MI*)	
Mandatory school	27.94	Unwealthy	36.84	≤3000	39.04
High school	40.42	Below average	42.77	3001–5000	40.63
Higher education	47.48	Above average	45.21	5001–7000	44.06
Professional situation (*PS*)		Wealthy	51.28	7001–9000	46.32
Employed	42.14			≥9001	56.82
Retired	48.39			No info.	31.44
Other	38.60				
Health and behavior					
Care preference (*CP*)		**Concern for future dependence** (*CD*)		**Contact with parents** (*CO*)	
Informal care	33.18	Not worried	34.68	Very often	47.65
Formal care	44.56	Worried	57.47	Often	41.42
Risk-taking (*RT*)		**Foresight** (*FO*)		Not very often	33.33
Low	44.66	Low	29.51	Never	23.08
Mid	39.04	Mid	39.41	No parents	42.05
High	47.29	High	45.24		
Self-perceived health (*CH*)		**Probability of dependence** (*PD*)			
Very bad	35.00	Improbable	34.29		
Bad	49.62	Unlikely	39.87		
Average	43.59	Likely	49.43		
Good	43.20	Very likely	62.90		
Very good	30.00				
LTC literacy					
Understanding of care insur. (*UI*)		**Understanding of care costs** (*UC*)		**Formal care exposure** (*FC*)	
Unclear	31.69	Unclear	26.77	No	40.91
Clear	58.08	Clear	54.09	Yes	47.85

TABLE 3 (Continued)

	Interest		Interest		Interest
Private insur. participation (*PI*)		**Dependent's participation** (*DP*)		**Dependent parents and help** (*EX*)	
Nothing	34.73	Nothing	37.29	No exposure	42.32
Small share	43.90	Small share	40.38	Expos. but not helped	36.84
Significant share	47.95	Significant share	41.46	Exposure and helped	44.82
Almost all	50.00	Almost all	54.09		
Don't know	39.23	Don't know	41.22		
Political factors					
Political orientation (*PO*)		**State's role** (*SR*)		**Insurer's role** (*IR*)	
Left	39.08	Disagree	27.08	Disagree	33.78
Center	37.55	Indifferent	35.65	Indifferent	34.09
Right	49.58	Agree	44.92	Agree	53.48
Other background variables					
LTC policy model region (*PM*)				**Nationality** (*NB*)	
At-home care model	53.57	Mixed model	38.76	Swiss	40.00
Institutional care model	33.71	Other	41.09	Not Swiss	54.24

Note: All values are in percent.

51.28% and 56.82% for the "wealthy" respondents: those with a monthly income above CHF 9000, respectively. These results align with findings from other works (e.g., America's Health Insurance Plans, 2012; Lin & Prince, 2013).

We find that interest in LTCI is increased among those who prefer formal help to informal care. This observation coincides with the fact that LTCI would rather cover external out-of-pocket expenses. Contrary to what one may expect, individuals who claim to be less risk-taking (*RT*) do not show a higher tendency to be interested in insurance compared to risk-takers. Some authors explain this by the fact that an LTCI policy, being a long-term contract, brings along a good amount of long-run counter-party risk that individuals with higher risk aversion levels do not like, and this effect may outweigh the risk aversion toward future dependence (e.g., Doherty & Schlesinger, 1990). Moreover, other authors like Pauly (1990) have shown that even utility-maximizing risk-averse individuals could choose little or no insurance if they face a conventional insurance offer. In contrast, individuals who claim to have a strong tendency to plan the future, as captured in the foresight variable (*FO*), show much stronger patterns: in the low foresight category less than 30% are interested in LTCI, while they are more than 45% in the high foresight class. This confirms findings by Swiss Re (2017), where forward-looking customer segments; that is, "planners" and "entrepreneurs," who are willing to plan ahead for later life, are identified as prospects for LTCI. Moreover, one of the highest concentrations of potential buyers (57.47%) is individuals who are worried about future dependence (see the

variable *CD*). Another relevant pattern is observed in the perceived probability of becoming dependent (*PD*): only 34.29% of those perceiving future dependence as "improbable" show interest in insurance, while they are 62.90% among those perceiving dependence as "very probable." Regarding their current health (*CH*), we find the largest share (49.62%) of potential buyers among those who perceive their health as bad. Moreover, our results show that those who have regular contact with their parents (*CO*) are more interested in an LTCI policy. It is possible that, through their parents, they are more aware of potential morbidities impeding older persons.

