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Mind Your Language: The Role of Culture in Future-Oriented Behavior*

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Abstract

What shapes long-term orientation? A small literature using cross-country comparisons and experimental data suggests that culture may be a key determinant in explaining time preferences. We provide novel within-country evidence on this issue by exploiting the historical and sharp German-French language border within Switzerland. Using tax data of the bilingual canton of Bern, we compare the behavior of individuals that are exposed to a common institutional, political, economic, and geographic environment but differ in their language. We find that compared to their French-speaking fellow citizens, the German speakers save more for retirement, are more likely to pursue continuing education and training, less prone to gambling, and dispose over higher wealth. We find no evidence that our results are driven by religion or that they reflect differences in risk aversion. Although horizontal transmission of culture may play its role, the results indicate that the underlying values and norms are mainly vertically transmitted.

Keywords: Culture, Language, Future-Oriented Behavior, Saving, Retirement, Education, Gambling

JEL Codes: D14, E21, J26, Z13

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1 Introduction

Many choices individuals face in everyday life involve a trade-off between costs and benefits at different points in time. You can spend all your earnings today or save for retirement, strive for higher education or find a job and start earning money. You are likely to experience long-term benefits from living a healthy lifestyle and exercise, but you can also spend your evenings binge-watching television series and eating junk food.

A growing body of literature (see below) links intertemporal preferences to various individual behaviors and traits. More recently, attention has been devoted to the possible reasons for the differences in long-term orientation. A couple of experimental and survey-based studies show that cultural factors may play a significant role. However, well-identified studies using large-scale, real-world data are still scarce.

In this paper, we aim to identify a causal effect of culture on future-oriented behavior using within-country cultural variation in Switzerland. As a first step, we provide illustrative evidence for differences in values and preferences across linguistic regions. Based on survey data, Table 1 shows that German-speaking respondents are more likely to consider saving as an important cultural value. Moreover, compared to their French-speaking fellow citizens, they are less likely to favor immediate rewards over delayed but more valuable rewards.

Table 1 suggests substantial differences in time preferences across language groups. Such evidence is, however, not sufficient to claim a causal link between culture and individual behavior. Survey-based differences in preferences must not necessarily translate into actual behavioral differences. Moreover, simple comparisons based on language do not allow for a rigorous isolation of the cultural component of individual behavior. In this article, we attempt to meet these challenges and carefully show that culture matters for individual behavior.

Using individual-level administrative tax data from the bilingual canton of Bern, we explore the link between language and future-oriented behavior. We exploit within-canton variation provided by the historical German-French language border running through the canton of Bern. While most of the residents speak German, a French-speaking minority lives spatially separated in the northwestern part of the canton. The share of German speakers jumps from roughly 20% to over 80% within a few kilometers, allowing us to implement a *local border contrast* approach – methodologically similar to the fuzzy regression discontinuity design. At the border, we compare the behavior of individuals that are exposed to a common institutional, political, economic, and geographic

Table 1: Survey evidence on long-term orientation across language groups

	German l.	French l.	Difference	N
Important qualities that children should learn at home (EVS)				
Thrift, saving money and things (2008)	0.396	0.259	0.136*** (0.033)	1,231
Thrift, saving money and things (2017)	0.413	0.296	0.117*** (0.020)	2,920
Choose between an immediate tax refund of CHF 1,000 or CHF 1,050 in one year (MOSAiCH 2011)				
CHF 1,050 in one year	0.457	0.291	0.166*** (0.034)	1,103

Notes: Standard errors in parentheses. Separation into language groups by the language of interview. Sources: European Values Study (EVS) 2008 and 2017, Measurement and Observation of Social Attitudes in Switzerland (MOSAiCH) 2011. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

environment but differ in their language. The language border analyzed in this paper has impeded the convergence of values and norms across the two regions. It does not only separate two language groups but also different cultures.

We identify systematic behavioral differences across the language groups. Individuals on the German-speaking side save more for retirement, are more likely to participate in continuing education and training, have a lower probability of gambling, and dispose over substantially higher levels of wealth. The results are robust to various model specifications.

In the final part of the paper, we aim to gain further insights on the channels and transmission mechanisms underlying our findings. First, we show that religious affiliation does not explain the observed language border effect but may affect behavior through separate channels. Second, we use data on insurance uptake and charitable donations as proxies for risk aversion and altruistic preferences (associated with risk sharing arrangements). Both channels do not affect our results. Third, we analyze individuals that are strongly exposed to other cultures. This enables us to partially isolate the effect of *vertically* transmitted cultural values from adaptation to local culture (*horizontal* transmission of culture). The estimates (e.g., from the bilingual city of Biel/Bienne) suggest that although both channels may play their role in explaining future-directed decisions, the evidence for vertically transmitted values and norms is much stronger.

Why should we care about these differences in individuals' behavior? First, more patient individuals enjoy significantly better life outcomes, including income, health, and education (e.g., Moffitt et al., 2011; Golsteyn et al., 2014; Sutter et al., 2013; Figlio et al., 2019). Second, as long-term orientation affects human and physical capital formation and productivity, it also contributes to the prosperity of a society (e.g., Sunde et al., 2021; Falk et al., 2018). Hence, understanding the cultural context of individuals' behavior is crucial for the design of welfare-maximizing policies that aim to foster future-oriented actions.

This paper relates to various strands of literature. It contributes to the substantial and growing body of research documenting the role of culture in shaping economic behavior (see, e.g., Guiso et al., 2006; Alesina and Giuliano, 2015; Falk et al., 2018). In particular, we contribute to the still relatively scarce literature on the effects of culture on intertemporal choices. This strand of literature uses mainly three approaches. First, survey data in cross-country regressions. Using data from the Global Preferences Survey (GPS), Falk et al. (2018) and Sunde et al. (2021) show that patience is associated with a greater propensity to save and higher educational attainment. Second, the "epidemiological" approach attempts to disentangle culture from the institutional and economic environment by studying immigrants of different origin and cultures but living in the same destination country (Fernández, 2011). Studies based on this approach document an effect of culture on household saving behavior (Fuchs-Schündeln et al., 2020) and educational attainment (Figlio et al., 2019). Third, culture has also been studied in experimental settings. Sutter et al. (2018) elicit time preferences of primary school children in a bilingual city in Italy. Using language as an identifier of culture, they find strong differences between the German and Italian speakers.

Because we use language as a proxy for culture, our paper also relates to a nascent literature connecting linguistic structures and economic outcomes (for an overview, see Mavisakalyan and Weber, 2018). Adopting a weak version of the *linguistic relativity* hypothesis[1], Chen (2013) analyzes how the grammar of future-time reference affects economic behavior. He categorizes languages according to whether a language requires its speakers to use a grammatically distinct form when talking about future events. He finds that speakers of a *futureless*

[1] Underlying this hypothesis (also referred to as the Sapir-Whorf hypothesis) is the idea that the particular language we speak influences our thinking, perceptions, and behavior. This issue boasts a long history of interest and controversy in social science (e.g., Campbell, 2003). Put simply, the idea exists in two forms (for an overview, see, e.g., Lucy, 1997; Casasanto, 2015; Leavitt, 2011). The strong version (*linguistic determinism*) states that language entirely determines thought, i.e., the language structure sculpts our cognitive processes. There is hardly any evidence supporting this strong version (e.g., Pinker, 1994). A weaker form argues that linguistic categories and usage influence thought and behavior without explicitly controlling cognitive processes. Speakers of different languages may perceive reality differently because the formal structures of their language condition the speakers' experience and perception of the world. Although there is some research in support of the weaker claim, there is no final agreement among linguists.

language (i.e., they use the present tense when speaking about the future) save more, have higher retirement savings, smoke less frequently, and are less likely to be obese. Chen (2013) argues that the varying grammar leads to differences in time perception and in the precision of beliefs about the timing of the future.

Since Chen's contribution, several studies have documented supporting evidence for his *linguistic-savings hypothesis*.[2] Yet, Chen's work has also received criticism from linguists for various reasons.[3] Although making a strong case for a causal interpretation, Chen (2013, p. 721) carefully states the possibility that "language is not *causing* but rather *reflecting* deeper differences that drive savings behavior". Given the complex and closely entwined relationship between culture and language, we remain cautious about the mechanisms causing any differences in behavior at the language border. The demonstration of a causal effect of language would require experimental manipulation in the language spoken. Yet, our evidence is consistent with the hypothesis of Chen (2013) as future-time reference is grammaticalized in French to an extent it is not in German (see online Appendix D).

