The role of culture in long-term care arrangement decisions*

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Abstract

In this paper, we show how and to what extent cultural factors may influence the LTC market and elderly living arrangements. Using a spatial regression discontinuity design, we exploit the within-state variation in language groups in Switzerland to provide evidence about cultural differences in LTC use. We show that elderly people residing in regions speaking a Latin language (French, Italian and Romansh) enter nursing homes in worse health conditions and rely more on home-based care compared to elderly people residing in the neighboring German regions. Differences in the strength of family ties across linguistic groups represent the most reasonable explanation for such differences.

Keywords: Long-term care, Culture, Spatial RDD.

JEL codes: I11, I18, C26.

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1 Introduction

Population aging and the change in the family structure are expected to increase long-term care (LTC) expenditure substantially in the next 50 years, raising the burden on society to cover elderly care services. In 2010, public LTC expenditure accounted, on average, for 1.8% of GDP across the EU-27 and this expenditure is expected to double by 2060 (**?**). However, the LTC market is still considered too small if we take into account the high expenditure associated with the old age dependency risk (**?**). A quite voluminous literature (see **?** for a review) has investigated the LTC insurance puzzle focusing on several supply side (e.g., imperfect competition and asymmetric information) and demand side (e.g., limited rationality, biased risk perception and informal care) factors. More recently, attention has been also devoted to the role of cultural factors,[1] mainly to explain the large cross-country variation in the size of this market (**?**). This paper shows how and to what extent cultural factors may influence the LTC market. To this aim we compare LTC arrangement decisions across language regions in Switzerland using a spatial regression discontinuity design (RDD).

LTC arrangements can be distinguished between residential care provided in nursing homes and home-based care provided at the individual's home. While residential care is always formally provided, home-based care can be either formal or informal - that is, provided by family members. Generally speaking, LTC arrangements respond to different needs and the choice among them is the result of different factors. The health condition of the older person is of fundamental importance in deciding the amount of formal and informal care required (**??**). In many cases, elderly people choose residential care only when their health condition is too critical to be cared at home (**?**). Another important determinant is the availability of substitutes for care. Indeed, cohabiting with other people increases the probability of receiving informal care, while living alone is significantly associated with higher formal home-based care and nursing home use (**?**). Finally, payment schemes for formal health care services are also found to influence LTC use (e.g., **??**).

Social scientists have also explored the cultural-driven north-south gradient in LTC arrangements across European countries. The elderly are more likely to be instituzionalized (i.e. in nursing homes), and more likely to use formal health care services in Continental and Scandinavian countries than in Mediterranean countries (e.g., **?**). **?** offers a cultural explanation for this phenomenon and, more generally, for the limited development of the LTC insurance market in many countries. He finds that family ties appear to influence the decisions to purchase LTC insurance, and that

[1]Following the growing literature on the economic effects of culture (e.g., **?**), we refer to culture as customary beliefs, attitudes and system of social norms that characterize a particular group and that are transmitted from generation to generation.

European countries with stronger family ties exhibit lower levels of formal LTC coverage. This is consistent with the sociologists' view according to which "weak" and "strong" family ties countries show very different cultural norms about the role of the family in taking care of the elderly (**?**). Nevertheless, in these studies the presence of significant differences among Southern, Central and Northern European countries in LTC utilization might be driven by the large differences in institutional settings. Indeed, economic conditions, institutional factors and cultural norms are very difficult, if not impossible, to disentangle using cross-country studies.

We overcome this problem by exploiting the unique institutional setting provided by Switzerland. Switzerland is a confederation of 26 states called cantons, and counts four distinct cultural groups corresponding to four different languages spoken, namely German, French, Italian and Romansh. These language groups are geographically well-delimited, and the discontinuity in the probability of speaking a given language is quite sharp at language borders. Moreover, there are large differences between cultural groups, particularly between German speaking communities and communities speaking a language of Latin origin (French, Italian and Romansh).

? show how the large cultural difference between these two broad language groups shapes the demand for social insurance. In particular, the support of redistribution policies and for the expansion of the social insurances is larger among Latin-speaking Swiss residents compared with their German-neighbors in adjacent municipalities. Moreover, the authors show the presence of stronger family ties among Swiss-Latin individuals. Using Swiss data from the European Value Survey (EVS) and the International Social Survey Program (ISSP), we also document the presence of clear differences between Latin and German speaking people living in Switzerland for some selected questions about family value and elderly care. Figure 1 clearly shows that Latin speaking respondents are more likely to consider the family as very important in their life. They also believe that elderly care should be provided by family members (especially adult children), and spend a larger amount of time in providing care for family members than people living in German areas.

In this paper, we argue that the before described difference in family values across the two main Swiss cultural groups - German and Latin - gives rise to large differences in the demand for LTC arrangements. First, we use a simple theoretical framework to predict how different individual preferences may affect the dependency level at entry (i.e., health conditions) in nursing homes and, as a consequence, the relative provision of home-based care compared to nursing homes. In particular, if stronger family ties imply stronger preferences for care at home, Latin speaking individuals are expected to enter a nursing home in worse health conditions and use more formal home-based care with respect to German speaking individuals. Then, using Swiss administrative data on nursing homes and formal home-based care providers, we provide empirical evidence that supports our theoretical predictions.

While cantons have large power in many economic sectors, including the organization of LTC services, linguistic borders do not always coincide with cantonal administrative borders. Particularly, there are three French and German speaking bilingual cantons and one Italian, Romansh and German speaking trilingual canton (see Figure 2). As in **?**, we disentangle the effect of culture from the effect of different institutional settings using a spatial RDD at the linguistic border between German and French speaking municipalities in the three bilingual cantons. Thus, contrasting LTC choices of people living on different sides of the linguistic border within the same canton (i.e., holding supply and institutional factors constant), we can identify the impact of culture on LTC arrangement decisions. We do not use the variation coming from the trilingual canton (Graubünden) because the identification would be based on too few municipalities and potentially confounded by important geographical discontinuities (i.e. the Alps).

Our results are robust to a large battery of robustness checks. We show that there are no discontinuities in our covariates and institutional characteristics that might potentially confound our analysis, such as socio-demographics characteristics, income, home ownership, prevalence of several (aging related) diseases, mortality and several supply side characteristics. Our results are also robust to the bandwidth choice and to different parametric and non-parametric specifications.

To provide further evidence that our results are driven by cultural differences in family values, we also investigate the mechanisms behind our results. Many alternative explanations are rejected when testing the continuity assumption. Then, we use survey data to investigate several household characteristics that are known to affect LTC choices. Again, we do not find evidence of differences in household composition and size across linguistic groups. We do instead find evidence of a larger presence of informal care from household members and relatives in Latin speaking regions, a result that supports the family ties explanation.

This paper provides a new contribution to the literature about the determinants of LTC use, showing the importance of culture on LTC arrangement decisions. The role of culture in shaping economic outcomes has been widely debated in the literature (e.g., **????**). For instance, **?** investigates how culture affects living arrangements, showing that children of Southern European immigrants in the United States tend to cohabit with their parents up to older ages as compared to children of Northern European immigrants. Indeed, our evidence allows to shed some light on one of the driving forces behind the substitutability between different LTC arrangements.

The remainder of the paper is structured as follows. The next section explains the institutional background and provides some basic insights about the organization and the distribution of formal LTC in Switzerland. Section 3 provides a simple theoretical framework to understand the role of culture in shaping LTC arrangement decisions, while Section 4 presents the data. The empirical strategy is presented in Section 5 while Section 6 presents the results. Finally, Section 7 concludes.

2 Institutional and cultural background

Language, culture and administrative borders

In Switzerland there are 26 cantons and 4 official languages: German, French, Italian and Romansh. In 2013, the Swiss population amounted to about 8 million people. German was spoken by 63.5% of the population, French by 22.5%, Italian by 8.1% and Romansh only by 0.5%. Linguistic areas are well-delimited on the territory: the German speaking part is located in the Centre-East of the country, French is spoken in the West, Italian in the South and Romansh in some valleys of the South-East.

However, linguistic areas do not always coincide with cantonal administrative borders. Specifically, three cantons — Berne, Fribourg and Valais —overlap with both French and German speaking areas, while the canton of Graubünden overlaps with German, Italian and Romansh speaking areas (see Figure 2). The language discontinuity in the Graubünden canton is limited to some specific valleys. On the contrary, the language discontinuity between French speaking areas in the Western part of the country and German speaking areas in the Central part runs from North to South without geographical barriers separating the two linguistic areas. The mountain barrier of the Alps is located in the South, and runs from East to West, while the Northern part is mainly covered by hills. Thus, there are no morphological differences between the two sides of this linguistic border. The linguistic border has historical roots and can be considered as fairly exogenous. As discussed by **??** it traces back to the Roman time (around VI-VII century A.D.) while cantonal boundaries emerged only during the late Middle Ages.

It is also worth noting that the linguistic border does not coincide with a religious border. However, Swiss-Latin border towns are characterised by roughly 14 percentage points fewer Protestants as compared to Swiss-German border towns. This percentage is compensated by a corresponding higher share of Catholics (**?**) with large heterogeneity across municipalities. Even though cultural norms might be shaped by religion membership, this does not appear to be an explanation for the the large difference in family values and LTC arrangements across the two linguistic groups. In particular, all the results reported in this paper are robust to the inclusion of controls for religion (Table A.4).

Our analysis involves 4 administrative levels: the Confederation, cantons, districts and municipalities. The Confederation sets general guidelines, Cantons are the states of the Swiss Confederation with large autonomy in terms of healthcare organization and policy, while districts are aggregations of municipalities within a canton. Districts do not have any legislative or executive power, nor any democratically elected authority. Still they play a role in the organization of some services, such as home-based care. Finally, municipalities are entitled to organize and guarantee the provision of LTC on their territory. To this end, they can coordinate with other municipalities or with the canton.

LTC organization

The Swiss health care system is based on private health care insurance, which is compulsory for all citizens. The LTC delivery system is highly decentralized and cantons started a federal co-ordination only recently. The Confederation only sets the general guidelines, such as the maximum contribution of patients and health insurers to both residential care and home-based care. Cantons are in charge of the organization of LTC services and guarantee health insurance subscription to those who cannot afford it.[2] Within the guidelines imposed by the Confederation, each canton may set different contributions for patients and health insurers. In particular, German speaking regions have so far relied more heavily on nursing homes, whereas French and Italian speaking areas have developed more home care services. According to the last change in the federal law on LTC provision,[3] about 65% of the cost of health care provided by either nursing homes or home-based health care services is covered by compulsory health insurance, and their reimbursement is regulated by the federal law on the compulsory health insurance.[4] Patients or residents themselves can be made to cover up to 20% of such costs (a ceiling of approximately 8,000 CHF per year). The remainder is covered by public authorities (cantons and municipalities). However, the canton establishes whether the residual costs for LTC are covered by the canton itself or by the patient's municipality of residence. Conversely, residential costs and help at home for activities of daily living (ADL) and instrumental activities of daily living (IADL) are generally covered by the patients through out-of-pocket expenditures (that might depend on income or wealth) or supplementary LTC insurances. However, cantons might decide to provide subsidies to cover at least partially the residual out-of-pocket expenditure.

[2] Notice that more than 50% of patients in nursing homes receive subsidies from local governments.
[3] The federal law was approved in June 13, 2008 and came into force in 2011.
[4] SR 832.10 - Federal law dated March, 18th 1994.

3 Theoretical framework

Several theoretical models provide guidance for optimal LTC arrangement policies (e.g., **??**), but none of them explicitly considers the role of culture in shaping LTC arrangement decisions. In this section we provide a simple theoretical framework to investigate the impact of culture on two outcomes: the dependency level at entry in nursing homes and, as a consequence, the relative provision of home-based care with respect to nursing home care. Although a discussion about the amount of informal care received from relatives is beyond the scope of this paper, this framework can be easily extended to encompass informal care provision. Further details are provided in the footnotes.

Consider the following quasi-linear utility function:

$$U(C, LTC) = C + d\phi(LTC) \qquad d \in [0,1] \tag{1}$$

where C is consumption, ϕ is an increasing and strictly concave function of LTC, and d is the intensity of care required by the elderly person, i.e. the dependency level. Equation (1) can be interpreted as either the household utility or the elderly person's utility, depending on the subject making LTC choices. LTC can be measured in day units or in multiple-day units. Besides, if the elderly person is in good health, i.e. $d = 0$, the household does not spend any amount of income in LTC services.