We further report some of the highest shares of potential buyers among those respondents that have clearly understood the care insurance information (58.08%) and the description of care costs (54.09%). We find other relevant patterns in the formal care exposure variable (*FC*). Individuals who have a parent or parent-in-law receiving formal care claim to be rather interested in insurance (47.85%). This could be expected as experiencing the burden of their relatives increases awareness. We further observe that those individuals who believe that private insurance (*PI*) would cover almost all care costs are thus 50% to be interested in insurance. Similarly, the share of the participants who think that the dependent person (*DP*) would have to bear almost all of the care costs would be interested in LTCI (54.09%). We find that those who think that the State (*SR*) must ensure the financing of care through social security, and that private insurance companies (*IR*) must produce solutions to supplement financing from the State through risk pooling, are more likely to be interested in insurance, with rates of 44.92%, and 53.48%, respectively.

Finally, we discover relevant effects from the other background variables. Specifically, 53.57% of those who live in cantons with an at-home care policy show interest in an LTCI policy. The share of potential buyers is much higher than what we observe in the other policy model regions. This difference may be linked to the different incentives: for example, incentives for the lower costs of at-home care, can make the perceived burden of costs for institutional care even more impressive. Contrastingly, we show that, individuals with foreign origins (nationality, *NB*) show a much higher interest in LTCI, with 54.24% of them classifying as potential buyers, as opposed to 40.00% for Swiss natives.

4 | MODEL FRAMEWORK

To understand what individual characteristics drive the interest in buying LTCI, and to estimate their respective effects, we start by fitting a GLM on the whole set of the available covariates and derive a reduced model including solely relevant variables that contribute to the model. We will rank them along their importance. We then add interaction terms to the reduced model to gain insights about possible relationships among variables. Given the high number of possible interactions between the 18 variables of the reduced model, we rely on the method of RFMs to identify the most promising interaction terms to be added to the GLM. Indeed, RFMs stand out owing to their capacity to spot interactions (e.g., Basu et al., 2018; Goldstein et al., 2011; McKinney et al., 2006; Wright et al., 2016); thus, we exploit this capacity to limit the number of interactions that we test for relevance in our GLM. Finally, we use RFMs to cross-check the variable importance results (see Supporting Information: Appendix C for details).

The first step in the modeling process is to fit a GLM to the binary response variable "*INTEREST*." Based on Question F4 and the discussion in Section 3.1, the response takes the

value of 1 for individuals reporting themselves interested in buying LTCI and 0 otherwise. In our model, we start by considering all 30 variables introduced in Section 2.3 (Table 1); that is, we use the set of variables $\mathcal{V} \in \{AG, GE, ..., NB\}$. Our GLM model responds to the estimation of the following equation:

$$g(INTEREST) = \boldsymbol{\beta}_0 + \sum_{i \in \mathcal{V}} \boldsymbol{\beta}_i \mathbf{1}_i, \tag{1}$$

where $g(\cdot)$ denotes the link function, $\boldsymbol{\beta}_0$ the vector of coefficients associated to the baseline, and $\boldsymbol{\beta}_i$ the vector of coefficients estimated for the different categories for each variable i in $\mathcal{V}$. The categories of the variables are reported in Table 1. For each recorded survey answer, we define $\boldsymbol{\beta}_i$ and $\mathbf{1}_i$ as vectors of dimension c_i, where c_i denotes the number of categories in the variable i. The only nonzero entry corresponds to a 1 in the respective category where the respondent belongs.

Using Akaike's information criterion (AIC), we find that the Logit link function (AIC = 1298.7) fits slightly better the model when compared to the Probit link function (AIC = 1299.0). Therefore, we select the Logit link function for g. To focus on the relevant variables that explain the response, we combine a forward and backward stepwise selection algorithm based on the AIC measure to derive a reduced model retaining only variables that improve the model. With the Logit link function, the reduced model that we specify below exhibits an AIC value of 1249.6. We note that with the same variables and a Probit link function, the reduced model would yield a slightly higher AIC value (1250.0). Retaining the Logit link function for g, the explicit equation of the reduced model including 18 variables writes out as follows:

$$g(INTEREST) = \boldsymbol{\beta}_0 + \sum_{i \in \mathcal{W}} \boldsymbol{\beta}_i \mathbf{1}_i. \tag{2}$$

The variables in the set $\mathcal{W}$ are reported in Table 4.