Following other literature (e.g., Alesina and La Ferrara, 2005; Desmet et al., 2012), we use language primarily as a marker for cultural variation. In this regard, we follow Guiso et al. (2006), who define culture as "those customary beliefs and values that ethnic, religious, and social groups transmit fairly unchanged from generation to generation". Therefore, culture can permanently influence individual behavior through beliefs, values, and preferences.

Finally, most closely related to our paper is Guin (2017), who examines saving behavior of low- and middle-income households across the German-French language border. Using survey data, he finds that German-speaking households

[2]In addition to the findings by Falk et al. (2018) and Sutter et al. (2018), future tense marking seems to affect individual environmental action (Mavisakalyan et al., 2018) and support for future-oriented policies (Pérez and Tavits, 2017). In a recent paper, Galor et al. (2018) provide evidence that pre-industrial geographical characteristics (measured by potential crop yield) may explain the structure of the future tense. They further suggest that the prevalence of long-term orientation and linguistic traits have coevolved over time. In a related paper, Galor and Özak (2016) show that the pre-industrial differences in agricultural return are associated with differences in today's long-term orientation.

[3]See Dahl (2013) and Roberts et al. (2015). They argue that the measured correlations may be spurious. Future tense marking may correlate with deeper underlying cultural values. The critics further suggest that Chen (2013) lacks convincing causal arguments, i.e., that you could formulate his hypothesis reversely. In addition, there may be problems with the data (e.g., coding of languages). It has been questioned whether his binary classification of future-time reference oversimplifies the complex structures of linguistic systems. Relatedly, Chen distinguishes languages based on prediction-based contexts. As Dahl (2013) argues, other patterns (i.e., intention-based statements) that impede the classification may also be relevant in determining our thinking about the future. However, Dahl (2013) also notes that the within-country estimates are Chen's most convincing arguments, making the case to shed further light on the language groups in multilingual countries such as Switzerland.

have a higher propensity to save than similar French-speaking households. Relatedly, Herz et al. (2021) find strong evidence for differences in time preferences experimentally eliciting students in a bilingual municipality in Switzerland. Students in German language classes are more patient than students in French language classes.

Our paper contributes to the existing literature in at least four aspects. First, we improve upon existing methodological approaches by exploiting a unique within-country setting. While cross-country comparisons are likely to suffer from omitted variables and endogeneity, the language border in Switzerland allows us to disentangle the effects of language from other factors, such as institutions (e.g., Alesina and Giuliano, 2015) and religion (e.g., Basten and Betz, 2013). Aside from neglecting horizontal transmission of culture, studies based on immigrants may be affected by sample selection bias (Fernández, 2011). By contrast, the historical and cultural roots of the language border allow for a fairly exogenous setting. Second, the data allow to dig deeper into the mechanisms at play. So far, only few studies have tried to pinpoint the channels through which culture affects behavior. Relatedly, we also contribute to the literature on the impact of religion (especially Protestantism) as we, unlike other studies, observe the individuals' religious affiliation. Third, our outcomes of interest include various types of behavior, some of them (e.g., gambling) have not been studied before in this setting. Fourth, while studies on economic behavior commonly use survey data, we capitalize on individual-level tax data. The use of tax data may better match the actual behavior of individuals. This is particularly important for our setting because language groups may culturally differ in their survey response behavior. Moreover, in contrast to experimental studies often facing the problems of small sample sizes and external validity, tax data provide us with a sufficiently large and representative sample.

2 Background: Languages in Switzerland

Lying landlocked at the crossroads between several European cultures, Switzerland consists of diverse linguistic and cultural regions within a small territory. It has four official languages: German, French, Italian, and Romansh.[4]

[4] Although the Swiss may have sympathy for the neighboring countries, they generally do not feel part of the French, German, or Italian nations. Importantly, the French-speaking regions have (apart from a few years under Napoleon's rule) never been part of France, nor have the German-speaking (Italian-speaking) regions been part of Germany (Italy). Though there were foreign influences, they all developed rather independently from their neighboring nations (see also online Appendix E). Being linguistically and culturally different, the Swiss language groups nonetheless share a set of common values, myths, and attitudes (Büchi, 2000, p. 294).

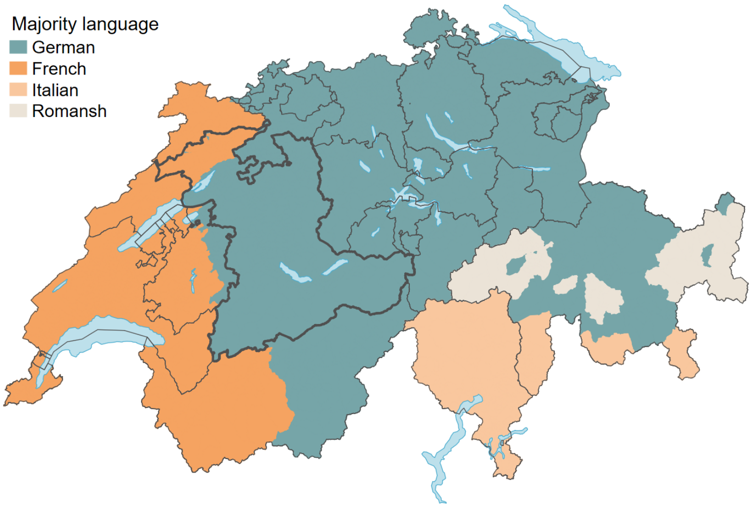

Figure 1: Language regions in Switzerland

Notes: Majority language of the resident population in Switzerland according to the Swiss census 2000 (data at municipality level). Dark lines show cantonal borders. The canton of Bern is highlighted using an increased line width.

Source: Federal Statistical Office (language data) and Federal Office of Topography swisstopo (municipalities' boundaries).

As of 2020, 62% of the population speak German as their main language, 23% speak French, 8% speak Italian, and 0.5% speak Romansh (FSO, 2022b).[5]

As Figure 1 highlights, the language groups reside mainly spatially separated.[6] In the center and the northeast, most of the residents speak German, whereas French is the main language in the western part of Switzerland known as the Romandie. The South and Southeast speak Italian and Romansh. The existence of rather sharp boundaries implies that even though Switzerland is a multilingual country, its territories are (with a few exceptions) monolingual.[7]

[5]The numbers refer to the permanent resident population aged 15 and over (respondents could name more than one main language). The remaining share speaks a non-national language as main language. The main language may be the standard or dialectal form. Romansh is a Rhaeto-Romanic language descending from Vulgar Latin.

[6]For the classification of municipalities into language groups, we use the criterion of the relative majority of a language group (*statistical* definition of the language border). This classification does not necessarily have to coincide with the constitutional classification (*political* definition of the language border). For example, at communal level, French is the official language almost everywhere in the Bernese Jura – even in the predominantly German-speaking municipalities of Mont-Tramelan and Rebévelier. See Werlen (2000, p. 44) for further discussions.

[7]The *territoriality principle* also drives the linguistic homogeneity at the local level. It states that the cantons decide on their official languages within their boundaries. Not least, it is a federalist principle to protect and promote the linguistic diversity and cultural heritage of a multilingual nation (Camartin, 1982, pp. 315–320). The territoriality principle guarantees languages

Figure 1 further shows that large parts of the linguistic boundaries do not coincide with cantonal administrative borders (depicted as black lines). Four out of the 26 cantons are officially multilingual. In our analysis, we focus on one of these cantons – the canton of Bern – exploiting the within-canton variation provided by the language border. The language regions and their borders date back to the post-Roman period and have been remarkably stable for centuries (see online Appendix E for a historical account of the German-French language border).[8]

Figure 2 takes a closer look at the bilingual structure of the canton of Bern, which acts as a bridge between German- and French-speaking Switzerland. While the majority of the canton is dominantly German-speaking (2020: 83% of the population), 11% speak French as their main language (FSO, 2022b). The French-speaking minority mainly resides in the northwestern part of the canton in the so-called Bernese Jura and around the bilingual city of Biel/Bienne. Most municipalities have a clear main language. Moreover, the two language regions in the canton are very stable.[9]

Figure 3 highlights the sharpness of the within-canton language border. It plots the share of German speakers as a function of the distance to the language border. Section 3 discusses in detail how we construct the distance measure. Within a few kilometers, the share of German speakers jumps from roughly 20% to over 80%, sharply spatially separating the French- from German-speaking municipalities. The sample also includes foreigners, which is mainly why the proportions are not even more extreme.