LTC services can be further subdivided into home-based care (HB) and nursing home care (NH):

$$LTC = \delta HB + (1-\delta)NH, \qquad \delta \in [0,1] \tag{2}$$

where δ is the preference parameter for home-based care, which captures the influence of culture. Indeed, individuals with stronger family ties are expected to show a higher value of δ with respect to individuals with weaker family ties. Home-based care and nursing home care are assumed to be perfect substitutes, since elderly people entering a nursing home do not receive any home-based care, and vice-versa.[5]

Assuming that the price of consumption is the numeraire, the budget constraint is

$$C + p_h(d)HB + p_nNH = \omega, \qquad p_h'(d) > 0 \tag{3}$$

[5]Notice that this framework can be easily expanded to encompass the distinction between formal and informal care provision. Indeed, the home-based care variable HB can be further decomposed as $HB = [\theta IF^\rho + (1-\theta)FM^\rho]^{\frac{1}{\rho}}$, where IF is the amount of informal care, FM is the amount of formal home-based care, θ is a preference parameter for informal care and ρ is the elasticity of substitution between the two. This framework allows for imperfect substitutability between formal and informal home-based care. Nevertheless, a thorough investigation of the interaction between formal and informal care is beyond the scope of this paper.

where $p_h(d)$ is the price of home-based care, which is an increasing function of the dependency level, d. p_n is the price of nursing homes, and ω is the endowment of the household. If HB and NH are expressed in days of care, $p_h(d)$ can be interpreted as the price of one day of home-based care, which becomes progressively more expensive as the elderly's health condition deteriorates. In other words, worse health conditions may require more hours of care, increasing the daily cost of home-based care.[6] For simplicity, we assume p_n to be independent of the elderly's health condition, since fixed costs in a nursing home usually outweigh variable costs due to adverse health conditions.[7]

The Swiss LTC organization fits well this framework. Generally, the price paid for nursing home care does not vary with the intensity of care required by the elderly person and is based on a daily tariff. Conversely, home-based care is provided in hours. Therefore, the more adverse the health conditions of the patient, the larger the number of daily hours of home-based care required, and the higher the daily price of home-based care. As a result, it seems reasonable to assume that for low levels of dependency the price of one day in home-based care is lower than the price of one day in nursing homes, while for high levels of dependency home-based care is more expensive than nursing home care.

The effect of culture on LTC choices

Using Equations (1)–(3), we can see that households are indifferent between nursing homes and home-based care if

$$\delta p_n = (1 - \delta) p_h(d). \tag{4}$$

In words, the elderly person enters a nursing home if the left-hand side of the equation is smaller than the right-hand side, that is when the weighted price of one day in nursing home care is smaller than the weighted price of one day in home-based care. Prices are weighted by preferences for home-based care. Indeed, the higher the preference for home-based care, the smaller the nursing home price to induce entrance in a nursing home. Therefore, the threshold dependency level beyond which the elderly person enters the nursing home can be obtained from Equation (4) as

$$d^* = p_h^{-1}\left(\frac{\delta}{1-\delta} p_n\right). \tag{5}$$

Notice that the inverse of a strictly increasing function is still an increasing function, and therefore the dependency level at entry is positively related to the preference parameter for staying at home.

[6] In the case of formal home-based care this cost is monetary, while in the case of informal care this cost can be measured as the monetary value of the time spent by the caregiver.

[7] To relax this assumption, let the nursing home price depend on the severity of the elderly's health status. Since fixed costs play a greater role in nursing homes than in home-based care, daily home-based care prices increase more rapidly with the severity of the elderly's health condition than daily nursing home prices, i.e. $p'_h(d) > p'_n(d)$.

This means that the threshold dependency level above which the elderly person is willing to enter a nursing home is higher for individuals with strong family ties (and thus high preference parameter for home-based care) than individuals with low family ties (small δ). Figure 3 shows graphically the results using a simple functional form for $p_h(d)$. For combinations of d and δ above the curve, the elderly person enters a nursing home, while for combinations of d and δ below the curve, the elderly person receives home-based care. In the empirical part of the paper, we are going to test the validity of this relationship.

Note that the household decision can be decomposed in two parts: first, the decision whether to purchase home-based or nursing home care, and second, the decision about the quantity of the chosen type of care to purchase. If we focus only on the second part of the problem, the quantity of service to buy, we can see that for positive values of the dependency level d the utility function is strictly concave. This means that preferences in the amount of service to purchase are single-peaked. Thus, assuming that individual preferences are aggregated according to a majoritarian voting rule, and that households correctly reveal their preferences, the median voter theorem applies and the optimal per capita provision of care corresponds to the preferences of the median-ranked household. From a supply viewpoint this implies that, if the government (or the market) aggregates citizens' preferences for home-based care, the higher the average δ in the population the higher the provision of home-based care, *ceteris paribus.*

To sum up, from this simple theoretical framework we obtain two preliminary results: (a) the dependency level at entry in nursing homes is higher for people with stronger preference for home-based care, and (b) if people are allowed to freely choose their preferred LTC arrangement option, LTC provision should reflect population preferences.

In the remaining of this paper, we exploit the within canton variation in the language spoken to show that Latin and German speaking areas are characterized by quite different social values and preferences, which give rise to remarkable differences in the demand for different LTC services. However, if result (b) applies, differences in the supply of LTC services across cantons should also reflect, at least partially, cultural differences across cantons. As a consequence, our identification strategy —that exploits only the cultural variation within cantons— should only capture a lower bound of the total effect of culture on LTC markets.

4 Data and descriptive statistics

4.1 Data

The main data source is the statistics on socio-medical institutions (SOMED) available from the Swiss Federal Statistical Office. SOMED is an administrative dataset containing data from nursing homes between 2006 and 2013. Each nursing home is required to transmit information about its clients, costs, revenues and personnel employed. Data about health care provision to clients are detailed and include length of stay, intensity of care received, type of arrangement within the nursing home, provenience and destination of the elderly. From 2007 on, a personal number is assigned to each client, allowing for consistent tracking of individuals over time. Given the nature of this dataset, there is limited information about socio-demographic characteristics of clients. However, for each individual we observe the place of residence before entering the nursing home, age, and gender.

Dependency level at entry

Following the insight of our theoretical model, the main dependent variable of interest is the dependency level at entry, which we define as the intensity of initial care received by the patient. To measure the dependency level, we use a harmonized scale that ranges from 0 to 4. During the period of interest (2007-2013), the measurement instruments adopted for reporting the intensity of care in nursing homes were not uniform across cantons. Nevertheless, given that each instrument can be converted into minutes of care provided, it was possible to harmonize the dependency levels and to collapse them into one major scale ranging from 0 to 4. In particular, each point of the scale corresponds to one additional hour of care per day. It is worth noting that the measurement instrument does not change at the linguistic border in the three bilingual cantons. We restrict the analysis of the dependency level at entry to people aged 50+ entering a nursing home with the intent to stay for a long time. Moreover, we focus on the dependency level "at entry" to avoid the confounding factor of nursing home treatment. More details regarding the construction of the dependency level at entry are provided in Appendix A.1.

We also consider two other proxies of the dependency level: age at entry and place of residence before entering the nursing home. The idea behind using age at entry is that the older an individual, the higher the likelihood of physical and mental impairments. However, we expect age to be a more noisy indicator of frailty with respect to the dependency level, because life events and health behaviors adopted during the whole life-cycle may affect individual's health at older ages. For instance, if people that would have entered at older ages in nursing homes show worse health-related behaviours, they may enter a nursing home at younger age, because their health status deteriorates faster than people with better health-related behaviour. Indeed, while Latin-speaking communities might be more reluctant to enter a nursing home compared to their German speaking counterparts, they also show worse health-related behaviours (**?**).

Also, the place of residence before entry is an interesting indicator of individual preferences towards LTC arrangements. In areas with greater preference for staying at home, the entrance in nursing home is postponed until the health conditions of the elderly person are too problematic to be cared at home. Thus, in these areas we expect more people entering a nursing home from hospital or from other rehabilitative institutions. On the contrary, where people decide to enter a nursing home in relatively healthier conditions, we expect more people to enter from home. The results based on age at entry and place of residence are very similar to those reported in the main text using the dependency level (see Appendix for further details).

Auxiliary data

We use additional datasets to explain why people in Latin speaking areas enters a nursing home in worse health conditions. First, we exploit the home care survey (HCS) which collects administrative data from home-based care providers. The time span of this database is from 2007 to 2013. Data about clients are aggregated by provider, and therefore it is not possible to make any inference about the intensity of care received by each person. The only available information is the number of clients receiving care, hours provided, and the number of cases by type of care, and (for some types of care) age group. Since home-base providers usually take care of clients residing in different municipalities (to exploit economies of scale from service provision, especially in rural environments) we aggregate the information at district level.

Second, we use voting data from national referenda. Switzerland has a long-standing tradition of direct democracy and many referenda take place every year. In the main text, we use data from the 2013 referendum on family policies about the approval of an amendment to the Swiss Constitution promoting the reconciliation between work and family duties and considering the needs of families in government policies. Specifically we use the share of people voting yes in each municipalities. **?** show that there are sharp differences in referendum outcomes on social issues between French and German speaking municipalities in bilingual cantons. These differences can be attributed to cultural differences between the two linguistic areas. As a result, referendum outcomes should be a reasonable proxy for preferences in this context. Other referenda involving the family (e.g., a referendum in 1996 on the introduction of the maternity leave) lead to similar conclusions.

Third, we use survey data providing information on household characteristics and informal care. In particular, we exploit the 2000 Public use sample (PUS) of the Swiss census (a random drawn sample of 5% of the population) to obtain additional information on household characteristics in the three bilingual cantons, and the fourth wave (2010) of the Survey of Health Ageing and Retirement in Europe (SHARE) for information on the level of informal care. All the other control variables at municipal and hospital level are obtain from the Swiss Federal Statistical Office (FSO) and are described in the Appendix A.2.

4.2 Descriptive statistics

In Table 1, we report basic descriptive statistics at individual level by linguistic area in the three bilingual French- and German speaking cantons. The variables of interest are *Dependency level at entry*, *Age at entry*, *Residing at home* and *Gender*. On average, French speaking individuals show higher dependency level at entry, age at entry, and are less likely to be at home prior to institutionalization. However, a mean comparison test cannot reject the null of equal means for *Age at entry* and *Gender*.[8]

Graphical evidence at district level for the whole country seems to indicate that people in Latin regions (and particularly in the French speaking area) enter nursing homes in worse health conditions, and use formal home care more often than people living in German regions (Figure 4).[9] One could argue that this pattern may be driven by average worse health conditions of people living in Latin speaking areas. As a robustness check, we use the share of people over 65 in nursing homes instead of the dependency rate and obtain very similar results (Figure A.1). Such evidence suggests that people in Latin speaking regions enter the nursing home in worse health conditions because they postpone their entrance, rather than being in worse health conditions compared to people in German speaking regions. This is also confirmed by Figure A.2 where we show that there are no discontinuities in common diseases among the elderly at the language border in the three bilingual cantons (see Section 6.1 for further details). If ever, mortality rate is slightly smaller on the Latin side (Figure A.3).

5 Empirical strategy

To causally identify the role of culture, we exploit the language divide in bilingual cantons as a source of exogenous variation within the canton. In particular, we use a spatial RDD contrasting the dependency levels at entry in nursing homes of individuals living on opposite sides of the linguistic border (controlling for canton fixed effects). In determining the impact of culture on the demand

[8]The standard errors in these tests are robust and clustered at municipal level.

[9]We use this level of aggregation to compare nursing home data with formal home-based care data. As discussed in Section 4, home-based care data are only at provider level.

for social insurance, **?** adopt a fuzzy RDD exploiting the jump in the probability of speaking French across the two sides of the linguistic border. According to their estimates, the share of the French speaking population to the West-hand side of the linguistic border is 85%, while the share of the French speaking population to the East-hand side of the linguistic border is about 10%. In our context, we are not aware of the language spoken by the elderly people in the sample. Hence, we refer to **?** for the first stage estimates of the fuzzy design, and we only focus on the reduced form.