After estimating the coefficients $\boldsymbol{\beta}_i$, one can translate their effect into expected probabilities p of being classified as interested in buying. Setting $\eta = g(INTEREST)$, the related probability p can be obtained from

TABLE 4 Variables retained in the reduced regression model (2)

Variable	Label	Variable	Label
GE	Gender	*UC*	Understanding of care costs
SH	Size of household	*PI*	Private insurance participation
ED	Education	*DP*	Dependent's participation
MI	Monthly income	*EX*	Dependent parents and help
CH	Self-perceived health	*PO*	Political orientation
CD	Concern for future dependence	*SR*	State's role
CO	Contact with parents	*IR*	Insurers' role
CP	Care preference	*PM*	LTC policy model region
UI	Understanding of care insurance	*NB*	Nationality

$$p = \frac{e^{\eta}}{1 + e^{\eta}}. \tag{3}$$

As our objective is to identify the most relevant factors that could trigger interest in purchasing LTCI, a measure to understand the variable importance beyond the predicted probabilities becomes necessary. To establish and importance ranking, we perform a log-likelihood ratio test λ using the value of the log-likelihood function $\log \mathcal{L}(\cdot)$ (e.g., Fox & Weisberg, 2019). Thereby, we compare two nested models M_0 and M_{reduced} by using the following equation:

$$\lambda = -2 \cdot \{\log \mathcal{L}(M_{\text{reduced}}) - \log \mathcal{L}(M_0)\}, \tag{4}$$

where M_0 refers to a reference model with n degrees of freedom and M_{reduced} denotes an alternative model with $n - m$ degrees of freedom. Such statistic follows an asymptotic χ^2-distribution with m degrees of freedom, allowing to compute p values and test for statistical significance (Silvey, 1970). When applying the test to our setup, we perform an analysis based on the log-likelihood ratio using the regression model (2) for the reference model and the same model after dropping one term as the reduced one (here: $m = 1$). Under this approach, the larger the obtained log-likelihood ratio statistic between both models, the more relevant is the variable as it contributes more to explaining the response variable.

5 | RESULTS AND DISCUSSION

We start this section by presenting the ranking of variable importance obtained from the GLM and supported by the RFM (Section 5.1). Then, in Section 5.2, we disclose and discuss the regression analysis results. Further, we investigate in Section 5.3 potential significant interactions and comment on them. Finally, we discuss the challenges for the emergence of an LTCI market in Switzerland in Section 5.4.

5.1 | Variable importance

The variable importance indicates the explanatory power of a particular covariate and is therefore a good indicator for identifying the most relevant characteristics. In addition to the importance ranking obtained from the GLM and log-likelihood ratio test λ (see Equation 4, and the fourth and fifth columns in Table 5), and as a consistency check, we evaluate the RFM and obtain information on variable importance from the mean minimal depth (see Equation 5 in the Supporting Information: Appendix and the sixth and seventh columns in Table 5).[4] The dashed lines in Table 5 highlight the 3 and 10 most important variables.

The importance rankings highlight the major role of the variable groups LTC literacy and health and behavior. Concern for future dependence (*CD*) and the understanding of care costs (*UC*) and understanding of care insurance (*UI*) are the three most important aspects to explain an individual's interest in insurance. The results from both approaches, the loglikelihood-ratio

[4]In figure 4 in the Supporting Information: appendix, we display the minimal depth distribution for each of the 18 explanatory variables that appear in the reduced GLM, see Equation (2).

TABLE 5 Importance ranking from the GLM and RFM for the variables included in the regression model (2)

			GLM		RFM	
Variable	**Label**	**Topic group**	**Ranking**	**Measure**	**Ranking**	**Measure**
CD	Concern for future dependence	Health and behavior	1	33.06	2	2.13
UC	Understanding of care costs	LTC literacy	2	30.30	1	1.93
UI	Understanding of care insurance	LTC literacy	3	20.87	3	2.17
CH	Self-perceived health	Health and behavior	4	19.76	8	2.81
MI	Monthly income	Socioeconomic factor	5	13.33	5	2.37
CO	Contact with parents	Health and behavior	6	13.11	7	2.81
IR	Insurers' role	Political factor	7	12.68	4	2.36
DP	Dependent's participation	LTC literacy	8	11.66	9	2.85
PI	Private insurance participation	LTC literacy	9	10.75	6	2.80
PM	LTC policy model region	Other background variable	10	7.24	10	2.89
NB	Nationality	Other background variable	11	6.65	16	4.07
EX	Dependent parents and help	LTC literacy	12	6.51	14	3.68
SR	State's role	Political factor	13	5.35	15	3.71
ED	Education	socioeconomic factor	14	5.07	12	3.52
PO	Political orientation	Political factor	15	4.77	11	3.39
SH	Size household	Demographic factor	16	4.61	13	3.62
GE	Gender	Demographic factor	17	2.62	18	4.32
CP	Care preference	Health and behavior	18	2.36	17	4.26

statistic in GLM and mean minimal depth criterion in RFM, select the same three variables for the first positions. Further, the top 10 most important variables are the same in the set of predictors under both methodologies. We observe that the monthly income (*MI*) is the only socioeconomic factor ranked in the top 10 variables, whereas the insurers' role is the only political factor appearing in a top position. In contrast, four variables among the top 10 belong to the group LTC literacy and three of them are from health and behavior.