At the German-French language border, labor markets are not separated and wages equalize (Cattaneo and Winkelmann, 2005; Eugster et al., 2017). For the most part, the language border does not coincide with geographical barriers and political borders. In the canton of Bern, individuals on both sides of the lan-

their own territory, which is especially important for the minority languages. In practice, a canton determines its official language (or more than one in a few cases) that is used as language of administration and school language. In addition to territoriality, the current version of the Federal Constitution defines further principles to conserve the country's linguistic diversity: language equality, language freedom, and the protection of the minority languages.

[8] The genetic structure of the population also reflects the language regions' stability over time. Novembre et al. (2008) find a close correspondence between genetic and geographic distances within Europe. In Switzerland, the observed genetic variation is lower within than between the different language regions. Moreover, they find that French and German speakers are genetically more similar than Italian and German speakers.

[9] The share of German speakers is not above two thirds or below one third of the population in only four municipalities: Romont (BE), Evilard, Châtelat, and the bilingual city of Biel/Bienne. Except for Châtelat, they are all located at the language border. In Biel/Bienne, the coexistence of two linguistic communities does not allow for drawing any statistical borders. Only five municipalities experienced a change in the majority language since 1860 (see online Appendix E.2).

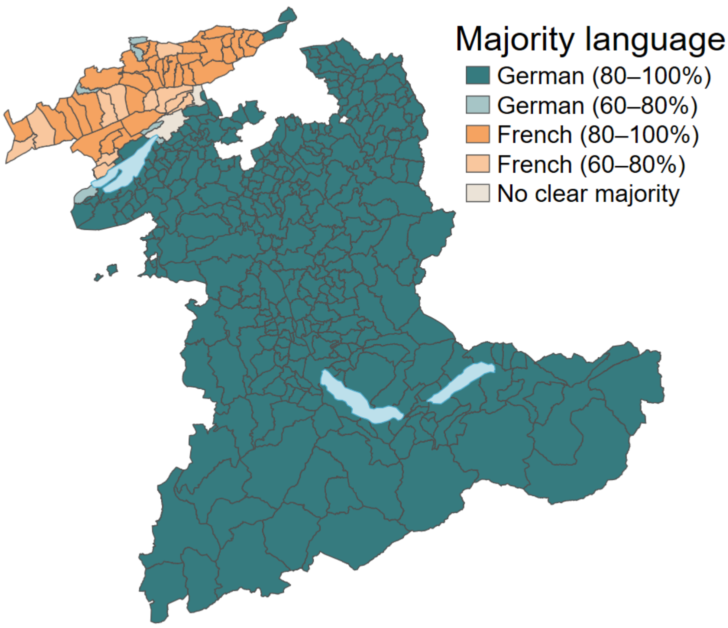

Figure 2: Majority language by municipality in the canton of Bern

Notes: Majority language (and its share of the resident population) for each municipality in the canton of Bern according to the Swiss census 2000 (data at municipality level; boundaries as of January 1, 2013).

Source: Federal Statistical Office (language data) and Federal Office of Topography swisstopo (municipalities' boundaries).

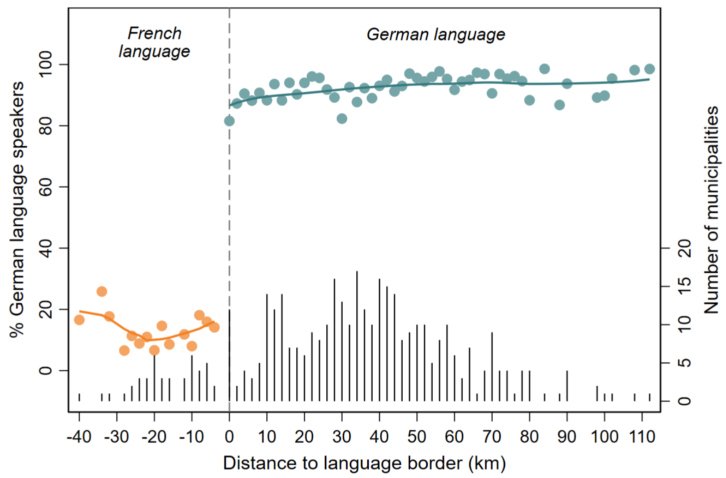

Figure 3: Share of German speakers by distance to the language border in the canton of Bern

Notes: Share of the resident population in the canton of Bern that speak German as main language as a function of the driving distance to the language border. Positive distance values indicate German-speaking municipalities, negative distance values indicate French-speaking municipalities. Scatter points show population weighted municipality level averages for distance bandwidths of 2 km (left axis). Lines are locally weighted regression estimates (bandwidth 0.8). The vertical lines show the number of municipalities for the binned 2-km-intervals (right axis). The figure excludes the bilingual city of Biel/Bienne.

Source: Own calculations based on Federal Statistical Office (Swiss census 2000; language data) and Google Maps (road distances).

guage border are exposed to mainly the same policies and institutions as they are predominantly set at the cantonal or federal level. This also applies to the relevant tax rules that affect our outcomes of interest. Furthermore, the language border partly follows natural terrain but not geographical barriers in the strict sense. The mobility between the two regions is not restricted as there is a well-developed and dense private and public transport infrastructure across the language regions.

Despite cross-border mobility and social interaction in various forms, the language border analyzed in this paper prevented clear patterns of cultural assimilation. It clearly separates different cultures. Individuals of the two language groups share a deeply rooted cultural heritage. Both regions are associated with different values and norms that govern preferences and behavior.[10] The cultural heterogeneity also regularly translates into different behavior at the ballot box. Hence, language group membership can adequately serve as a proxy for a broader set of cultural norms and values.

3 Data

Our main data source is individual-level administrative tax data from the canton of Bern, covering the years 2012 and 2013. We pool both years to enhance precision. For specific outcomes and analyses, we also use data from the years 2002 and 2003.[11] These proprietary data contain an extensive selection of items recorded in individual tax returns and were kindly provided by the cantonal tax administration.[12] In addition to financial variables, we also observe a set of

[10]In recent years, the Swiss language border has been exploited in several studies, revealing broad cultural differences between the language groups. Eugster and Parchet (2019) show that although there are sharp cultural differences in (political) preferences, tax competition leads to gradually smoothing tax rates at the border. Eugster et al. (2011) and Eugster et al. (2017) find that there are strong differences in the demand for social insurances, work attitudes, and unemployment durations across language groups. Further research shows that the German- and the French-speaking language groups differ in terms of long-term care use (Gentili et al., 2017), retirement decisions (Cottier, 2018), environmental preferences (Filippini and Wekhof, 2021), financial literacy (Brown et al., 2018), and international trade (Egger and Lassmann, 2015).

[11]We have not been able to obtain tax data over a longer period of time or of other cantons at the language border. We focus on the years 2012 and 2013 because there were many municipal mergers in 2014, reducing the number of distinct values in the running variable (see also Section 4). The years 2002 and 2003 allow us to analyze if the effect of culture has changed within a decade (see Section 6.1).

[12]Switzerland levies taxes at the federal, cantonal, and municipal level. The cantons are responsible for the collection of the tax returns and the taxes. Upon reaching the age of 18 years, every permanent resident in Switzerland becomes subject to taxation and is legally obligated to file a tax return. Two groups of individuals do not have to complete a tax return: First, individuals taxed at source if their income and wealth do not exceed a certain threshold. These are mainly foreign nationals working in Switzerland without a settlement permit. Second, certain employees

individual background characteristics and information on the municipality of residence.

The use of tax data has several advantages: First, they provide a sufficiently large sample and do not suffer from nonresponse or top-coded data. Second, tax data are generally more accurate and reliable as self-reported survey answers are free of costs and thus may yield biased estimates. This is particularly relevant for our study because language groups may culturally differ in their response behavior. A common drawback of tax data, the misreporting of income and wealth (tax evasion), is not a major concern in our case. Our outcome variables are mainly based on expenses or winnings, the tax declaration of which is fiscally advantageous for the individuals.

A potential difficulty in analyzing Swiss tax data is the treatment of married couples. Their taxation is based on the principle of household taxation, i.e., the income and wealth of spouses are aggregated and jointly taxed. Married couples have to file only one tax return and are subject to a different tax schedule than single households. Thus, married couples show up as a single unit in the tax data. While socioeconomic characteristics and some financial variables are available at the individual level, we observe many financial items of married couples only in aggregate form. We treat married couples in our analysis as follows: We duplicate each married couple so that we have an observation for each of the spouses. We divide the values by two if the items only exist at the aggregate level. For example, a married couple in the tax data with aggregate net wealth of CHF 100,000 (roughly USD 100,000) will represent two observations in our final dataset with net wealth of CHF 50,000 each. In a robustness check, we replicate our results by treating married couples as one observation instead. The results are qualitatively unchanged.