Following their approach, we define municipalities at the border as those French speaking municipalities bordering with at least one German speaking municipality. The municipality of interest here is the municipality of residence of the elderly person before being institutionalized, not the municipality of the nursing home. Thus, we define the treatment as a dummy variable equal to 1 if the elderly person resided in the French speaking area before entering the nursing home. The assignment (or running) variable is the kilometric travel distance from the municipality of residence to the closest French speaking municipality on the linguistic border. French speaking municipalities at the linguistic border are assigned a distance of 0 from the border, while all the other French speaking municipalities are assigned a positive number. In the same way, all the German speaking municipalities are assigned a negative number.

More specifically, we estimate the following regression:

$$Y_{im} = \beta_0 + \beta_1 F_m + \beta_2 dist_m + \beta_3 Z_{im} + \beta_4 F_m dist_m + \varepsilon_{im} \tag{6}$$

where Y_{im} is the dependency level at entry of the individual i residing in municipality m (before entering in the nursing home); F_m is a dummy for French municipalities (our treatment), $dist_m$ is the assignment variable, Z_{im} represents a set of covariates and ε_{im} is a stochastic error term. The coefficient β_1 represents the effect of interest, namely the difference in dependency levels between the French speaking and the German speaking areas at the linguistic border. In the standard regression discontinuity approach, all the control variables should be continuous at the cut-off, and thus control variables are not required. However, in the present setting we control for the canton and the year of entry in nursing homes. Given that LTC policies are set at cantonal level, controlling for cantons is fundamental to ensure a correct comparison of observations across the linguistic border. To the same extent, the year of entry is important to avoid capturing time effects in our average treatment effect. The interaction term between the treatment and the assignment variable accounts for the possibility of different linear trends on either side of the discontinuity.

The effect of interest and the selection of the optimal bandwidth are both computed using the non-parametric procedure developed in **?** and **?**.[10] The non-parametric estimator allows to

[10]We use the 2016 version of the Stata command *rdrobust*.

correct for the bias that might arise imposing the linearity of the fitting line (with robust bias-corrected confidence intervals). The choice of the bandwidth is based on the optimal bandwidth choice proposed by Imbens and Kakyanaraman (2012). However, we also test the robustness of our results to the bandwidth choice and to higher polynomial orders using parametric specifications (see Appendix).

Finally, we evaluate the validity of our identification strategy (i.e., continuity assumption) by testing for the presence of discontinuity at the border for a very large set of covariates (socio-demographic and economic variables) and other relevant variables that, by definition, should be continuous at the border. In particular, we test for discontinuity in the prevalence of the most common diseases. This is meant to verify whether the discontinuity in the dependency level at entry in nursing homes is caused by a discontinuous change in the health conditions at the border rather than different preferences regarding the time of entry in nursing homes, as we argue. Additionally, we test for discontinuity in prices and other supply factors (i.e., insurance contributions and number of nursing home beds) that should be also continuous at the border.

6 Results

6.1 Regression discontinuity design

We start the analysis by showing the discontinuity in the dependency level at entry at the linguistic border (Figure 5). We control for canton fixed effect to account for supply and other institutional differences. Each point in the graph represents the mean residual for a group of municipalities aggregated according to the distance from the linguistic border in the three bilingual cantons. The cloud of bins looks noisy because in some municipalities the number of observations (i.e., number of people who entered a nursing home) is quite low. Moreover, using a bandwidth larger than 30 km implies losing at least one canton on each side of the border.[11] Therefore, we report the full bandwidth in the top figure, while in the bottom figure the analysis is restricted to a bandwidth of 25 km and to municipalities with at least 50 people who entered a nursing home in the period of interest (2007–2013). In the 25-km figure we observe quite a clear jump in the dependency level at entry in nursing homes at the linguistic border (predicted also in the full bandwidth figure). Similarly, Figure 6 reports the discontinuity in the share of voters (at municipal level) voting "yes" in the 2013 referendum on family policies after controlling for canton fixed effect. The large discontinuity in referendum outcomes at the linguistic border suggests a large discontinuity in preferences for family policies, which mirrors the differential use of LTC services.

[11]Note that the full bandwidth is not symmetric because the German side spans for almost 150 km, while the French one for less than 80.

A more formal test of our RDD on the dependency level at entry is presented in Table 2. The optimal bandwidth is computed non-parametrically and the results are obtained controlling for canton and year fixed effects.[12] Column (1) displays the estimates of the treatment effect (French border) without accounting for the possibility of the linear fitting bias. Columns (2) and (3) show the estimates of the bias-correction procedure proposed by **?** that accounts for the presence of the linear fitting bias in estimating the average treatment effect. The average treatment effect is always positive and statistically significant even with robust bias-corrected confidence intervals (Column (3)). The magnitude of this coefficient accounts for around 10% of the standard deviation. Since our estimates represent a reduced form effect, the coefficient β_1 estimated above should be inflated to take into account the jump in the probability of speaking French at the linguistic border. According to **?**, the impact of the treatment (i.e. residing in the French speaking region) on the language spoken is 0.754. Hence, the average treatment effect should be multiplied by a factor of 1.327 (1/0.754). In the bias-corrected robust specification, the inflated average treatment effect is 0.13. This means that accounting for the actual probability of residing on one side of the linguistic border and speaking the same language, French speaking people show a 0.13 higher dependency level at entry than German speaking people, which is 13% of the standard deviation. In addition, recalling that each point in our measurement scale of the dependency level corresponds to one hour of care per day, a French-German gap of 0.13 corresponds to 6 more minutes of care per day at entry in the French speaking part. To give a grasp about the magnitude of this effect, 6 minutes per day corresponds to 36.5 hours of care in one year per elderly person in nursing home.

Robustness checks

To check the validity of our non-parametric estimates, we perform a parametric RDD evaluating the sensitivity of the estimated coefficients to different bandwidths (namely 25-km, 50-km and 100-km) and different polynomial orders (up to fourth). The results reported in Table A.2 of Appendix are consistent with those reported in the main text.

We also repeat our non-parametric estimations with two more dependent variables: age at entry (*Age at entry*) and residing at home prior to nursing home entry (*Residing at home*). The regression discontinuity results for these two variables are presented in Table A.3 of Appendix. The point estimate on *Age at entry* is always positive, even though the large standard errors wipe out

[12]As a robustness check, we report the results without controlling for canton and year fixed effects in Table A.1 of Appendix. The magnitude of the coefficient β_1 is almost 4 times larger than the main estimates. This result might be due to canton-specific factors correlated with the language. For instance, some cultural differences may be captured by the canton fixed effect since the three bilingual cantons have a different proportion of German-speaking people (Bern 84%, Friburg 33%, and Valais 29%). In any case, this result confirms the importance of controlling for institutional differences across cantons to disentangle the cultural variation.

the significance of the coefficients. This confirms our previous insights, according to which French speaking individuals tend to enter nursing homes at older ages, but this measure is too noisy to find any conclusive evidence. For *Residing at home* the estimated discontinuity at the language border is always negative and statistically significant. This suggests that German speaking individuals enter a nursing home from their home more often than French speaking individuals. This supports our idea of a cultural divide between the two areas. Indeed, people in the French speaking region are more likely to enter a nursing home from hospital or another institution, that is when critical health conditions do not allow to postpone entry anymore.

Continuity assumption

As previously mentioned, control variables and other potential determinants of entrance in a nursing home should be continuous at the cut-off. For this reason, in the Appendix we provide graphical evidence of the continuity of a very large set of variables. In particular, we do not observe evidence of a discontinuity at the linguistic border in gender, mortality rate, share of people 65+, population, home ownership, taxable income, and education (Figures A.3 and A.4). This also allows us to discard some of the most plausible explanations for the observed discontinuity in the dependency level at the linguistic border. Conversely, we do find a discontinuity in the immigration rate and, if we consider a bandwidth larger than 25 km, in the unemployment rate. The close proximity to France explains the higher immigration rate on the French side of the three bilingual cantons. We believe that such discontinuity is not a concern for our identification because we already showed large differences among natives (almost all people in nursing home) in preferences and family values. Regarding the unemployment rate, the relatively large difference between the two language groups fades away as we get closer to the language border. Nevertheless, the estimated discontinuity in the dependency level is not affected when we include these variables as controls in our RDD (Table A.4).

Finally, we use two additional levels of aggregation to further test our main identification assumption. First, we exploit the distance between the municipality of the provider headquarter and the linguistic border to show that there are no discontinuities in clients out-of-pocket expenditure for LTC services, in private insurance contributions and in the number of nursing home beds (Figure A.5). This result is not surprising because we are holding constant the supply factors at cantonal level. Then, we use administrative data at hospital level to test for the presence of discontinuity in diseases (Figure A.2). In particular, we do not find evidence of discontinuities in acute myocardial infarction, hip fractures, strokes, and Parkinson disease, which are frequent among the elderly and likely to affect LTC arrangement decisions.[13]

6.2 Mechanisms and alternative explanations

The large battery of tests on the continuity assumption (Figures A.2–A.5) allows us to reject several plausible explanations for the discontinuity in the dependency level at the language border. In particular, we show that demographic, socio-economics aspects (demand side), supply-side factors and health conditions are continuous at the language border. Furthermore, following the literature on the determinants of LTC choices we find no evidence of discontinuity in home ownership.

Clearly, most of the evidence reported so far comes from aggregate data at municipal level and does not allow to investigate other household characteristics that affect LTC choices and to focus on households with elderly people. For this reason, in Table 3, we investigate whether there are differences between the two language groups in several household characteristics. We use census data (PUS) and focus only on the three bilingual cantons. Although differences in family values could affect the household structure, we do not find evidence of large differences in the household size between the two linguistic groups, both unconditional (Column (1)) and conditional on respondents 65+ (Column (2)). Moreover, focusing only on 65+ respondents we do not find differences in the probability of living alone (Column (3)) or with a partner (Column (4)). Finally, in Column (5) we show that there are no differences in the probability of living with parents for adult respondents (aged 30–64).

Family value and informal care

We already documented large differences in family values between the two cultural groups in Figure 1. Also, the figure suggests that Latin speaking individuals consider elderly care a family duty and spend more time taking care of other family members. Furthermore, political preferences (i.e. referendum votes) on family policies are strongly correlated with the language. Finally, using data from the Swiss Household Panel we find that Latin respondents declare to have more frequent contacts with both children and relatives than German respondents (see Table A.5).[14] This supports the interpretation that the language spoken captures the cultural variation in preferences about the family.

We argue that these differences in family values and ties explain why people from Latin speaking areas enter a nursing home in worse health conditions than their German neighbors. Strong family ties may lead people to postpone entrance in nursing home because people prefer to stay with their

[13] We also investigate other diseases but their prevalence does not allow to provide a meaningful test of the continuity at the linguistic border.

[14] More details regarding Swiss Household Panel data are provided in the Appendix (see the notes of Table A.5).

family members as long as possible. However, home care arrangements require that medical and personal care is carried out at home with formal or informal care services. We already showed that in Latin speaking districts there is a larger use of home care services (Figure 4). Moreover, we expect that informal care is also more widespread in Latin speaking regions because help at home for ADL and IADL is generally not covered by health insurance. Unfortunately, we do not have data on informal care that allow us to show evidence of discontinuity at the language border in the provision of informal care. Despite this, we can take advantage of survey data from SHARE focusing on the two Swiss NUTS2 regions that include our bilingual areas.[15]

Table 4 shows that Latin speaking respondents living in these two regions receive and provide more informal care than their German counterpart. In particular, Latin respondents receive more care from both household members and relatives outside the household, and they also provide more care to other family members or to grandchildren. This difference is robust to the inclusion of potential confounders such as age, sex, education and area characteristics (rural vs. urban). By comparing the results of Table 3 and 4, it is interesting to note that individuals speaking a Latin language provide more informal care, even though the household size is not statistically different between the two areas (if ever, it is smaller in the French speaking area). This evidence further corroborates our argument that observed differences in LTC arrangement choices between the two cultural areas should be driven by different family values.

7 Discussion

This paper investigates the role of culture in shaping LTC arrangement decisions. We use data from Switzerland, a multi-cultural confederation of 26 states and four languages, where the two main linguistic groups —Latin and German— are characterized by large differences in family values and opinions about the role of family in taking care of the elderly.