5.2 | Regression analysis results on the interest in LTCI

In Tables 6 and 7, we present the results obtained for the regression model (2) on the probability to report interest in buying LTCI. For each of the 18 variables included in the model

TABLE 6 Results for regression model (2) (see also Table 7)

	Coefficient	SD error	Sig.	Probability of interest	Importance (rank)
Intercept	−0.735	0.401	*	32.41%	
Demographic factors					
Gender (baseline: Male)					(17)
Female	−0.248	0.153		−5.18%	
Size household (baseline: 3+)					(16)
1	−0.397	0.196	**	−8.04%	
2	−0.051	0.173		−1.11%	
Socioeconomic factors					
Education (baseline: High school)					(14)
Mandatory school	−0.730	0.332	**	−13.65%	
Higher education	−0.049	0.164		−1.07%	
Monthly income (baseline: 3001–5000)					(5)
≤3000	−0.036	0.248		−0.78%	
5001–7000	0.115	0.227		+2.57%	
7001–9000	0.115	0.261		+2.55%	
≥9001	0.415	0.271		+9.64%	
No info.	−0.533	0.237	**	−10.44%	
Health and behavior					
Self-perceived health (baseline: Average)					(4)
Very bad	−0.918	0.568		−16.34%	
Bad	0.383	0.243		+8.87%	
Good	−0.059	0.174		−1.29%	
Very good	−0.786	0.245	***	−14.48%	
Concern for future dependence (baseline: Not worried)					(1)
Worried	0.915	0.161	***	+22.08%	
Contact with parents (baseline: Very often)					(6)
Often	−0.391	0.194	**	−7.93%	
Not very often	−0.673	0.239	***	−12.76%	
Never	−1.248	0.529	**	−20.31%	
Other	−0.358	0.200	*	−7.30%	
Care preference (baseline: Formal care)					(18)
Informal care	−0.284	0.186		−5.90%	

Note: The significance levels are
*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

TABLE 7 Results for regression model (2) (continued from Table 6)

	Coefficient	SD error	Sig.	Probability of interest	Importance (rank)
Intercept	−0.735	0.401	*	32.41%	
LTC literacy					
Understanding of care insurance (baseline: Unclear)					(3)
Clear	0.744	0.163	***	+17.81%	
Understanding of care costs (baseline: Unclear)					(2)
Clear	0.912	0.167	***	+22.00%	
Private insurance participation (baseline: Nothing)					(9)
Small share	0.448	0.203	**	+10.47%	
Significant share	0.665	0.225	***	+15.83%	
Almost all	0.485	0.305		+11.37%	
Don't know	0.118	0.284		+2.62%	
Dependent's participation (baseline: Nothing)					(8)
Small share	−0.134	0.224		−2.87%	
Significant share	−0.069	0.223		−1.49%	
Almost all	0.378	0.251		+8.76%	
Don't know	0.752	0.323	**	+18.02%	
Dependent parents and help (baseline: No exposure)					(12)
Exposure but not helped	−0.487	0.203	**	−9.65%	
Exposure and helped	−0.308	0.173	*	−6.36%	
Political factors					
Political orientation (baseline: Center)					(15)
Left	−0.202	0.188		−4.26%	
Right	0.194	0.182		+4.39%	
State's role (baseline: Agree)					(13)
Disagree	−0.796	0.377	**	−14.63%	
Indifferent	−0.191	0.191		−4.05%	
Insurers' role (baseline: Agree)					(7)
Disagree	−0.554	0.198	***	−10.80%	
Indifferent	−0.523	0.169	***	−10.29%	
Other background variables					
LTC policy model region (baseline: Mixed model)					(10)
At-home care model	0.448	0.182	**	+10.45%	
Institutional care model	−0.126	0.277		−2.69%	
Other	−0.007	0.230		−0.16%	

(Continues)

TABLE 7 (Continued)

	Coefficient	SD error	Sig.	Probability of interest	Importance (rank)
Nationality (baseline: Swiss)					(11)
Not Swiss	0.486	0.189	***	+11.39%	

Note: The significance levels are
*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