We restrict our analysis to individuals aged 25 to 64 who are not claiming any kind of state or private pension. By doing so, we create a homogeneous sample of the adult population that has predominantly completed initial education and is not yet fully or partially retired.[13]

We exclude individuals living in the bilingual city of Biel/Bienne (located at the language border) and use them in a separate analysis. For our main estimations, we restrict the sample to individuals living in a municipality within 30 kilometers driving distance of the language border (see Section 4 for a discussion of the bandwidth selection). Our tax data do not provide information

of international organizations (mainly in the canton of Geneva).

[13]The results do not change if we modify the age span. They are also unaffected if we do not condition for labor force participation. Thus, differences in early retirement behavior do not drive our findings.

on citizenship. It is therefore not possible to limit our sample to Swiss citizens. However, we can control at municipal level for the share of foreigners and the share of residents with a foreign language as their main language.

We observe the chosen language (either German or French) in dealing with the cantonal administration (hereinafter referred to as the *tax return language*). For most individuals, this language is identical to the mother tongue. For those without German or French as their mother tongue, it likely indicates the language and culture an individual feels closest to.[14] For married couples, we observe the tax return language for both spouses individually.

Outcomes of Interest. Based on the literature and data availability, we study the following four outcomes in future-oriented behavior in a sample of individuals across the language border (see online Appendix C.1.2 for further details on the variables):[15]

(i) *Retirement saving*: In addition to state pension and occupational pension provisions, Switzerland encourages its citizens to save in voluntary private pension plans by providing tax benefits. Voluntary private contributions paid into such called *Pillar 3a* accounts can be deducted from taxable income up to a specified amount (2013: CHF 6,739). The decision of whether to save in a voluntary private pension scheme (*extensive margin*) may be different from the decision of how much money to put into the scheme, conditional on having paid into the scheme (*intensive margin*). Consequently, we model both decisions separately.

    We restrict our sample to individuals who are entitled to save in voluntary private pension plans, i.e., individuals with employment income or compensation for loss of earnings. We further exclude self-employed workers and farmers as they are subject to separate rules that we cannot accurately map with our data.

(ii) *Continuing education and training*: The probability to pursue continuing

[14]As one language usually dominates in one region, there are incentives to sort according to language background or to learn the local language, enhancing one's chances of social and economic integration. This does not automatically lead foreigners to give up their mother tongue and henceforth absorb the cultural peculiarities associated with the local language. However, at least the second generation of immigrants grows up with the local language and adopts it.

[15]Empirical studies have linked time preferences to various individual behaviors. For the impact on saving, see, e.g., Falk et al. (2018); Sutter et al. (2018); Cronqvist and Siegel (2015); and Ashraf et al. (2006); for wealth, see, e.g., Epper et al. (2020) and Moffitt et al. (2011). For the role on education, see, e.g., Falk et al. (2018); Backes-Gellner et al. (2021); Golsteyn et al. (2014); and Mischel et al. (1989); for gambling, see, e.g., Dixon et al. (2003); Ida and Goto (2009); and Alessi and Petry (2003).

education and training. The variable is based on whether the individual claimed tax deductions for the costs related to continuing education programs. We restrict our analysis to the extensive margin as the amount (intensive margin) is difficult to interpret.[16]

(iii) *Gambling*: The likelihood of engaging in gambling activity. The dummy is based on whether the individual declared gambling winnings (e.g., from lotteries) in the tax return. In contrast to all other outcomes, we use tax data of earlier years (2002 and 2003, respectively) for gambling. This is due to a tax reform in 2013 that greatly reduced the number of individuals with declared gambling winnings.

(iv) *Net wealth*, which is defined as the total amount of assets minus debt. Because the wealth distribution is skewed to the right, we follow Chen (2013) and apply an inverse hyperbolic sine (IHS) transformation.[17] Net wealth is the result of various underlying decisions and circumstances. For example, it depends on the decision to own real estate, to get into debt, and how to invest your money. Therefore, we must interpret the results for net wealth carefully.

Distance to the Language Border (*Running Variable*). We assign municipalities to the two main language regions according to the main language indicated by the majority of the population (or the largest minority, respectively) (Federal Statistical Office, census 2000). Similar to Eugster et al. (2017), we use the driving distance in kilometers between a municipality's center and the language border as the forcing variable. We calculate the driving distance using Google Maps. We assign French-speaking municipalities negative distance values and German-speaking municipalities at the language border a distance value of zero. As for the measure, the travel distance by car is superior to the Euclidean distance as it accounts for geographic barriers (e.g., lakes) between

[16]Underlying factors that geographically vary may drive the differences at the intensive margin: First, the availability of education choices varies depending on job and economic sector. Second, the employers often bear some of the costs, the share varying depending on economic sector and employer.

[17] The IHS transformation is defined as:

$$IHS(y) = log\Big(y + (y^2 + 1)^{\frac{1}{2}}\Big). \tag{1}$$

As Woolley (2011) notes, this transformation can be interpreted similar to a logarithmic variable (except for small values) as it approximately equals $log(2y)$ or $log(2) + log(y)$, respectively. In contrast with taking the logarithm of a variable, the IHS transformation is also defined for zero values, which makes it increasingly popular in applications using wealth data. See Burbidge et al. (1988) and Bellemare and Wichman (2020) for further discussions of the IHS transformation.

municipalities. The travel distance better reflects the economic and social distance between the individuals in our sample. In a robustness test, we show that using the driving time instead of the driving distance does not change any of our results qualitatively. See online Appendix C.2 for further details on the running variable.

Individual Controls. Most of our regressions contain a large set of individual and municipality controls that the literature has shown to potentially affect time preferences (see, e.g., Herz et al., 2021; Sutter et al., 2018; Brown et al., 2018). The individual characteristics include socio-demographics, such as age, age squared, gender, number of dependent children, and marital status. We also use information on the financial background, controlling for gross income.[18] We transform gross income using the IHS function (see footnote 17) to address the skewed distribution and the presence of nonpositive values. We further use a dummy for dual earner married couples, a dummy for whether an individual owns residential property, and two dummies for self-employed and agricultural workers, respectively. In additional analyses, we also use information on each individual's religious affiliation (dummies for Catholic, Protestant, and other/no religion).

Municipality Controls. We supplement our tax data with information on the municipalities of residence. We use information on the demographic and economic structure: four education groups containing the share of the highest education achieved, the share of foreign residents, and the share speaking non-official languages. We further control for the tax level and whether the municipality is a large city or not. In a robustness check, we extend our set of covariates by including additional municipality-level controls: three age groups (0–19, 20–64, 65 and above), the share of workers in each of the three sectors, unemployment rate, population size, and dummies for whether the municipality belongs to an agglomeration area or not and for whether the population exceeds 10,000 inhabitants.

Table 2 shows summary statistics for our outcomes and control variables. Online Appendix Table C1 contains further details on each variable. Our final sample consists of 281,482 observations in 165 municipalities.

[18]We prefer gross income over taxable net income (i.e., gross income minus deductions) as some of our outcome variables represent tax deductions and thus directly affect the taxable income. Moreover, we control for some deductions (e.g., marital status and children) that partially explain the difference between gross and taxable income.