To identify the impact of culture, we perform a spatial RDD at the linguistic border of the three French and German speaking bilingual cantons. We find that people residing in the French speaking part of the country enter a nursing home with higher dependency level as compared to people residing in the German speaking areas. Adopting different parametric and non-parametric specifications, we find that the French-German gap in the dependency levels at entry corresponds to 6 more minutes of care per day in the French speaking areas (i.e., 36.5 more hours of care in a year per elderly person in nursing home), and accounts for roughly 13% of the standard deviation.

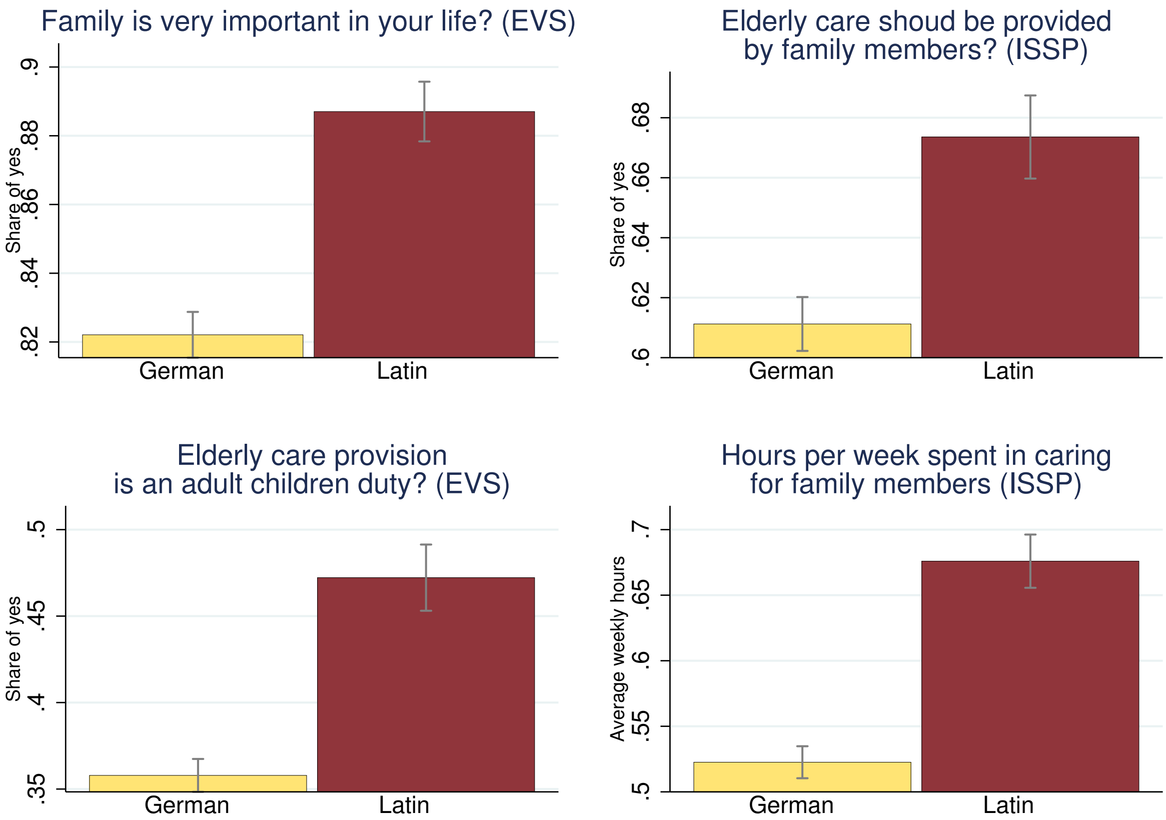
[15]For consistency with our main analysis, we only use data from respondents living in the bilingual NUTS2 regions: CH01 (Vaud, Valais, and Geneva) and CH02 (Berne, Fribourg, Solothurn, Neuchatel, Jura). The Nomenclature of Territorial Units for Statistics (NUTS) is a standard geocode for referencing the subdivision of countries for statistical purposes.

The reported evidence of a strong (causal) influence of culture on the Swiss LTC market may also contribute to explain the large cross-country variation in the size of LTC markets. This is particularly relevant for Europe, where cultural differences about the role of family show a clear North-South gradient.

Our findings may have important policy implications. Public policies that incentivize specific LTC arrangements may lead to different behavioral responses in the population according to predominant preferences. In other words, increasing the provision of specific elderly care arrangements without a careful evaluation of the demand-side response may not be sufficient to expand their use. For example, in Switzerland between 27% and 56% of days spent in nursing homes in 2013 involved people with very low need of care. Notably, experts argue that people receiving between one and two hours of daily care could be cared more efficiently with formal home-based services than in nursing homes (**?**). However, given their stronger preferences for nursing home care, German speaking individuals with mild health problems may still be better off entering a nursing home, even though it would be more cost-effective from the society viewpoint to grant them care at home. Therefore, expanding formal home-based care provision in German speaking areas may not trigger an increase in home-based care use per se.

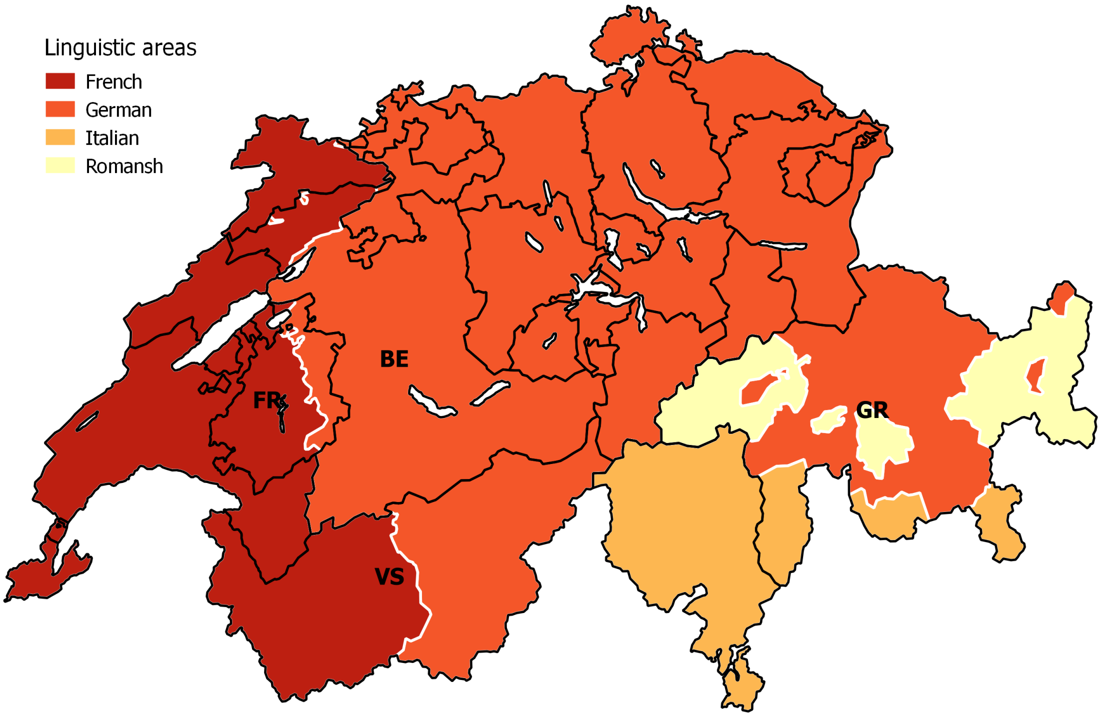
Finally, our results suggest that the availability of substitutes for elderly care may be endogenous to culture. Many empirical studies investigating the substitutability between formal and informal services use the presence of other people in the household or the presence of children living within a certain distance from the household as an instrument for the provision of informal care. However, French speaking individuals provide more informal care even in the absence of systematic differences in household size. This suggests that the availability of substitutes for formal care per se does not trigger the provision of informal care.

Figure 1: Cultural attitudes in Latin and German speaking areas towards family and elderly care



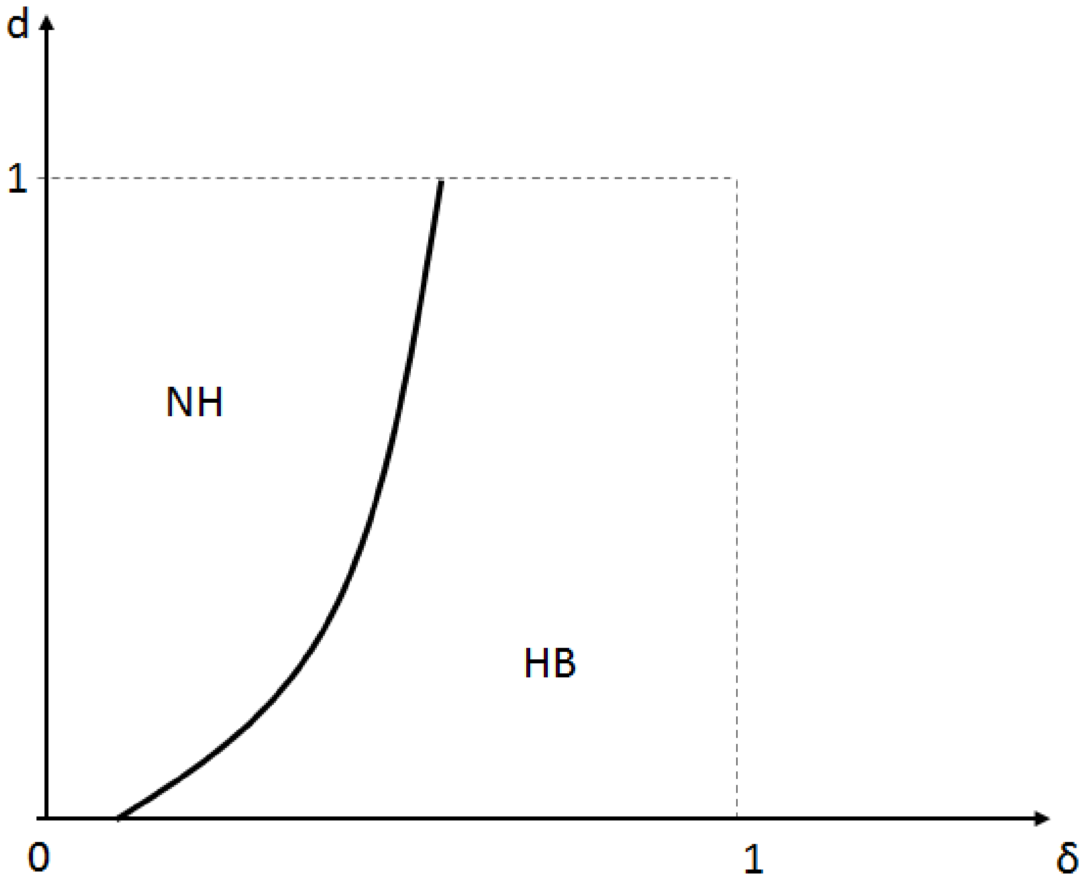
Notes - Sources: These figures are based on data from the 2008 Swiss sample of the European Value Survey (EVS) and from the 2012 Swiss sample of the International Social Survey Programme (ISSP). The EVS includes 1'238 respondents (937 Germans + 301 Latins), while the ISSP includes 1'198 respondents (892 Germans + 306 Latins). Each graph shows the Latin-German gap after conditioning on age (full set of age dummies), sex and education. Top-left: EVS - Question 2: "How important is the family in your life?"; Top-right: ISSP - Question 14: "Thinking about elderly people who need some help in their everyday lives, such as help with grocery shopping, cleaning the house, doing the laundry etc. Who do you think should primarily provide this help?"; Bottom-left: EVS - Question 51a: "Which of the following statements best describes your views about responsibilities of adult children towards their parents when their parents are in need of long-term care? Adult children have the duty to provide long-term care for their parents even at the expense of their own well-being."; Bottom-right: ISSP - Question 16b: "On average, how many hours a week do you spend looking after family members? (e.g. children, elderly, ill or disabled family members?)". Results are substantially unchanged even conditional on standard demographic and socio-economic controls (i.e., age, sex, education, employment status).