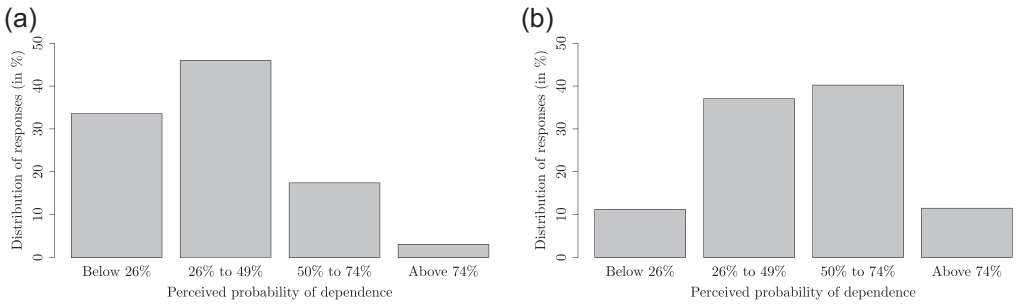
and per category, we provide the estimate of the regression coefficient, standard error, and significance level. As all variables have multiple categories, we choose the category with the largest overall prevalence (see Table 11 of Supporting Information: Appendix B) as baseline. We calculate the probability to be interested in LTCI from Equation (3) and report the absolute baseline (intercept) probability and changes in probability along the variables' categories. In the last column, for each variable, we recall the variables' position in the importance ranking from the log-likelihood ratio test λ.[5]

People living alone are significantly less interested than those living in a household of three people or more. We report an estimated coefficient $\beta_{SH} = -0.397$ corresponding to a change of −8.04% in the expected probability. This finding confirms the observation from the descriptive statistics about the role of family members as potential substitutes for professional caregivers. We conclude that individuals living alone do not feel that they should buy extra insurance to make up for a potential lack of informal caregivers.

Regarding education, we find a significant difference in interest among individuals in the lowest education level (mandatory education) and others. In fact, they show a significant negative coefficient compared to respondents with the baseline high school level ($\beta_{ED} = -0.730$). This translates into a predicted probability of interest decreasing by 13.65%, keeping everything else constant. These findings coincide with conclusions of other studies (America's Health Insurance Plans, 2012; Cramer & Jensen, 2006). Similar results can be found when analyzing the potential interest by respondents' self-perceived health: those who claim to have very good health ($\beta_{CH} = -0.786$) are 14.48% less interested than those who reported average health.

In the health and behavior group, we find that concern for future dependence has the highest effects. Taking the baseline (not worried) as a point of reference, we observe that the probability for a person to be interested in buying LTCI increases by 22.08% when the individual is worried about dependence ($\beta_{CD} = 0.915$). This variable ranks first in our importance ranking. To emphasize this result, we show in Figure 3 the relation between the concern for future dependence and the perceived probability of dependence. In graphs (a) and (b) we report the distribution of the responses on the perceived probability of dependence for those claiming to be not worried or worried about dependence, respectively. For those

[5]As part of the modeling process and in addition to the GLM results, we provide information on the model's accuracy. For the reduced regression model (2), a confusion matrix analysis results in a specificity (true negative rate) of 80.87% and sensitivity (true-positive rate) of 62.81%, for an overall accuracy of 73.26%. Moreover, relating to the diagnostic ability, we observe the area under the receiver operating characteristic (ROC) curve yielding 0.7184 out of 1. Finally, to assess how much the true-/false-positive rate could change when introducing new data into the model, we perform a 10-fold cross-validation of the area under the ROC curve, resulting in a cross-validated indicator of 0.6870.



Not worried about dependence ($N = 718$). Worried about dependence ($N = 348$).

FIGURE 3 Distribution of responses in the perceived probability of dependence for respondents that are (a) not worried, and (b) worried about dependence.

declaring not being worried about dependence, most respondents indicate the perceived probability to become dependent as below 50% (see Figure 3a). Unsurprisingly, we observe that respondents indicating to be worried about dependence (Figure 3b) also claim higher chances of becoming dependent with most responses in the category "50% to 74%." This observation suggests that many of those that are worried are interested in LTCI as they perceive that they are likely to need assistance in the future. Following this reasoning, prospects buy coverage because they consider themselves as "bad risks." Such a result has also been obtained in other studies. For example, Finkelstein and McGarry (2006) and Courbage and Roudaut (2008) have found evidence that individuals' private information about their risk level influences the probability of purchasing LTCI in markets such as that of France and the United States. Similarly, other authors (e.g., Sloan & Norton, 1997) found that the purchase of these policies depends on "the person's perception of his or her future use which may depend on observable and unobservable characteristics." In mature markets with years of experience, insurers can account for any adverse selection and information asymmetries in their pricing or coverage restrictions (Adams et al., 2014). In Switzerland, however, the situation is currently more challenging as the insurers' experience is limited and relevant data are scarce.

In the LTC literacy group, as shown in Table 7, we note that individuals with a good understanding of care costs are 22% more likely to be interested in LTCI than others ($\beta_{UC} = 0.912$). Further the understanding of care insurance is another important indicator for potential buyers ($\beta_{UI} = 0.744, +17.84\%$). These two variables are ranked in the second and third positions in terms of importance. Moreover, the beliefs about the sources of financing are important as well. Those who claim to not know how much would remain to be covered by the dependent's participation ($\beta_{DP} = 0.323$) show an 18.02% higher expected probability to be interested in insurance than those who think that the dependent person is not financially involved.