Table 2: Summary statistics and balance

	All (1)	German l. region (2)	French l. region (3)	Difference (4)	Difference at border (5)
Panel A. Future-oriented behavior outcomes					
Retirement saving	0.62	0.62	0.61	0.02	−0.01
Retirement saving (CHF 000s)	4.10	4.22	3.39	0.82***	0.41**
Continuing education	0.07	0.07	0.03	0.04***	0.01***
Gambling	0.01	0.01	0.02	−0.01***	−0.01***
Net wealth (IHS transf.)	7.06	7.27	5.80	1.47***	1.27***
Panel B. Individual characteristics					
Age	44.28	44.30	44.14	0.16	0.31
Female	0.49	0.49	0.48	0.01***	0.00
Marital status: single	0.25	0.26	0.22	0.03***	0.00
Marital status: married	0.61	0.60	0.62	−0.02	0.01
Marital status: divorced	0.14	0.14	0.15	−0.02***	−0.01
Marital status: widowed	0.00	0.00	0.00	0.00	0.00
No. of dependents	0.81	0.79	0.91	−0.12***	−0.07*
Gross income (IHS transf.)	11.41	11.43	11.26	0.17***	0.01
Dual-income couple	0.45	0.45	0.44	0.00	0.01
Homeowner	0.42	0.41	0.48	−0.08***	−0.04
Self-employed	0.16	0.16	0.15	0.01	0.04
Farmer	0.04	0.04	0.03	0.01	0.04**
Religion: Catholic	0.19	0.16	0.32	−0.16***	−0.17**
Religion: Protestant	0.54	0.57	0.38	0.19***	0.21***
Religion: other/none	0.27	0.27	0.30	−0.03**	−0.05
Panel C. Municipality characteristics: basic					
Share primary education	0.23	0.22	0.30	−0.08***	−0.02
Share secondary education	0.53	0.54	0.49	0.04***	0.04**
Share tertiary education	0.19	0.20	0.16	0.04***	−0.02
Share no education	0.04	0.04	0.05	0.00	0.00
Share foreign speakers	0.05	0.06	0.04	0.01**	0.01
Share foreigners	0.13	0.13	0.16	−0.04**	0.00
Tax multiplier	1.63	1.59	1.89	−0.30***	−0.17*
Large city	0.12	0.15	0.00	0.15	−0.16
Panel D. Municipality characteristics: extended					
Agglomeration	0.51	0.59	0.01	0.58***	0.27*
Age: share 0–19	0.20	0.20	0.22	−0.02***	0.00
Age: share 20–64	0.61	0.61	0.59	0.02***	0.01
Age: share 65 and above	0.19	0.19	0.20	−0.01	0.00
Unemployment rate	0.02	0.02	0.03	0.00***	0.00
Population (000s)	8.71	9.65	3.10	6.55	−5.87
Urban	0.19	0.22	0.00	0.22*	−0.13
Share primary sector	0.10	0.11	0.07	0.04	0.04
Share secondary sector	0.30	0.28	0.41	−0.14***	0.02
Share tertiary sector	0.60	0.61	0.51	0.10***	−0.07

Table 2 (continued)

	All (1)	German l. region (2)	French l. region (3)	Difference (4)	Difference at border (5)
Panel E. Additional outcomes (Section 7 on mechanisms)					
Charitable contributions	0.76	0.77	0.75	0.02	0.02
Charitable contr. (log amount)	5.73	5.74	5.65	0.09***	0.04
Charitable contr. (income share)	0.01	0.01	0.00	0.00***	0.00
Life insurance policy	0.22	0.21	0.26	−0.04***	−0.01
Observations	281,482	241,004	40,478	281,482	281,482
Municipalities	165	124	41	165	165

Notes: The first three columns show means of individual outcomes and individual and municipality characteristics. Column (1) includes all individuals in the sample, columns (2) and (3) separated for the German and French side of the border, respectively. Column (4) shows the mean difference between columns (2) and (3). Column (5) shows the difference at the language border by estimating our baseline specification (see equation 2). Specifically, we regress each variable on a dummy = 1 for individuals in the German language region while controlling for the distance to the language border (allowing for different trends on both sides of the border) and a year effect. Standard errors are two-way clustered at municipality and individual level. The sample includes individuals aged 25–64 who are not claiming any kind of state or private pension and who are living in municipalities within 30 km of the language border. Municipality characteristics are weighted by the number of observations in the sample. Retirement saving is expressed in CHF 1,000, the population in 1,000 inhabitants. Net wealth and gross income are transformed using the IHS function (see footnote 17). The number of observations varies depending on outcome: the number is lower in the retirement saving estimates due to sample restrictions, gambling uses data from other years. See online Appendix Table C1 for variable definitions and sources. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

4 Empirical Strategy

The aim of this paper is to identify the effect of culture on future-oriented behavior. We use language as a proxy for cultural variation. The concern with regressing economic outcomes on language is that the language regions may geographically correlate with unobserved factors that also affect intertemporal choices. For instance, as Alesina and Giuliano (2015) argue, culture and institutions complementarily interact and jointly affect economic outcomes. With respect to retirement saving behavior, country-specific differences include pensions policies (e.g., Chetty et al., 2014), tax incentives (e.g., Andersen, 2018), or the generosity of the social security system (e.g., Engen and Gruber, 2001).

Following previous research (e.g., Eugster et al., 2011, 2017), we address the identification challenges by using a *local border contrast* (LBC) approach. Methodologically, the LBC is similar to the fuzzy regression discontinuity (RD) design. As Eugster et al. (2017) argue, the LBC differs from the fuzzy RD design in that people can move freely and thus are able to manipulate the distance to the language border. Nonetheless, the historical and cultural roots of the language border paired with limited migration flows allow for a fairly exogenous setting. Furthermore, using a distinctive terminology also accounts for the different bandwidth selection required in our setting (see below).

We exploit the jump in the probability of speaking either German or French at the within-canton language border and contrast individual behavior across the two sides of the border. Specifically, we estimate various specifications of the following model:

$$\begin{aligned} y_{im} &= \alpha + \beta\,\text{German}_m + \gamma\,\text{Distance}_m + \delta\,\text{German}_m \times \text{Distance}_m \\ &\quad + \zeta\,\boldsymbol{X}_{im} + \epsilon_{im}, \end{aligned} \tag{2}$$

where y_{im} is the outcome of interest of individual i residing in municipality m. German_m is a dummy variable equal to 1 if the municipality is in the German language region (i.e., the majority of the population speaks German) and 0 if the municipality is in the French language region. The running variable is the Distance_m to the language border (see Section 3), while the parameters γ and δ allow for different spatial trends on both sides of the border. The main coefficient of interest is β, which captures the LBC. $\boldsymbol{X}_{im}$ is a vector of individual and municipality characteristics. Moreover, this vector contains a year effect as we pool two years of tax data.

In practice, we estimate equation (2) by linear regression using OLS. We probe the sensitivity of our results by estimating probit models instead of linear probability models (if y_{im} is a binary choice variable) and other specifications (see online Appendix Table B3). For all estimations, we cluster standard errors two ways, by individual and by municipality.[19]

Bandwidth Choice. Optimal bandwidth choice in our case is different from the conventional RD framework. The RD effect is estimated by focusing on observations in a close neighborhood around the cutoff. This setup requires a continuous running variable and a lot of data around the discontinuity. In terms of implementation, recent literature favors nonparametric estimation strategies and fully data-driven bandwidth selection (Calonico et al., 2020). In a research design based on geography, this would require geo-referenced data at the in-

[19]The tax data are in anonymized form but contain a personal number assigned to each tax unit, allowing to track tax units over time (see online Appendix C.1.1 for details). As Lee and Card (2008) show, standard errors in RD designs should be clustered on the individual values of the running variable. As we pool two years of tax returns (and some individuals move to another municipality), our data have a nonnested structure. Clustering at the highest level of aggregation is thus not sufficient (Cameron et al., 2011).

dividual level (i.e., the exact address of each individual's residence) (see, e.g., Dell, 2010). However, for reasons of data protection, we only dispose of each individual's municipality of residence. Our data thus show mass points in the running variable, which complicates the estimation procedure. Moreover, there are municipalities with weak language majority close to the border, which may spuriously weaken the treatment effect. Hence, to accurately estimate the regression functions, we choose an ad hoc bandwidth approach by ensuring that we have a sufficiently large number of municipalities in our sample. This procedure also allows us to condition on a range of observable municipality characteristics.

We confine the analysis to individuals located not more than 30 kilometers from the language border. To probe the sensitivity of our results, we complement this ad hoc bandwidth with estimates for bandwidths of 20 and 40 kilometers, respectively. Following the recommendation of Gelman and Imbens (2019), our baseline model adopts a linear specification, but we also control for a quadratic specification of the forcing variable in a robustness check.

We further complement our LBC approach with OLS specifications that do not include the distance as running variable (hereinafter referred to as *OLS* for simplicity). Comparing LBC and OLS estimates is useful for at least two reasons (Dehdari and Gehring, 2022): It indicates whether there is potential sorting at the border and whether municipalities at the border are similar to the average municipality in the canton (i.e., if the local average treatment effect may be externally valid).