Figure 2: Linguistic areas across Switzerland



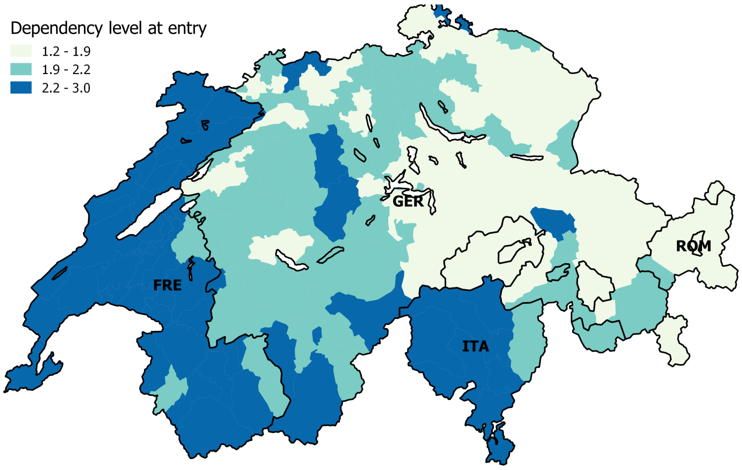
Notes - Colors correspond to different linguistic areas. In order from the darkest color to the lightest color: French speaking area, German speaking area, Italian speaking area, and Romansh speaking area. Dark lines correspond to cantonal borders while white lines highlight linguistic borders that do not coincide with cantonal borders. Cantonal labels are reported only for bilingual and trilingual cantons and correspond to: BE - Bern; FR - Fribourg; GR - Graubünden; VS - Valais.
Sources: Base maps: ©OFS, ThemaKart.

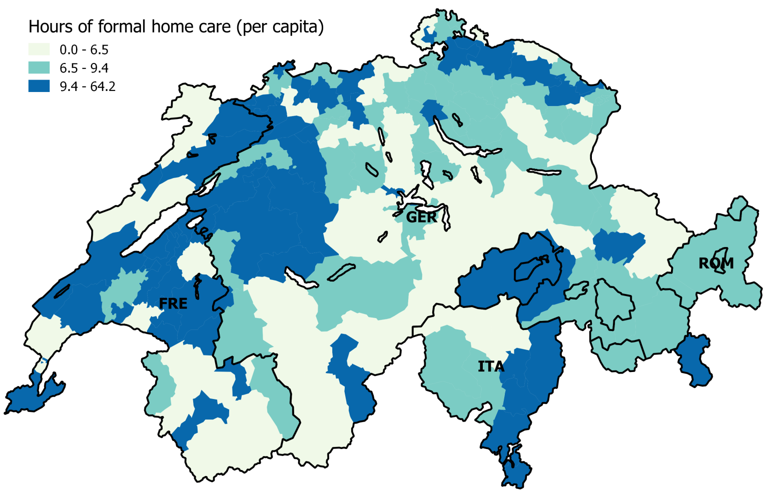
Figure 3: Relationship between dependency level and preference parameter for home-based care



Notes - Graph drawn according to the functional form $p_h(d) = \alpha + \beta d$, where α can be interpreted as the fixed component of home-based care price with respect to the severity of the elderly person health condition, and β can be interpreted as the variable component of home-based care price with respect to the severity of the elderly person health condition. Then, $d^* = \frac{\delta(p_n+\alpha)-\alpha}{(1-\delta)\beta}$.

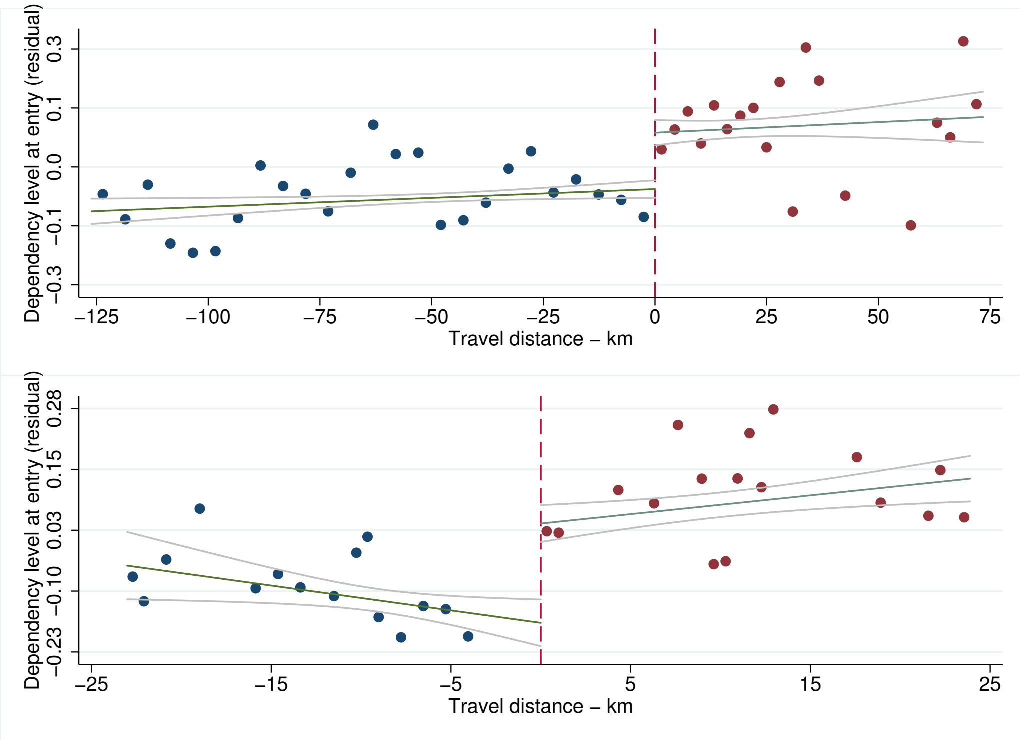
Figure 4: Dependency level at entry and share of people over 65 in formal home-based care by district and linguistic area in 2013





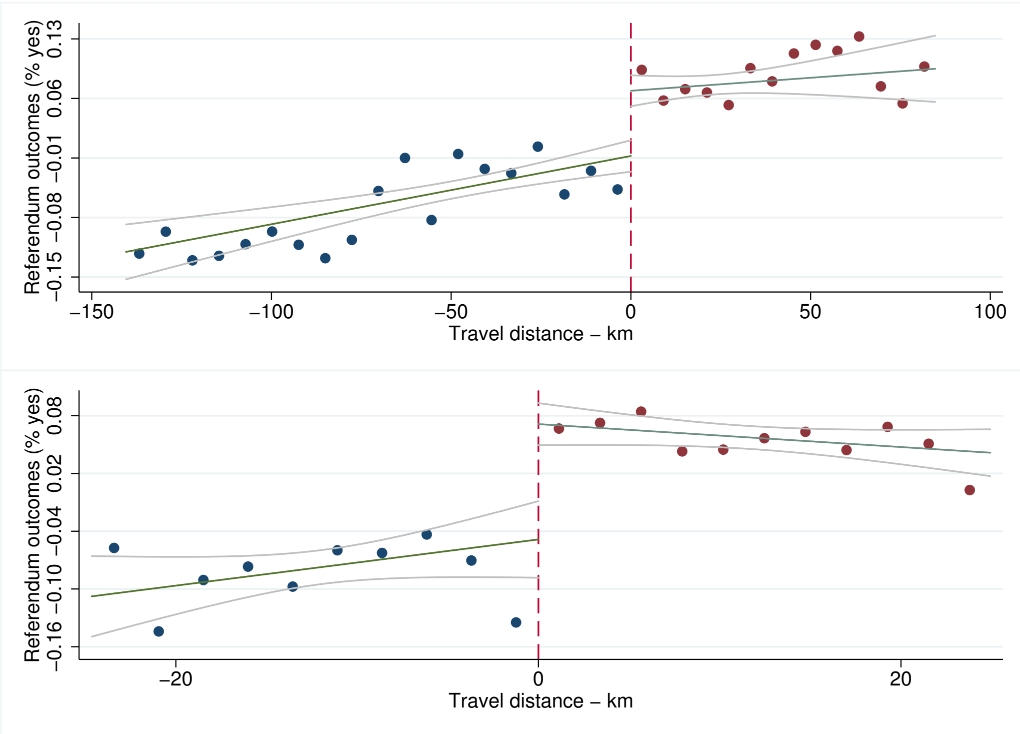
Notes - The map reports the average dependency level at entry in nursing home (top) and the average number of hours of home-based care per person aged 65 or more (bottom) by district in 2013. Intervals depicted in different colors correspond to the terciles of average hours of formal home-based care (per capita) by district. Black borders delimit linguistic areas: FRE - French, GER - German, ITA - Italian, ROM - Romansh.
Sources: Base maps: ©OFS, ThemaKart; Data: SOMED and HCS - year 2013.

Figure 5: Distribution of dependency level at entry across the linguistic border



Notes - This graph is based on individual data from the three bilingual cantons of Berne, Fribourg and Valais for the period 2007-2013, and is adjusted for cantonal and year fixed effect. The top graph includes all people from all municipalities, while the bottom graph includes only people that used to live within 25 km (travel distance) from the language border. The number of bins is automatically computed by the *cmogram* command of Stata 14 and corresponds to $\#bins = min\{sqrt(N), 10*ln(N)/ln(10)\}$, where N is the (weighted) number of observations. We exclude from the figure extreme values (top and bottom 1% of the dependency level distribution) and individuals from municipalities with less than 50 observations. Positive values on the x-axis correspond to the kilometric travel distance from the closest French speaking municipality on the linguistic border for French speaking municipalities. Negative values on the x-axis correspond to the kilometric travel distance from the closest French speaking municipality on the linguistic border for German speaking municipalities. French speaking municipalities at the linguistic border are assigned a distance of 0 from the linguistic border.
Sources: Elaboration on SOMED data - years 2007-2013.

Figure 6: Distribution of preferences for family policies across the linguistic border - 2013 referendum outcomes



Notes - The referendum was about the approval of an amendment to the Swiss Constitution committing the cantons to provide complementary day care facilities to help the reconciliation between work and family duties, and allowing the Confederation to intervene whenever cantonal efforts are insufficient. This graph is based on municipal data from the three bilingual cantons of Berne, Fribourg and Valais, and is adjusted for cantonal fixed effect. The top graph includes all the municipalities, while the bottom graph includes only municipalities within 25 km (travel distance) from the language border. The number of bins is automatically computed by the *cmogram* command of Stata 14 and corresponds to $\#bins = min\{sqrt(N), 10 * ln(N)/ln(10)\}$, where N is the (weighted) number of observations. Positive values on the x-axis correspond to the kilometric travel distance from the closest French speaking municipality on the linguistic border for French speaking municipalities. Negative values on the x-axis correspond to the kilometric travel distance from the closest French speaking municipality on the linguistic border for German speaking municipalities. French speaking municipalities at the linguistic border are assigned a distance of 0 from the linguistic border.
Sources: Elaboration on Swiss Federal Statistical Office data - year 2013.

Table 1: Descriptive statistics: individual level data in the three bilingual cantons

	French			*German*			t-test
Variable	Obs.	Mean	S.D.	Obs.	Mean	S.D.	P-value
Dependency level at entry	10,189	2.58	1.01	31,413	1.93	.95	0.000***
Age at entry	10,189	83.93	7.94	31,413	83.85	8.25	0.505
Gender	10,189	.33	.47	31,413	.34	.47	0.311
Residing at home	9,965	.33	.47	30,619	.57	.50	0.000***

Notes - *Dependency level at entry* is measured on a scale from 0 to 4, *Age at entry* is a discrete variable from 50 onwards, *Gender* is a dummy variable equal to 1 for men, and *Residing at home* is a dummy variable equal to 1 if the elderly person was residing at home prior to institutionalization, and 0 if he/she entered the nursing home from a hospital or from another institution. All these variables are drawn from SOMED. The data refer to the cantons of Berne, Fribourg and Valais for the period 2007-2013 and are reported at individual level. The number of observations for *Residing at home* is lower because of missing values. P-value refers to a t-test for mean comparison between French speaking and German speaking individuals. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors are robust and clustered at municipal level.