Furthermore, among the political factors, responses vary significantly on the perceived role of the different stakeholders—the State, citizens, and insurers—for financing care. For instance, those who think that the government is not responsible for ensuring the financing of care ($\beta_{SR} = -0.796, -14.63\%$) are less interested in LTCI. Respondents who disagree ($\beta_{IR} = -0.554$) or are neutral ($\beta_{IR} = -0.523$) to having a larger offer from insurers are also more likely to reject insurance cover. Finally, both other background variables show significant effects. As highlighted earlier, we confirm that individuals from cantons promoting the

at-home care model show significantly more interest in LTCI policies ($\beta_{PM} = 0.448$) to complement their care financing. Further, we find that respondents who come from households with foreign origins ($\beta_{NB} = 0.486$, 11.39%) are more disposed to purchase LTCI.

We conclude that knowledge about LTC, the involved costs, and the financing challenges are the most important characteristics to drive the interest in purchasing LTCI. In fact, we notice that the usual socio-demographic factors such as age, sex, and education level are either nonsignificant or not part of the most influential factors. Given the magnitude of the effects, we further conclude that it is imperative to successfully communicate the principles of care insurance and the challenges of care costs. These aspects can make the difference to convert an uninterested individual into a policyholder. These results coincide with the conclusions of Zhou-Richter et al. (2010) and Lambregts and Schut (2019). Indeed, they state that being aware of the risk through enhanced knowledge is a vital element to trigger interest in purchasing insurance. Finally, we also discern that in a market where subscribing care insurance is voluntary, most successful sales would address individuals who are concerned about future dependence. This observation is not necessarily good news for insurers as it signals that the market development could go through adverse selection in early stages. This potential problem of adverse selection, however, requires a deeper analysis beyond this study. To better understand why interested individuals are worried about dependence, we consider potential interactions among the variables in Section 5.3.

5.3 | Relations between potential LTCI buyers' characteristics

Having a comprehensive set of variables at hand, it is important to look into the possible dependence among pairs of variables. We thus assess potentially relevant variable interactions in the regression model (2) and expand our understanding of the relationships among these variables. Using the most important interactions identified by the RFM (see Figure 5 in Supporting Information: Appendix C for details), we uncover four interaction terms that have a significant effect when added individually to the reduced regression model (2). They are "$UC \times MI$," "$UC \times DP$," "$CD \times DP$," and "$UI \times PI$." In Tables 8–10, we report the marginal effects in terms of changes in the expected probability to declare LTCI interest. The reported values for these interactions refer to the baseline presented in Section 5.2 (Tables 6 and 7). The significance reported next to each value indicates the significance of the interaction term effect in the respective categories. The significance notation appearing in the entries of the matrix

TABLE 8 Change in the expected probability of LTCI interest when appending the $UC \times MI$ interaction in regression model (2)

Understanding of care costs × Monthly income ($UC \times MI$)						
	<3000	**3000–5000**	**5000–7000**	**7000–9000**	**>9000****	**Don't know***
Unclear	+12.3%	(baseline)	+8.88%	+14.37%	+22.55%	−5.72%
Clear***	+21.14%**	+34.35%	+32.09%	+28.33%*	+36.47%*	+17.46%

Note: Statistical significance in the entries of the matrix (rows/columns) indicates the significance of the individual variables themselves (e.g., UC and MI); statistical significance next to each value indicates the significance of the interaction term effect (e.g.,UC× MI) in the respective categories.

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

TABLE 9 Change in the expected probability of LTCI interest when appending the $UC \times DP$ and $CD \times DP$ interactions, respectively, in regression model (2)

	Nothing	Little	Important*	All	Don't know
Understanding of care costs × Dependent's participation ($UC \times DP$)					
Unclear	(baseline)	−0.11%	−9.18%	+8.43%	+17.63%
Clear***	+17.91%	+15.76%	+25.28%**	+31.67%	+46.30%
Concern for future dependence × Dependent's participation ($CD \times DP$)					
Not worried	(baseline)	−3.98%	−1.19%	+9.95%	+7.88%
Worried**	+19.67%	+16.86%	+14.95%	+26.55%	+52.93%**

Note: See note in Table 8.

TABLE 10 Change in the expected probability of LTCI interest when appending the $UI \times PI$ interaction in regression model (2)

Understanding of care insurance × Private insurance participation ($UI \times PI$)					
	Nothing	**Little**	**Important**	**All**	**Don't know**
Unclear	(baseline)	+8.56%	+8.45%	+3.44%	−0.25%
Clear	+22.47%	+30.89%	+30.79%*	+26.01%	+22.21%

Note: See note in Table 8.

indicates the significance of the individual variables themselves when considered next to the interaction term in the GLM.