As can be seen in Figure 3, the language border does not generate a sharp design. People with different native languages live on both sides of the border. In the conventional fuzzy RD framework, equation (2) would thus identify the reduced form effect. Because we do not have data on the individuals' spoken language, we are not able to estimate a credible first stage and only report reduced form estimates. However, we do have data on the individually chosen tax return language (see Section 3). Analogously to Figure 3, online Appendix Figure A1 plots the share of German tax returns as a function of the distance to the language border. At the border, living in the German language region raises the probability of filling the tax return in German by around 76 percentage points. The average effect of language group membership should thus be inflated by approximately 32%.[20] We should keep this in mind when interpret-

[20] As 1/0.76 = 1.32. We obtain it by estimating a first stage regression in which the treatment variable (tax return language) is explained by the instrument (language region). Our estimate is in line with other literature on the Swiss language border (e.g., Eugster et al., 2011).

ing the results.

Our empirical strategy is intuitively appealing. As it relies not only on a within-country but on a within-canton comparison, we are able to contrast individuals that are exposed to a common institutional, political, (socio-)economic, and geographic environment but differ in their language. The analysis thus provides us with a geographic quasi-natural experiment that allows to disentangle the effect of culture from other confounding factors.

Validity of the Identifying Assumptions. The reliable identification of the LBC requires that predetermined covariates are balanced at the cut-off. This assumption allows for individuals of the French language region to serve as a valid counterfactual for individuals of the German language region. Though not directly testable, we can use observable factors to assess the validity of the assumption.

Table 2 assesses the validity of the design by comparing individual (panel B) and municipal characteristics (panels C and D) on each side of the language border. Column (1) shows the sample average for individuals and municipalities located within 30 kilometers of the language border, columns (2) and (3) show the mean for both language regions separately. Column (4) reports the difference in the means between the two regions. Column (5) reports the LBC. We obtain it by estimating equation (2), where in this case y_{im} is the covariate of interest and $\boldsymbol{X}_{im}$ only contains a year effect.

While there are mean differences in individual characteristics between the two language regions, we find that most variables are balanced using the LBC specification to test for differences at the border. Notable exceptions are religion and farmer. The share of Protestants is higher on the German side of the language border, whereas the share of Catholics is higher on the French side. However, religion may be endogenous to our treatment as it is also an integral part of culture. We thus do not control for religious affiliation in our main specification. A separate analysis of religion in Section 7.1 shows that the main results are not overly sensitive to the inclusion of these covariates.

Similar to the individual characteristics, the municipal covariates mostly transition smoothly across the border. Conversely, there is a statistically significant but economically small difference in the share of residents with secondary education and a weakly significant jump at the border in tax levels. We believe that such weak discontinuities are not of great concern for our identification, although both the education level and the tax level may be prone to confounding. Generally, the inclusion of covariates can improve the efficiency of the estimation procedure. However, to deal with the potential endogeneity, the empirical analysis follows a staggered inclusion of control variables.

Overall, the predetermined covariates appear quite well balanced around the border. We also provide graphical evidence of the balance tests in the online Appendix (Figures A2, A3, and A4). Reassuringly, individual and municipal characteristics are broadly continuous at the language border.

5 Results

Graphical Analysis. We begin by graphically analyzing the relationship between culture and future-oriented behavior using LBC plots of the five outcomes. Figure 4 plots the means of the variables for 2 kilometers distance bins, together with fitted lines on both sides of the border. The figure shows visual evidence for discontinuities at the border, except for the likelihood to save in voluntary private pension plans (first plot). While these plots reveal significant treatment effects of culture, we refine the results in the following with regression analysis.

Retirement Saving. In panel A1 of Table 3, the dependent variable is binary indicating whether an individual saves in a voluntary private pension scheme (extensive margin). Panel A2 shows the intensive margin, i.e., the (nonzero) amount of the contribution restricting the sample to individuals with contributions > 0. Panel A3 shows the overall effect combining both margins by using the procedure discussed in McDonald and Moffitt (1980).[21] Column (1) shows estimates without any covariates (except for a year effect), column (2) includes individual controls, column (3) adds municipality characteristics.

As panel A1 shows, the language does not influence the decision whether to save in voluntary private pension plans. The point estimates are close to zero in all specifications and not statistically significant. On the intensive margin, German speakers save substantially more than their French-speaking counterparts. Once controlling for a vast array of individual and municipal characteris-

[21] Subsequently, we follow Goldin and Homonoff (2013) who use the procedure by McDonald and Moffitt (1980) analyzing the effect of taxes on cigarette demand at the extensive and intensive margin. The expected value of pension contributions (y) can be decomposed into its intensive and extensive part:

$$E[y|x] = E[y|x, y > 0] \times Pr(y > 0|x), \quad (3)$$

where x are the independent variables (e.g., language). The combined effect of a change in one of the independent variables (e.g., from French to German language) can be expressed as

$$\frac{\partial E[y|x]}{\partial x} = \frac{\partial E[y|x, y > 0]}{\partial x} \times Pr(y > 0|x) + \frac{\partial Pr(y > 0|x)}{\partial x} \times E[y|x, y > 0]. \quad (4)$$

To obtain an approximate estimate of the combined effect, we use the regression coefficients of panel A1 and A2 and combine them with the sample estimates of $Pr(y > 0|x)$ and $E[y|x, y > 0]$.

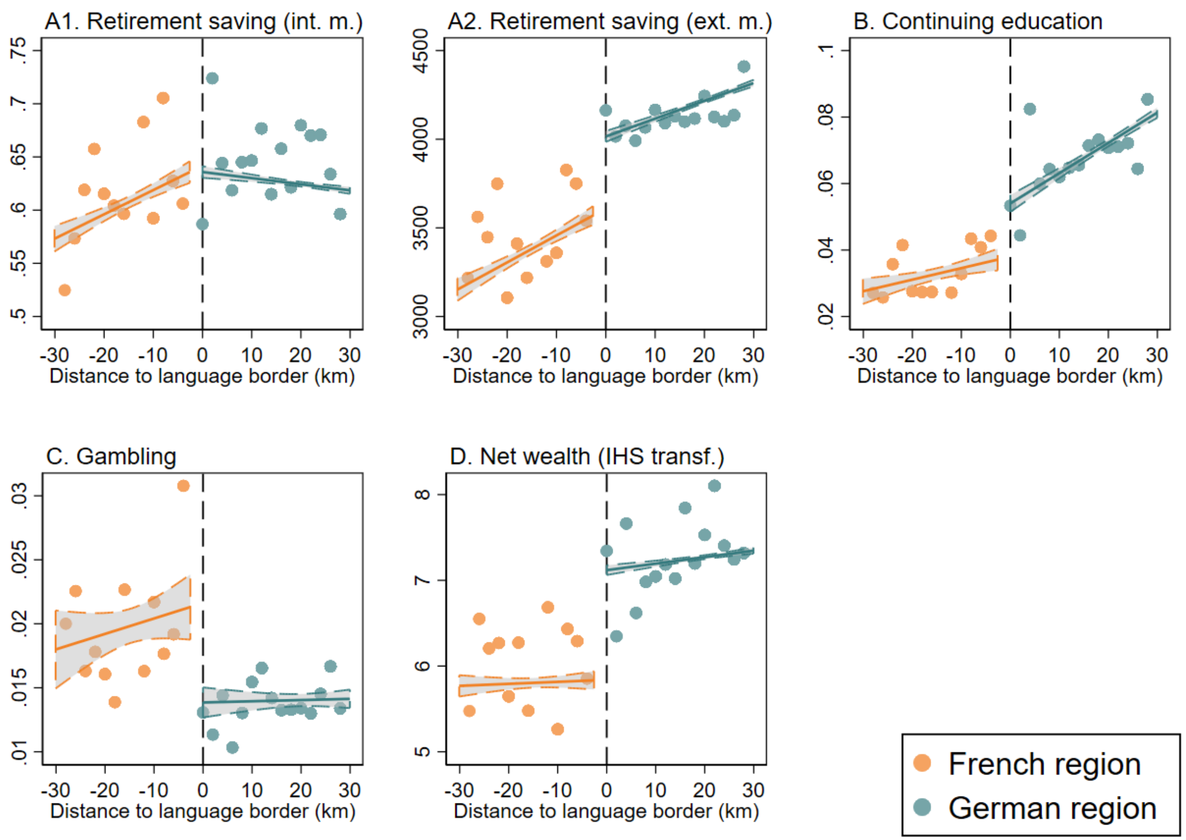

Figure 4: Future-oriented behavior at the language border

Notes: The figure plots the future-oriented behavior outcomes by distance to the language border: (A1) the share of individuals who save in voluntary private pension plans, (A2) the amount of the contribution given that a contribution was made, (B) the share of individuals attending continuing education and training programs, (C) the share of individuals engaging in gambling activity, and (D) the net wealth (IHS transformed; see footnote 17). The distance to the language border is negatively coded for French-speaking municipalities and positively for German-speaking municipalities. Dots correspond to data aggregated into 2-km bins, while the lines are linear regression estimates based on all underlying observations with 95% confidence intervals displayed.