Table 2: Non-parametric Regression Discontinuity Design

Variable	Conventional (1)	Bias-corrected (2)	Robust (3)
		Dependency level at entry	
French border (β_1)	.106***	.103***	.103**
	(.04)	(.04)	(.05)
Observations on the East	5,400	5,400	5,400
Observations on the West	5,828	5,828	5,828
Bandwidth	19.91	19.91	19.91
Mean of dependent variable	2.34	2.34	2.34
Std. dev. of dependent variable	1.02	1.02	1.02
Canton fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes

Notes - All the estimates are based on individual level data from the three bilingual French and German speaking cantons of Berne, Fribourg and Valais for the period 2007-2013. The dependent variable *Dependency level at entry* is measured on a 0-4 scale. The assignment variable is the kilometric travel distance from the closest French speaking municipality on the linguistic border. Controls include year of entry and canton of residence prior to institutionalization. The number of observations refer to the number of individuals respectively on the East and on the West of the linguistic border. The number of municipalities on the East of the linguistic border is 80 while the number of municipalities on the West is 107. In Figure A.6 in Appendix we also show the distribution of municipalities across the linguistic border. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors (in parenthesis) are robust and clustered at municipal level. Estimates are performed using the Stata command *rdrobust*.

Table 3: Household composition (PUS 2000)

Dep. variable:	Hh. size	Hh. size	Single	Partner	Parents
Sample:	All	65+	65+	65+	30–64
	(1)	(2)	(3)	(4)	(5)
Latin language	-.073*	-.124	.007	.001	-.005
	(.038)	(.143)	(.012)	(.012)	(.003)
Observations	62,348	11,230	11,230	11,230	29,446

Notes - Data are drawn from Public use sample (PUS) of the 2000 Swiss census. We only include Swiss respondents from the three bilingual cantons of Berne, Fribourg and Valais. Each column reports the results of different regressions of *Latin language* on different variables and samples: (1) household size – the full sample; (2) Household size – 65+ sample; (3) Single household – 65+ sample; (4) living with a partner – 65+ sample; (5) Living with parents in the household – 30–64 sample. *Latin language* is a dummy for the language of the interview, i.e. whether the questionnaire was completed in French (Latin) or German. Each regression also controls for age, sex, canton fixed effects and a dummy for rural areas. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors (in parenthesis) are robust to heteroskedasticity.

Table 4: Language and informal care in bilingual regions (SHARE data)

	Care from hh. members	Care from family (no hh.)	Care to hh. members	Looking after grandchildren
	(1)	(2)	(3)	(4)
Latin language	.016*	.071**	.125***	.133***
	(.010)	(.026)	(.035)	(.048)
Observations	891	752	752	365

Notes - Data are from wave 4 of SHARE. We only include Swiss respondents aged 50+ from the NUTS2 regions: CH01 (Vaud, Valais, and Geneva) and CH02 (Berne, Fribourg, Solothurn, Neuchtel, Jura). Each column reports the result from probit regressions of *Latin language* on four different dummy variables: (1) the respondent received care from household members; (2) the respondent received care from family members outsides the household; (3) the respondent provided care to household members; (4) the respondent looked after grandchildren. *Latin language* is a dummy for the language of the interview, i.e. whether the questionnaire was completed in French (Latin) or German. Each regression also controls for age (quadratic), sex, education (5 dummies) and a dummy for rural areas. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors (in parenthesis) are robust to heteroskedasticity.

A Appendix (for online publication)

A.1 Measuring the dependency level at entry

The measurement instruments adopted to evaluate the dependency level of elderly people in nursing homes vary within and between cantons and over time. In particular, there are three instruments. The PLAISIR is mainly adopted in French-speaking cantons and reflects the intensity of care required by elderly people. Conversely, the other two instruments, BESA and RAI-RUG, reflect the intensity of care actually provided to elderly people. Since care requirements may not correspond to the level of care actually provided, the PLAISIR instrument may slightly overestimate the dependency level of elderly people at entry. Therefore, a harmonization of the instruments is necessary. In 2011 an instrument harmonization effort was made by the Swiss assembly of cantonal health care department directors. Thus, a uniform measurement instrument is in place since 2011. Using the suggested conversion procedure we harmonize the intensity of care from different instruments adopted before 2011. Moreover, there are two versions of the BESA instrument: the first one uses a scale from 0 to 12, and each level of the scale corresponds to 20 minutes of daily care; the second one ranges from 0 to 4, and each level of the scale corresponds to 1 hour of daily care. Therefore, we collapse all the scale values into a broader measurement scale, ranging from 0 to 4.

Following the harmonization of measurement instruments and scales, we assess the dependency level at entry for each nursing home resident. We focus on the initial event of care received after entry. We also perform a robustness check using the most intensive event of care received during the year of entry rather than the very first care, and obtain the same results.

Several nursing home residents show repeated entry-exit spells in the period considered, either in the same nursing home or in different nursing homes (around 4% of individuals). Therefore, to consider the most correct entry date, we exclude temporary residents.[16] Also, we deal with repeated spells applying a simple algorithm. We keep the first entry date if the individual does not go back home for more than 6 months. This means that for individuals admitted to hospital after institutionalization and then re-entered the nursing home, we consider the first entry date as the actual entry date. Conversely, for individuals who go back home for more than 6 months before entering again, we exclude the first spell and we apply the same criterion to the second entry date. For individuals who go back home for more than 6 months even after the second spell, we also exclude the second spell and apply the same criterion to the third spell, and so on. Of course, for individuals who stay for more than one year and then go back home for more than 6 months before entering again, we keep the first entry date.

[16] Nursing homes may host temporary patients needing a rehabilitation period after hospitalization or elderly people joining daily activities who are not actually residing in the nursing home.

Finally, we consider that the provision of care may not have started immediately after the date of entry in a nursing home. Since our data only report the ending date of care, people entering a nursing home in the last part of the year may be disproportionately likely to show no care received in the year of entry. To avoid wrong imputation, for elderly people who enter a nursing home between October and December and do not show any care event until the end of the year, we consider the first care event received in the second year.

A.2 Description of variables

Individual level data (from SOMED)

Dependency level: Discrete variable ranging from 0 to 4. 0 corresponds to no care required and each additional unit corresponds to one hour of daily care. A dependency level of 4 corresponds to 4 or more hours of care per day.
Age at entry: Discrete variable. Only clients entering the nursing home at 50 years old or more are included in the sample.
Gender: Dummy variable equal to 1 for men.
Residing at home: Dummy variable equal to 1 if the elderly person resided at home before entering a nursing home and equal to 0 if the elderly person was in a hospital or in another institution.

Municipal level data (sources in parenthesis)[17]

Referendum (% 'yes') (FSO): Share of people voting 'yes' to the 2013 referendum on family policies. The referendum was about the approval of an amendment to the Swiss Constitution committing the cantons to provide complementary day care facilities to help the reconciliation between work and family duties, and allowing the Confederation to intervene whenever cantonal efforts are insufficient.
Mortality rate (FSO): Number of deaths per municipality out of municipal population.
Share of people above 65 (FSO): Share of people above 65 years old out of municipal population. Since population data by age are not available before 2010, we project the share of elderly people in 2010 on the population between 2007 and 2009.
Population (FSO): Number of municipal residents.
Immigration rate (FSO): Number of foreign residents out of municipal population.

[17]FSO stands for Federal Statistical Office; FTA stands for Federal Tax Administration.

Birth rate (FSO): Number of new births out of municipal population.
Home ownership rate (FSO): Share of people owning their dwelling by municipality.
Unemployment rate: Share of unemployed out of municipal population. Since unemployment data could not be disaggregated at municipal level for municipalities that underwent a merger before 2016, this variable is only available for 2016.
Taxable income (FTA): Logarithm of per capita municipal income.
Share tertiary education (FSO): Share of municipal residents with tertiary education.
Altitude (FSO): Average between the minimum and the maximum elevation of the municipality.
Religion (FSO): Share of catholics out of total municipal population.

Provider level data (sources in parenthesis)

Nursing homes - client out-of-pocket (SOMED): Client out-of-pocket expenditure by nursing home divided by the number of nursing home clients. Before 2011 this variable was not available.
Share over 65 in nursing home (SOMED): Number of people above 65 years old residing in a nursing home out of population above 65 years old residing in the district.
Home care - client out-of-pocket (HCS): Client out-of-pocket expenditure by provider divided by the provider number of clients. Before 2011 this variable was not available.
Home-care hours (HCS): Number of hours of formal home-based care provided by district out of population above 65 years old residing in the district.
LTC insurance contribution (SOMED and HCS): Sum of insurance contributions for nursing home and home-based care divided by the sum of nursing home and home care clients. Before 2011 this variable was not available.
Nursing homes - number of beds (SOMED): Number of beds for long stayers in nursing homes.

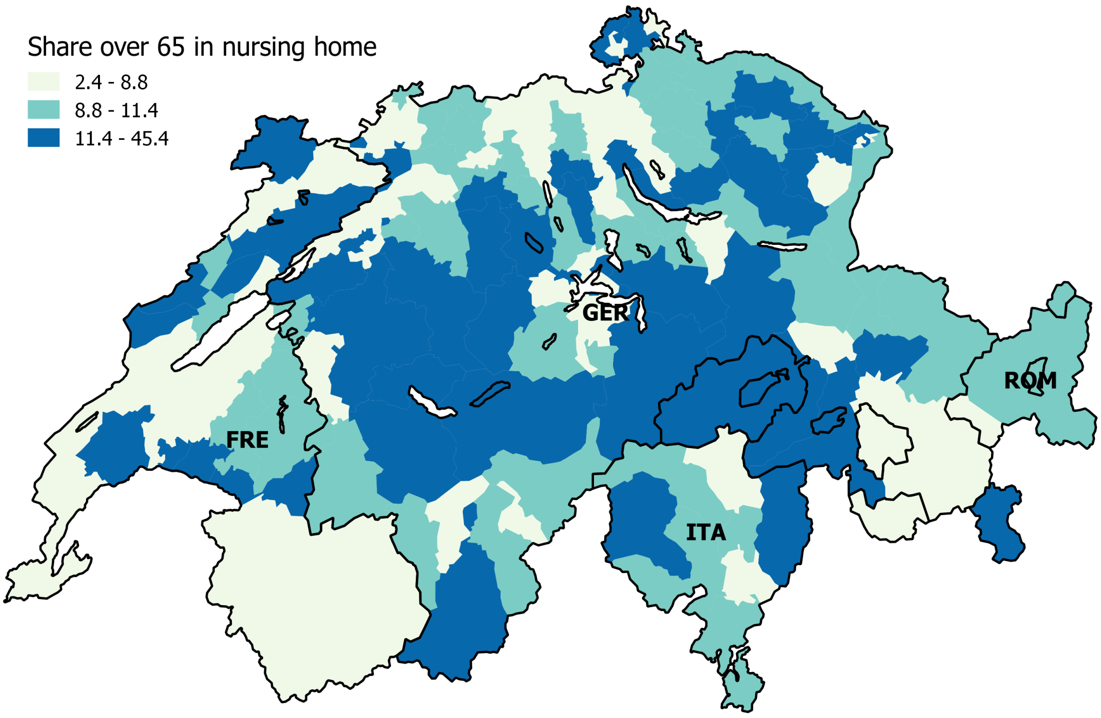
MEDSTAT level data (hospital admission data)[18]

Incidence of AMI (Acute Miocardial Infarction): Number of hospital admissions for AMI out of medstat population.
Incidence of hip fractures: Number of hospital admissions for hip fracture out of medstat population.

[18]Medstats are geographical units defined according to postal codes. Since we only have population at municipal level, whenever a municipality overlaps several medstats we assign an equal share of municipal population to all the medstats involved.