Assessing the interaction between a person's understanding of care costs and monthly income ($UC \times MI$), we observe a particularly high increase in interest for those respondents at the higher income level (above CHF 9000) who have a clear understanding of costs. Indeed, they are 36.47% more likely to be interested in purchasing LTCI compared to the baseline. We do not observe, however, a clear tendency among the lower income levels where results fluctuate. Although we observe that the significant values of the marginal probabilities increase with the monthly income among those who have a clear understanding of the costs, for the levels between CHF 3000 and 7000, the nonsignificant higher values do not align. This ambiguity coincides with the findings from other researchers. For example, Costa-Font and Rovira-Forns (2008) note that the effect of income and wealth is expected to be ambiguous as premiums affect a household income, making the policy particularly more attractive for higher- (vs. lower-) income individuals. They specify, however, that certain income levels give a person the capacity to self-insure while lower income levels have access to social programs to help them bear the costs.

Through the interaction between the understanding of care costs and the dependent's participation in costs ($UC \times DP$, see the first panel in Table 9), we identify that individuals who declare a clear understanding of costs and believe that the dependent person covers an important share of the expenses are 25.28% more likely to be interested in LTCI. This signals how individuals who comprehend better the financial consequences of dependence may be more sensible to how LTCI can reduce the burden for the dependent, which makes them more interested in insurance. Moreover, we find a particularly high amount of interest among

individuals worried about future dependence and claiming to not know what share remains to be paid by the person in need of care (+52.93%, see the $CD \times DP$ panel in Table 9). This result provides additional insight on how a part of the population is particularly worried because they lack knowledge about how much they would have to cover in case of dependence, and this causes them to be interested in buying insurance.

Regarding a person's understanding of care insurance, we find a significant interaction with the private insurance participation variable ($UI \times PI$). The results of the regression model in Table 10 indicate that individuals who think that private insurance covers an "important" share of the care costs are more likely to buy LTCI (+30.79%) if they understand the insurance product description.

5.4 | Emergence of LTCI in Switzerland: Takeouts and discussion

5.4.1 | Awareness and understanding of LTC(I)

Potential customers are concerned about future dependence and characterized by a good understanding of care insurance and care costs. These characteristics that relate to awareness and literacy can be addressed with information and education. Our results align with previous findings documented in the literature. For instance, using survey data from Canada, Boyer et al. (2020) find that a low take-up rate may be grounded in information frictions regarding the general knowledge of insurance and of LTC costs. In this sense, to awaken the interest in buying LTCI policies, it is essential to make the population aware of the frequency and severity of the risk insured, and to provide a clear explanation of the benefits that come with an LTCI policy. To do this, insurers and regulators must make sure that they have the necessary insights about the issue and its future evolution. This requires further analysis, especially given that the LTC risk is actuarially not well documented in Switzerland (Fuino & Wagner, 2018a).

5.4.2 | Low interest in insurance and family role

Only 42% of the respondents would be interested in LTCI; that is, most individuals (58%) would discard purchasing a classical LTCI solution even before discussing the price of such insurance. One major challenge for insurers to overcome this is the lack of trust in insurance companies as it ranks as the main reason for individuals not to buy LTCI (cf. Figure 2b). Indeed, insurers and regulators must strive hard for the population to view potential LTCI products as trustworthy. Appealing products should also address the feeling of being a burden to the family and the protection of the inheritance of children (cf. Figure 2a). Indeed, dependence and LTC concern all family members, who may play a role in the insurance decision (Courbage et al., 2020a).

5.4.3 | Attractive products and social security

We believe that insurers have to provide attractive products that may ideally fulfill several concerns and thus more broadly attract customers. Innovative hybrid policies could combine survival annuities, pensions, or reverse mortgages with LTCI (Chen et al., 2021; Murtaugh et al., 2016; Shao et al., 2019; Vidal et al., 2020), include benefits for supporting informal care

(Wu et al., 2020), and a savings component (Fuino, Maichel-Guggemoos, et al., 2020). In the case of savings products, the tax environment can provide adequate incentives to overcome crowding-out effects. For example, tax rules could consider LTC savings as tax-qualified amounts and specify tax exemptions on the savings amounts and allow withdrawals in the case of LTC needs at reduced tax rates.

From policymakers' perspective, a solution to fill the protection gap could include enhancing the benefits of social insurance through enlarging the cover of health insurance or increasing pension payments in case of long-term dependence. Indeed, we observe that some countries prefer to rely more on public schemes for managing LTC. For example, in 2000, Japan implemented a mandatory LTCI program funded by a general tax and premiums paid by the insureds (Matsuda & Yamamoto, 2001). In our survey, we have highlighted the relevance of the prevailing regional LTC policies that encourage care at home or institutional care. The available financing from the State and the incentives to save for LTC services strongly influence insurance purchase. Solutions must therefore consider the social security background as well as the needs of the poorest and the potential contributions of the richest in the population. These thoughts deserve further investigation.