Table 3: Effect of culture on retirement saving, continuing education, gambling, and net wealth

	Local border contrast					OLS		
Bandwidth	30 km			20 km	40 km	30 km	20 km	40 km
	(1)	(2)	(3) Baseline	(4)	(5)	(6)	(7)	(8)
	A1. Retirement saving (extensive margin)							
German language	-0.006	0.004	-0.003	0.003	-0.003	0.010	0.011	0.005
	(0.038)	(0.019)	(0.012)	(0.015)	(0.012)	(0.008)	(0.009)	(0.007)
Mean dependent variable	0.62	0.62	0.62	0.63	0.58	0.62	0.63	0.58
Observations	218,681	218,681	218,681	111,744	410,725	218,681	111,744	410,725
	A2. Retirement saving (intensive margin)							
German language	406.874**	383.715***	435.055***	357.579***	481.055***	542.694***	569.447***	609.296***
	(179.049)	(102.212)	(77.372)	(82.273)	(71.700)	(45.122)	(54.167)	(42.310)
Mean dependent variable	4,100.93	4,100.93	4,100.93	3,969.18	4,270.09	4,100.93	3,969.18	4,270.09
Observations	136,035	136,035	136,035	69,943	240,258	136,035	69,943	240,258
	A3. Retirement saving (combined effect)							
German language	227.998	254.806***	258.609***	234.146***	270.220***	377.357***	399.524***	378.522***
	(205.659)	(93.696)	(56.740)	(65.841)	(50.881)	(38.056)	(42.696)	(35.267)
Mean dependent variable	2,551.07	2,551.07	2,551.07	2,484.39	2,497.83	2,551.07	2,484.39	2,497.83
Observations	218,681	218,681	218,681	111,744	410,725	218,681	111,744	410,725
	B. Continuing education and training							
German language	0.015***	0.017***	0.023***	0.018***	0.027***	0.030***	0.031***	0.028***
	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.003)	(0.003)	(0.003)
Mean dependent variable	0.07	0.07	0.07	0.06	0.07	0.07	0.06	0.07
Observations	281,482	281,482	281,482	145,540	521,507	281,482	145,540	521,507

Table 3 (continued)

	Local border contrast					OLS		
Bandwidth	30 km			20 km	40 km	30 km	20 km	40 km
	(1)	(2)	(3) Baseline	(4)	(5)	(6)	(7)	(8)
	C. Gambling							
German language	-0.009***	-0.009***	-0.009***	-0.011***	-0.006**	-0.005***	-0.006***	-0.006***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
Mean dependent variable	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.01
Observations	274,554	274,554	274,554	142,329	501,496	274,554	142,329	501,496
	D. Net wealth (IHS transf.)							
German language	1.274***	1.079***	1.140***	1.012***	1.099***	0.930***	0.949***	0.982***
	(0.468)	(0.370)	(0.244)	(0.274)	(0.227)	(0.144)	(0.163)	(0.142)
Mean dependent variable	7.06	7.06	7.06	6.86	7.19	7.06	6.86	7.19
Observations	281,482	281,482	281,482	145,540	521,507	281,482	145,540	521,507
Controls (all panels)								
Individual controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipality characteristics	No	No	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table presents estimates of equation (2) for different bandwidths and specifications. Columns (1)–(5) show local border contrast estimates, controlling for the road distance to the language border, a year effect, and different sets of covariates. Columns (6)–(8) do not include the distance as running variable. The dependent variables are the probability to save in voluntary private pension plans (panel A1), the amount of contributions made given that a contribution was made (panel A2), the overall effect combining the extensive and intensive margins (panel A3; see footnote 21), the probability to pursue continuing education and training (panel B), the probability of engaging in gambling activity (panel C), and net wealth (panel D). Net wealth is transformed using the IHS function (see footnote 17). Column (2) adds individual controls (age, age squared, gender, marital status, number of dependents, income, dual earner couple, residential property, self-employed, and agricultural worker). Columns (3)–(8) also include municipality characteristics (education levels, foreign residents, foreign speakers, tax level, and large city). Online Appendix Table C1 reports definitions and sources of the variables. In contrast to the other outcomes, gambling is based on data from different years. Two-way cluster-robust standard errors in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

tics, this difference becomes highly statistically significant. Although the effects are quantitatively similar across specifications, the covariates seem to control for some unobserved heterogeneity. In our preferred specification (column 3), conditional on contributing, German speakers save annually CHF 435 more, which is roughly 11% based on the mean contribution of CHF 4,100. The combined estimates (panel A3) suggest that German speakers annually save roughly CHF 260 more than French speakers (or about 10%, evaluated at the sample mean). This result is similar but somewhat lower compared to a simple linear model also using the individuals with zero contributions (see online Appendix Table B3).

The difference between the language groups becomes greater (smaller) using a larger (narrower) bandwidth but remains statistically significant. Narrower bandwidths yield larger standard errors. The differences in the LBC are not surprising as there is some unobserved heterogeneity, which is reduced within a narrow bandwidth, and as there are several municipalities with weak language majority close to the border.

The LBC is remarkably qualitatively coherent across specifications. Interpreting the results, the French speakers seem to be equally aware of private pension plans (panel A1) but finally behave differently contributing less into the pension scheme (panel A2). This finding may also indicate that differences in the level of information about the pension scheme and its tax-saving incentives (and the availability and accessibility of financial services) do not drive our results at the intensive margin. As there is a strong positive correlation between pension wealth and other assets in Switzerland (Kuhn, 2020), it is rather unlikely that pension contributions crowd out private saving. Moreover, the results are robust to controlling for wealth (see online Appendix Table B2) and different sample restrictions.[22]

In addition to contributions into Pillar 3a accounts, employees can also take advantage of buying into a pension fund (see also online Appendix C.1.2). Both options exhibit similarities, e.g., in terms of tax benefits. However, whereas the maximum amount that can be paid into Pillar 3a accounts is uniformly set, permissible voluntary payments into the occupational pension scheme depend on individual factors, such as age and past and current salaries. We thus refrain from including individual buy-ins into pension funds as other decisions may drive the results. However, for the sake of completeness, combining both

[22]Differences in employment do not drive the results. The results are fairly unchanged if we do not exclude individuals disposing no income. See also online Appendix Table B3. Moreover, if we estimate our baseline model with employment status (i.e., a dummy for whether someone has any kind of earned or replacement income) as outcome variable, there is no robust and statistically significant difference between the language regions.

options in one variable increases the difference at the intensive margin. The estimate (baseline specification as in Table 3, evaluated at the sample mean) shows that German speakers save 22% more (coefficient: $1,088.547^{***}$; standard error: 206.102). The extensive margin is hardly affected (coefficient: 0.001; standard error: 0.012).

Continuing Education and Training. Panel B of Table 3 presents results for the effect of culture on the probability to participate in continuing education and training courses in the relevant tax year.[23] In our baseline specification, German speakers are 2.3 percentage points (or about 34%, evaluated at the sample mean) more likely to pursue continuing education and training. This difference is highly statistically significant across specifications – although, as before, the magnitude of the effect varies.[24]

As Table 2 shows, the German speakers are on average slightly better-educated. According to FSO (2022a), in Switzerland, participation in continuing education and training is positively correlated with education level and occupational status. However, it is unlikely that underlying differences in the education level solely explain the results. First, the difference in education between the two language groups is relatively small. Second, language may also be responsible for the differences in educational background in the first place. Third, in all our specifications, we control for the individuals' income (positively correlated with education) and the education level (at the municipality-level). Fourth, as online Appendix Figure A6 shows, the treatment effect is mostly increasing with income decile. The top decile (where we assume many well-educated individuals) contains the second highest LBC. The above arguments also apply to other outcomes and make it very unlikely that the results in general are driven by differences in education.

Another concern may be that the supply of training programs could be larger and/or faster to reach on the German side. However, the difference even exists when analyzing the bilingual city of Biel/Bienne (see Section 7.3.1)

[23]Costs relating to continuing education and training are only tax-deductible if the individual also declares income from employment in the same tax year. The results are more pronounced if we restrict our sample to individuals with earnings from employment.