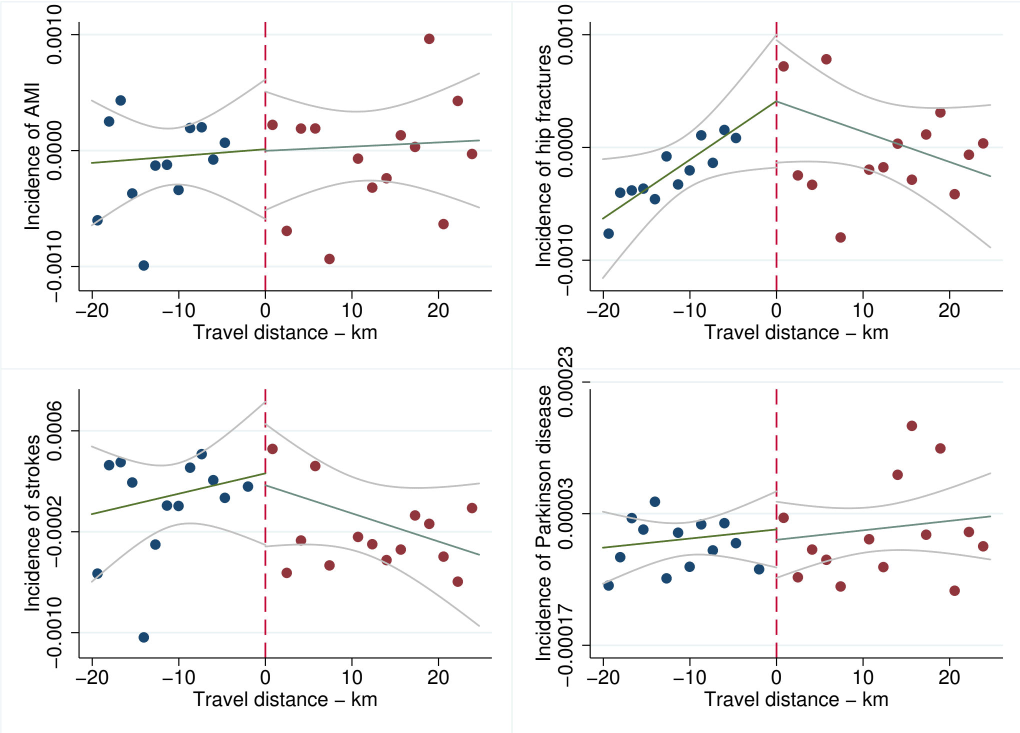
Incidence of strokes: Number of hospital admissions for stroke out of medstat population.
Incidence of Parkinson disease: Number of hospital admissions for Parkinson disease out of medstat population.

Figure A.1: Percentage of people over 65 in nursing homes by district and linguistic area in 2013



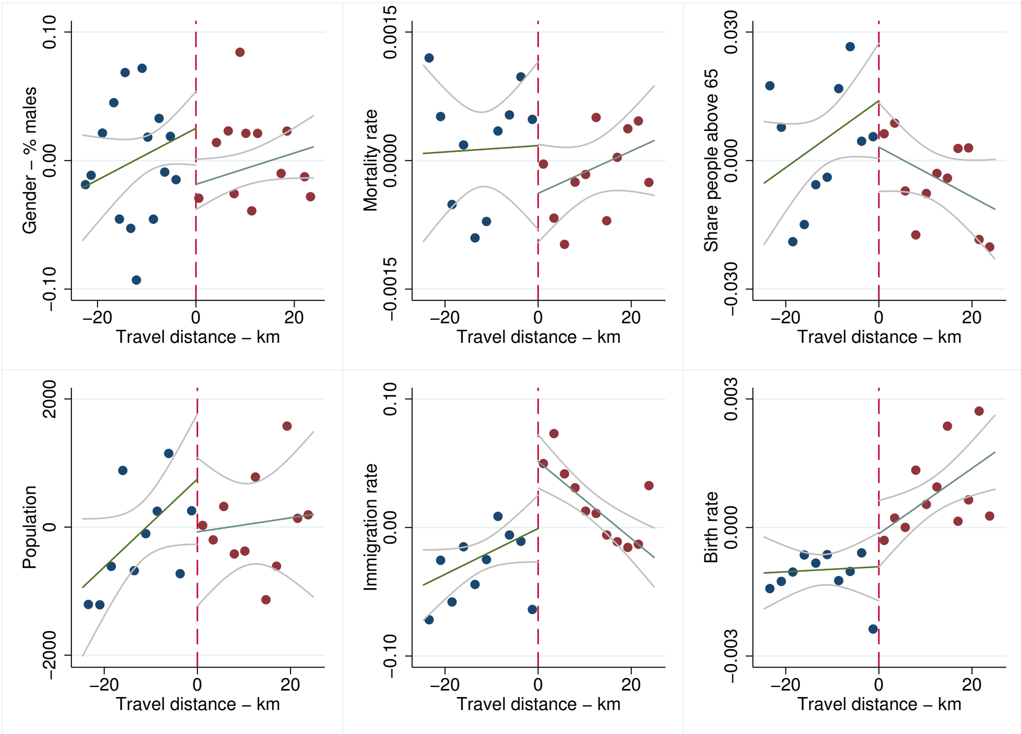
Notes - The percentage of people in nursing homes is computed dividing the number of people above 65 years old residing in a nursing home by the number of people above 65 years old residing in the district. Intervals depicted in different colors correspond to the terciles of the percentage of people above 65 residing in a nursing home by district. Black borders delimit linguistic areas: FRE - French, GER - German, ITA - Italian, ROM - Romansh.
Sources: Base maps: ©OFS, ThemaKart; Data: SOMED - year 2013.

Figure A.2: Distribution of diseases across the linguistic border (hospital admission data)



Notes - The graphs are based on provider-level data from the three bilingual cantons of Berne, Fribourg and Valais for the period 2007-2012, and are adjusted for cantonal fixed effects. For hospital data the unit of observation is the medical statistical unit (medstat), which is defined in terms of postal codes. We derive the distance of each medstat from the linguistic border averaging the distances of the municipalities within the medstat. The number of bins is set manually to 15 on each side of the discontinuity, and the graph is performed using the Stata command *cmogram*. Positive values on the x-axis correspond to the kilometric travel distance from the closest French speaking municipality on the linguistic border for French speaking municipalities. Negative values on the x-axis correspond to the kilometric travel distance from the closest French speaking municipality on the linguistic border for German speaking municipalities. French speaking municipalities at the linguistic border are assigned a distance of 0 from the linguistic border. The number of cases is normalized according to each medstat population.
Sources: Elaboration on hospital admission data - years 2007-2012.

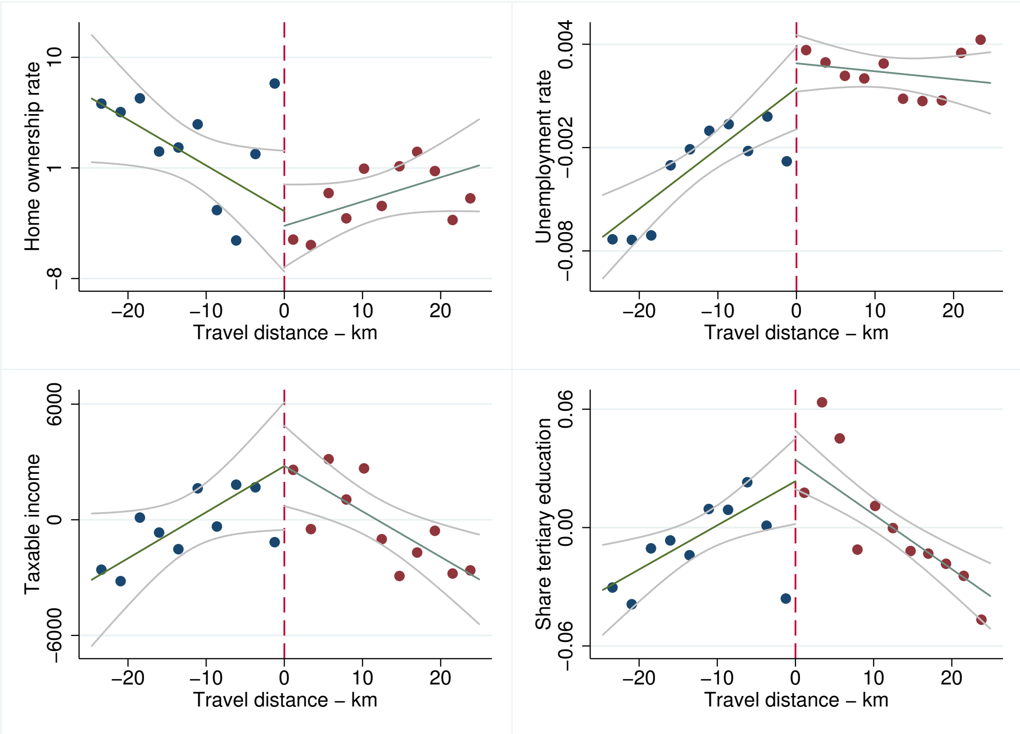
Figure A.3: Distribution of demographic variables across the linguistic border (individual or municipal level)



Notes - The graph for gender (top-left) is based on SOMED individual data for the three bilingual cantons of Berne, Fribourg and Valais for the period 2007-2013, and is adjusted for cantonal and year fixed effects. The other graphs are based on municipal data from the three bilingual cantons of Berne, Fribourg and Valais for the period 2007-2013, and are adjusted for cantonal fixed effects. The number of bins is automatically computed by the *cmogram* command of Stata 14 and corresponds to $\#bins = min\{sqrt(N), 10 * ln(N)/ln(10)\}$, where N is the (weighted) number of observations. Positive values on the x-axis correspond to the kilometric travel distance from the closest French speaking municipality on the linguistic border for French speaking municipalities. Negative values on the x-axis correspond to the kilometric travel distance from the closest French speaking municipality on the linguistic border for German speaking municipalities. French speaking municipalities at the linguistic border are assigned a distance of 0 from the linguistic border.

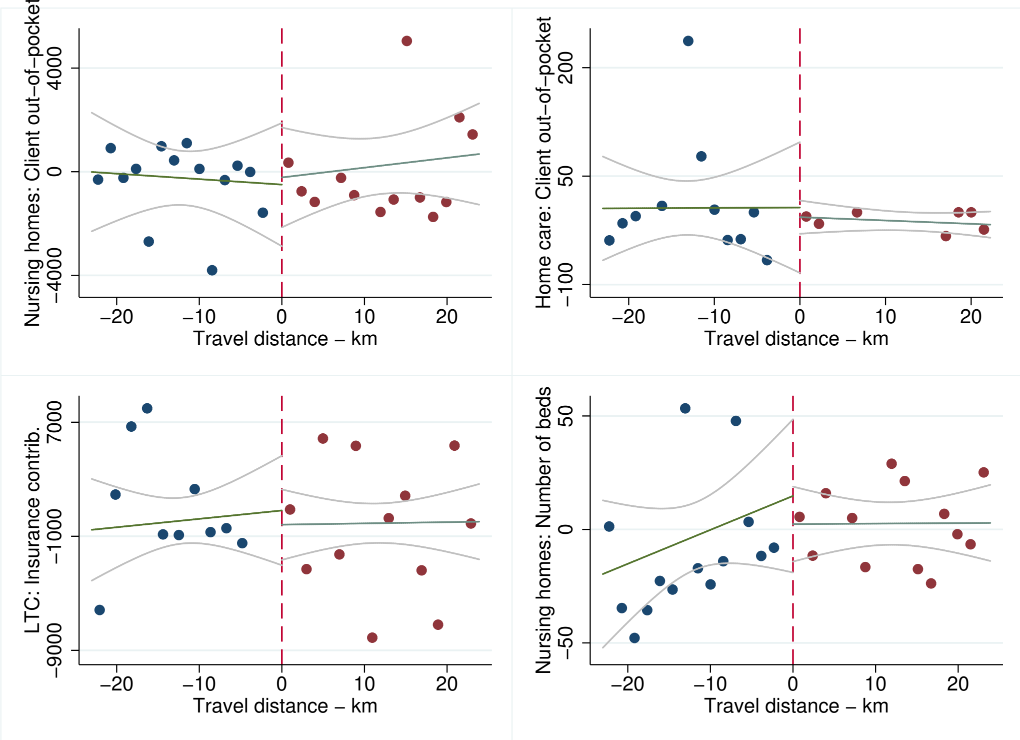
Sources: Elaboration on SOMED and Swiss Federal Statistical Office data - years 2007-2013.