5.4.4 | Supply and demand of LTCI

In this paper, we focus on the personal characteristics potentially driving the demand. We do not consider LTCI prices nor the supply side. Indeed, the willingness to pay for LTCI, beyond the assessment of the personal willingness to seek protection, includes studying the cost of LTC cover and the offered premium levels and benefits. Such study would typically require specific survey methods (like, e.g., discrete choice experiments) to integrate price, insurance offer characteristics, and individual factors.

It is well known in the literature that the supply side often does not match the demand side expectations (e.g., Brown & Finkelstein, 2007). This is generally attributed to the randomness of the size and occurrence of claims, information asymmetry, insurance premiums, and coverage limits (Eling & Ghavibazoo, 2019). Accurate estimation of the size and incidence of LTCI claims requires knowledge of each factor as well as their interactions (Biessy, 2017; D'Amico et al., 2009; Fong et al., 2017; Guibert & Planchet, 2018), which is nearly impossible owing to the scarcity of available data (Fuino & Wagner, 2018a). Information asymmetry comprises adverse selection and moral hazard (Chen, 2001). Our observations suggest that potential customers buy insurance because they perceive themselves as a "bad risk," which leaves much room for adverse selection (see Section 5.2). Moreover, moral hazard in the LTC context often corresponds to intra-family moral hazard as the caregiver behavior can affect LTCI demand and losses (Pauly, 1990). The above reasons make it difficult for private insurers to set appropriate prices, often resulting in higher premiums and adjustments to current policies (Carrns, 2015). Indeed, these changes are poorly perceived and almost always misunderstood by customers. Finally, the coverage limit (amount limit or term limit) to be introduced by insurance companies is certainly one, if not the most important, aspect affecting the offer. Indeed, this raises important ethical and image issues for insurance companies, because to offer an affordable premium, they will have to interrupt the indemnity at the most inopportune moment, as it is often unrealistic to assume that an older person will regain autonomy in old age (Fuino & Wagner, 2018a).

6 | CONCLUSION

In Switzerland, barely any LTCI product exists despite the country's context of increasing life expectancy, large financial assets, and a mature insurance market. The potential of the Swiss LTCI market is unknown, and the need for solutions to cope with the risks of dependence and to complement the relatively extensive social insurance and help from the State tends to increase. In this study, we identify the main determinants triggering individuals' interest in purchasing LTCI, which helps to provide a depiction of the potential buyers. From the initial set of explanatory variables, including demographic factors, socioeconomic characteristics, health and behavior variables, LTC literacy indicators, and political elements, we find that covariates on LTC literacy and health and behavior are by far the most relevant elements to characterize potential customers. We observe that demographic and socioeconomic variables only play a secondary role.

From our results, we learn that interest in LTCI in the Swiss market is significantly driven by factors that relate to individuals' knowledge of dependence, care costs, and sources of financing. Regarding LTC literacy, we find that the understanding of the idea of care insurance, the comprehension of the potential losses and LTC prevalence, as well as the level of concern about the own dependence are the three most relevant factors driving LTCI interest. Moreover, we show that a person's concern for future dependence is highly linked to the perceived probability of becoming dependent in the future. We also identify the most relevant interactions between variables. We unveil how a person's interest is affected by their level of understanding of care and the interactions among income and beliefs about the own participation in costs. Similarly, the individual's understanding of insurance and its interaction with beliefs about private insurance participation in costs play a role. Furthermore, the interest changes drastically based on the individual's level of concern for future dependence and the own financial share in the costs.

Our results are of interest to insurance companies that consider providing LTCI policies as a way of expanding their business in Switzerland and in markets that show similar characteristics regarding, for example, the development of private LTCI. The output provides policy suppliers with the main tools to understand potential target segments, their size, and their main opportunities and challenges. We note that it is important to build up knowledge and awareness of LTC and related costs. Information on types of care, total cost, and typical cost sharing is crucial. Trust relationships are essential for prospects to engage with insurers. The in-place regional LTC models are also a key pillar for driving LTCI. While in care-at-home model regions public financing in nursing homes is less available, the setup encourages the development of private insurance solutions covering extra costs. Eventually, private LTCI may play a critical role in supplementing solutions from the State which may become (too) expensive for social systems in the coming decades. Beyond the limitations that come with the type of survey study we present, we are aware that we do not address the impact of LTCI pricing on the demand and multiple issues from the supply side. These perspectives cannot be neglected and deserve further empirical research in the Swiss market.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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