Figure A.4: Distribution of socio-economic variables across the linguistic border (municipal level)



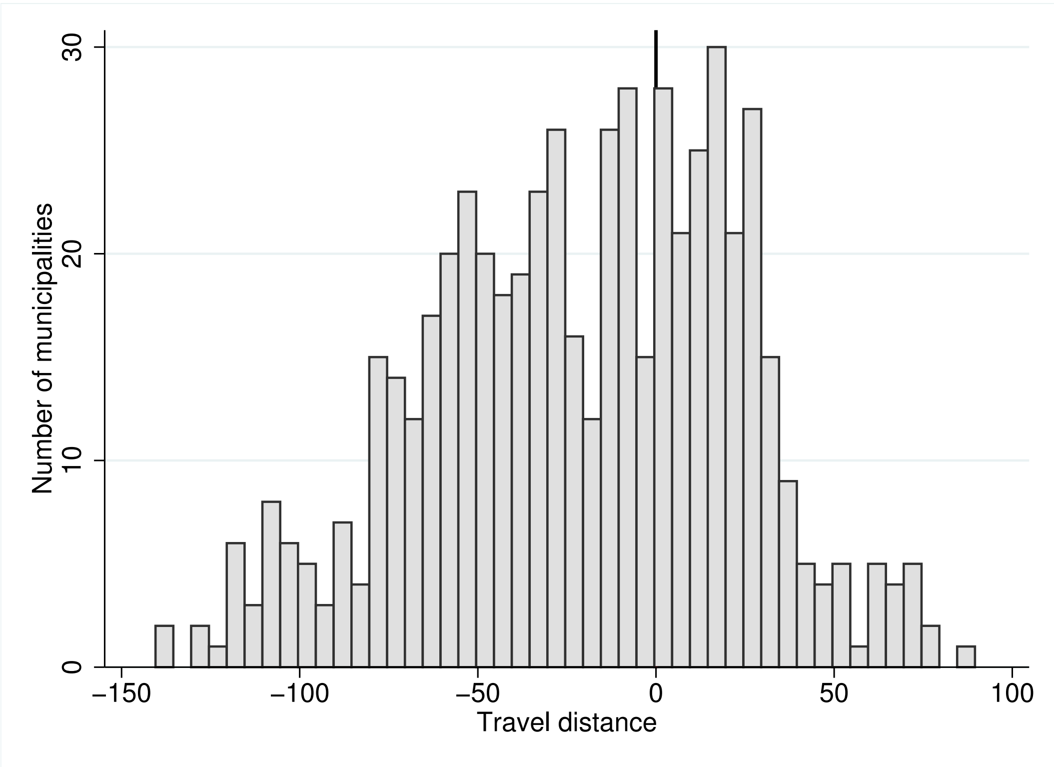
Notes - The graphs are based on municipal data from the three bilingual cantons of Berne, Fribourg and Valais for the period 2007-2013, and are adjusted for cantonal fixed effects. Income data are only available up to 2012, while unemployment data are only available for 2016. The number of bins is automatically computed by the *cmogram* command of Stata 14 and corresponds to $\#bins = min\{sqrt(N), 10 * ln(N)/ln(10)\}$, where N is the (weighted) number of observations. Positive values on the x-axis correspond to the kilometric travel distance from the closest French speaking municipality on the linguistic border for French speaking municipalities. Negative values on the x-axis correspond to the kilometric travel distance from the closest French speaking municipality on the linguistic border for German speaking municipalities. French speaking municipalities at the linguistic border are assigned a distance of 0 from the linguistic border.
Sources: Elaboration on Swiss Federal Statistical Office data and Federal Tax Administration data - years 2007-2013.

Figure A.5: Distribution of supply-side variables across the linguistic border (provider level)



Notes - The graphs are based on provider-level data from the three bilingual cantons of Berne, Fribourg and Valais, and are adjusted for cantonal fixed effects. Data about client out-of-pocket expenditure and private insurance contributions are only available since 2011. The graph about the number of beds is based on the whole period, 2007-2013. The graph about home care client out-of-pocket expenditure is based on the cantons of Berne and Valais, since this value was 0 for all the providers in Fribourg. Figures for client out-of-pocket expenditure and private insurance contributions only refer to medical care costs. Residential costs or ADL and IADL costs are not included. Each provider is assigned a kilometric distance from the linguistic border according to the municipality of its headquarter. The number of bins is set manually to 15 on each side of the discontinuity and the graph is performed using the Stata command *cmogram*. Positive values on the x-axis correspond to the kilometric travel distance from the closest French speaking municipality on the linguistic border for French speaking municipalities. Negative values on the x-axis correspond to the kilometric travel distance from the closest French speaking municipality on the linguistic border for German speaking municipalities. French speaking municipalities at the linguistic border are assigned a distance of 0 from the linguistic border.
Sources: Elaboration on SOMED and HCS data - years 2007-2013.

Figure A.6: Distribution of municipalities across the linguistic border



Notes - This graph represents the number of municipalities according to the kilometric travel distance from the linguistic border. Each bar corresponds to a 5-km bandwidth.
Sources: Elaboration on FSO data.

Table A.1: Non-parametric Regression Discontinuity Design without controls

Variable	Conventional (1)	Bias-corrected (2)	Robust (3)
	Dependency level at entry		
French border (β_1)	.389***	.419***	.419***
	(.09)	(.09)	(.11)
Observations on the East	3,704	3,704	3,704
Observations on the West	3,484	3,484	3,484
Bandwidth	10.22	10.22	10.22
Mean of dependent variable	2.29	2.29	2.29
Std. dev. of dependent variable	1.02	1.02	1.02
Canton fixed effects	No	No	No
Year fixed effects	No	No	No

Notes - All the estimates are based on individual level data from the three bilingual French and German speaking cantons of Berne, Fribourg and Valais for the period 2007-2013. The dependent variable *Dependency level at entry* is measured on a 0-4 scale. The assignment variable is the kilometric travel distance from the closest French speaking municipality on the linguistic border. Estimates are performed using the Stata command *rdrobust*. Observations refer to the number of individuals. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors (in parenthesis) are robust and clustered at municipal level.

Table A.2: Parametric Regression Discontinuity Design

Variable	(1)	(2)	(3)	(4)	(5)	(6)
			Dependency level at entry			
French border (β_1)	.123**	.094*	.141***	.106**	.016	.154**
	(0.05)	(.05)	(.04)	(.05)	(.06)	(.06)
Observations	12,780	27,499	39,988	39,988	39,988	39,988
Dep. var. mean	2.33	2.16	2.10	2.10	2.10	2.10
Dep. var. std. dev.	1.02	1.03	1.01	1.01	1.01	1.01
Bandwidth:	25 km	50 km	100 km	100 km	100 km	100 km
Polynomial fit:	Linear	Linear	Linear	Quadratic	Cubic	Quartic
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes - All the estimates are based on individual level data from the three bilingual French and German speaking cantons of Berne, Fribourg and Valais for the period 2007-2013. The dependent variable *Dependency level at entry* is measured on a 0-4 scale. The assignment variable is the kilometric travel distance from the closest French speaking municipality on the linguistic border. Estimates are performed using the Stata command *rdrobust*. Observations refer to the number of individuals. Control variables are year of entry and canton of residence prior to institutionalization. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors (in parenthesis) are robust and clustered at municipal level.

Table A.3: Non-parametric Regression Discontinuity Design with other dependent variables

Variable	Conventional (1)	Bias-corrected (2)	Robust (3)
		Residing at home	
French border (β_1)	-.075***	-.065***	-.065***
	(.02)	(.02)	(.02)
Observations on the left	5,149	5,149	5,149
Observations on the right	4,595	4,595	4,595
Bandwidth	17.25	17.25	17.25
Mean of dependent variable	.43	.43	.43
Std. dev. of dependent variable	.50	.50	.50
		Age at entry	
French border (β_1)	.591	.728	.728
	(.50)	(.50)	(.62)
Observations on the left	4,519	4,519	4,519
Observations on the right	4,276	4,276	4,276
Bandwidth	13.87	13.87	13.87
Mean of dependent variable	83.80	83.80	83.80
Std. dev. of dependent variable	8.05	8.05	8.05
Canton fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes

Notes - All the estimates are based on individual level data from the three bilingual French and German speaking cantons of Berne, Fribourg and Valais for the period 2007-2013. The dependent variable *Residing at home* is a dummy variable equal to 1 if the elderly person was residing at home prior to institutionalization, and 0 if he/she entered the nursing home from a hospital or from another institution. The dependent variable *Age at entry* is a discrete variable from 50 onwards. The assignment variable is the kilometric travel distance from the closest French speaking municipality on the linguistic border. Controls include year of entry and canton of residence prior to institutionalization. Estimates are performed using the Stata command *rdrobust.* Observations refer to the number of individuals. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors (in parenthesis) are robust and clustered at municipal level.

Table A.4: Regression Discontinuity Design with additional controls (non-parametric and parametric)

Column	(1)	(2)	(3)	(4)	(5)	(6)
	Non-parametric RDD (Conventional)					
French border (β_1)	.092**	.109***	.113***	.110***	.104***	.098***
	(.04)	(.04)	(.04)	(.04)	(.04)	(.04)
Observations on the East	5,400	5,309	5,461	5,433	5,433	5,400
Observations on the West	5,868	5,030	5,951	5,899	5,933	5,868
Bandwidth	20.06	18.17	20.73	20.40	20.58	20.14
Mean of dependent variable	2.34	2.32	2.34	2.34	2.34	2.34
Std. dev. of dependent variable	1.02	1.02	1.02	1.02	1.02	1.02
	Parametric RDD (25-km bandwidth)					
French border (β_1)	.121***	.124***	.127***	.121**	.123***	.120***
	(.04)	(.05)	(.05)	(.05)	(.05)	(.04)
Observations	12,780	12,780	12,780	12,780	12,780	12,780
Mean of dependent variable	2.33	2.33	2.33	2.33	2.33	2.33
Std. dev. of dependent variable	1.02	1.02	1.02	1.02	1.02	1.02
Canton fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Immigration rate	Yes	No	No	No	No	Yes
Birth rate	No	Yes	No	No	No	Yes
Gender	No	No	Yes	No	No	Yes
Municipal altitude	No	No	No	Yes	No	Yes
Religion	No	No	No	No	Yes	Yes

Notes - All the estimates are based on individual level data from the three bilingual French and German speaking cantons of Berne, Fribourg and Valais for the period 2007-2013. The dependent variable *Dependency level at entry* is measured on a 0-4 scale. The assignment variable is the kilometric travel distance from the closest French speaking municipality on the linguistic border. Controls include year of entry, canton of residence prior to institutionalization, and some additional controls according to the specification adopted. The additional controls included are the municipal immigration rate, *Immigration rate*, birth rate, *Birth rate*, altitude, *Municipal altitude*, share of catholics, *Religion*, and/or a dummy variable for gender equal to 1 for males, *Gender*. The upper part of the table reports the conventional non-parametric RDD estimates computed with the Stata command *rdrobust*. The bottom part of the table reports the parametric RDD esitmates adopting a 25-km bandwidth and a linear polynomial specification. Observations refer to the number of individuals. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors (in parenthesis) are robust and clustered at municipal level.

Table A.5: Estimated Latin language effects on contacts with children and relatives (logit regressions, only individuals aged 60+)

	No. of contacts with children		*No. of contacts with relatives*	
Column	(1)	(2)	(3)	(4)
At least once	.013	-.007	.143***	.066***
a week	(.01)	(.02)	(.02)	(.02)
At least twice	.105***	.156***	.062***	
a week	(.02)	(.03)	(.02)	(.02)
At least three	.146***	.052**	.106***	.047***
times a week	(.02)	(.03)	(.02)	(.02)
Observations	2,632	2,632	3,077	3,077
Demographic controls	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Canton fixed effects	No	Yes	No	Yes

Notes - Data are drawn from waves 1 to 12 of the Swiss Household Panel (SHP), a yearly panel study administered by the Swiss Federal Statistical Office. More information on this dataset is available at: http://forscenter.ch/en/our-surveys/swiss-household-panel/documentationfaq-2/. This table shows the coefficients of a Latin language dummy variable (equal to 1 if the individual speaks either French, Italian or Romansh or 0 if he/she speaks German) on the probability of having contacts with children (Columns 1 and 2) or relatives (Columns 3 and 4) at least once, twice, or three times a week. Particularly, the SHP relevant variables to compute the number of contacts are "P$$N08 - How frequent are your contacts with children? (times per month)" and "P$$N13 - How frequent are your contacts with relatives? (times per month)". The reported coefficients are the marginal effects of logistic regressions. Demographic variables include sex and age. Observations only include individuals aged 60+ residing in the cantons of Berne, Fribourg and Valais. Standard errors (in parenthesis) are robust to heteroskedasticity.
Source: Swiss Household Panel - years 1999-2010.