Moreover, because self-employed individuals may also partially deduct education expenses as business expenses, we may miss the education activity of self-employed individuals (incomplete data availability). However, the effects remain qualitatively unchanged if we exclude the self-employed (and farmers) from the analysis.

[24]As discussed in Section 3, an analysis of the intensive margin does not provide meaningful information. For completeness, the estimate (baseline specification as in Table 3) shows that German speakers declare 20% higher education costs (coefficient log of education expenses: 0.195^{***}; standard error: 0.063).

where there are broad education offers for both language groups.

Gambling. Panel C of Table 3 shows the results for the effect of culture on the likelihood of engaging in gambling activity. French speakers are roughly 1 percentage point more likely to show any sign of gambling participation. This is about two-thirds of the sample mean. Differences in tax honesty do not explain the results.[25]

Net Wealth. Panel D of Table 3 presents the results of net wealth as dependent variable. As we apply an IHS transformation, the coefficients can be interpreted as percent changes. Individuals in the German-speaking part dispose over roughly double the wealth than the French-speaking population. The effect is both economically and statistically significant and hardly quantitatively affected by the specification.

The results for net wealth need to be interpreted carefully. You could argue that inheritance or gift drive the LBC in wealth. However, there are good reasons why these transfers are not a severe threat to our interpretation. First, we argue that the practice of passing on wealth itself can be seen as a future-oriented action (i.e., in favor of future generations).[26] Second, significant wealth differences already exist in the twenties (see online Appendix Figure A7), when the probability of inheritance or gift is low (see Ben and Fluder, 2015, for an analysis with the same tax data). This finding also contests the argument that differences in wealth may be due to differences in risk appetite (e.g., affecting financial investments).

In sum, we find that German speakers are more future-oriented in various behaviors. The estimates in this Section need to be multiplied by approximately 32% to get the effective treatment effect as there is not perfect compliance at the language border (see Section 4). Similarly, online Appendix Table B1 shows the baseline results restricting the sample to individuals whose tax return language matches the predominant language in the language region where they live. As

[25] All winnings from gambling must be declared in the tax return, including tax-free winnings. A refundable withholding tax is levied on winnings from gambling that exceed a certain amount (see online Appendix C.1.2). If applied, it is always worth declaring the winnings in the tax return. However, there may be cultural differences in the declaration of winnings within the exemption limit. Thus, we also run regressions using only winnings above the exemption limit. The estimates remain practically unchanged.

[26] It is further rather unlikely that inheritance and gift drive the results through differences in the number of children. As Table 2 and also Steinhauer (2018) for the language border shows, German-speaking women have slightly fewer children than French-speaking women. The difference is, however, too small to account for the substantial LBC in wealth.

expected, the estimates are to some degree higher.

A comparison of the LBC with the naïve OLS estimates shows ambiguous results. For the retirement saving and education outcomes, the OLS estimates are of a magnitude higher, while the reverse is true for gambling and wealth. The differences in the findings may be due to unobserved heterogeneity. The local average treatment effect may thus not be generalized for municipalities that are far away from the border. It is only representative of individuals who live near the language border and who align themselves accordingly. On the other hand, the ambiguous results may alleviate the concern that sorting markedly affects our findings (e.g., that German speakers with rather "French preferences" move closer to or even across the language border). Moreover, as the results are consistently robust across all specifications, it seems rather unlikely that culture does not play its part in explaining the geographic variation in behavior.

6 Robustness Tests

In this section, we examine the robustness of our results to alternative specifications. First, online Appendix Table B2 explores how including additional municipality-level (column 2) and wealth controls (column 3) affect our estimates. To allow for comparisons, column (1) reports the results of our baseline estimates (column 3 of Table 3). Although wealth itself seems to be partially determined by culture, controlling for it does not qualitatively affect our estimates.

In column (4), we show the robustness of the results to a second-degree polynomial function of the running variable. By definition, this specification makes it harder to find a discontinuity. The results show that the language effect persists.

In columns (5) to (7), we fundamentally modify the running variable and the sample. The results are not affected if we use the distance in driving minutes instead of kilometers (column 5). We drop municipalities with a language majority of less than 65% in column (6). Hence, municipalities with a narrow language majority cannot serve as border municipalities when calculating the running variable (see also online Appendix C.2). Moreover, we exclude individuals living in these municipalities from the analysis. Not surprisingly, the differences between the language groups are more pronounced than in the baseline estimates.

In column (7), we only allow municipalities in the canton of Bern to function as language border municipalities. As a result, many German-speaking individuals living close to the German-French language border (but further away from the within-canton language border) are not included in the estimation anymore. The differences remain statistically significant, are, however, quantitatively less pronounced.

Second, we report results relying on alternative estimation techniques and specifications (online Appendix Table B3). For binary outcome variables, we test probit models as an alternative to the linear probability model. For retirement saving, we also test the full sample (i.e., including zero values) using OLS and separately estimate the intensive margin by logarithmic transformation of the dependent variable. For net wealth, we estimate a model without the IHS transformation of the outcome. All the results remain qualitatively unchanged.

Third, we check whether the treatment of married couples affects our results. In the main analysis, we use duplicates of married couples who constitute one tax unit, dividing financial values in half. This procedure may bias estimates (particularly gambling) as we assign the behavior of one spouse also to the other spouse. Online Appendix Table B4 reports the estimates using households instead of individuals as units of observations. As expected, the retirement saving contributions are of a magnitude higher, whereas the other outcomes are hardly affected. As the education outcome is available at the individual level, we do not estimate it using household units.

Fourth, we undertake a placebo analysis to test whether our outcomes are discontinuous at artificial cutoffs. As suggested by Imbens and Lemieux (2008), we look at jumps at the median of the running variable on either side of the cutoff value. Online Appendix Figure A5 shows estimates for the two placebo cutoffs along with the true cutoff. We do not observe statistically significant discontinuities at placebo cutoffs for most outcomes. The education coefficient in the French region subsample is the exception. However, we do not think that this result casts doubt on the validity of the empirical design. Many continuing education opportunities for the French speakers are locally concentrated near the border (especially in the city of Biel/Bienne). In addition, a few municipalities close to the border show only a weak language majority. It is thus not overly surprising that individuals close to the border show a higher probability to pursue education activities. In results not shown, the coefficient is not statistically significant anymore if we drop individuals whose language does not match the predominant language where they live.

Fifth, we run simple cross-sectional regressions (i.e., not including the distance as running variable) using the individual tax return language instead of the majority language variable. The results in online Appendix Table B5 do not alter the interpretation of the main results.

6.1 Decade-Long Difference-In-Differences

Has the effect of culture changed over time? Following Cottier (2018), we pool tax data of the years 2002/2003 (*period 1*) and 2012/2013 (*period 2*) and use a long difference-in-differences approach. Specifically, we estimate a modified version of equation (2):

$$\begin{aligned} y_{im} &= \alpha + \beta \,\text{German}_m + \gamma \,\text{Distance}_m + \delta \,\text{German}_m \times \text{Distance}_m \\ &\quad + \eta \,\text{German}_m \times \text{Period2} + \theta \,\text{Distance}_m \times \text{Period2} \\ &\quad + \kappa \,\text{German}_m \times \text{Distance}_m \times \text{Period2} \\ &\quad + \zeta \,\boldsymbol{X}_{im} + \epsilon_{it}, \end{aligned} \tag{5}$$

where *Period2* is a dummy equal to one for individual observations in the years 2012 and 2013. Year effects are included in $\boldsymbol{X}_{im}$. η captures the parameter of interest, i.e., the change in the language effect between the two periods. β provides the language effect in the first period.

Table 4 reports the results of equation (5), showing only the two relevant language coefficients. For all outcomes, the effect of language is statistically significant in the first period. There are no changes regarding retirement saving (intensive margin) and wealth over time. The LBC in continuing education and training may have decreased slightly. However, this result is not robust to various (unreported) robustness tests. Yet, there is a statistically and economically significant reduction in the LBC of the probability to save in voluntary private pension plans. The year effects (2012 and 2013; not reported in Table 4) show an increase of 19 to 20 percentage points compared to the earlier period. The differences between the language groups remain if we restrict the sample to those individuals who show up in all of the four observation years.

7 Mechanisms

We proceed with an examination of potential channels and transmission mechanisms underlying our findings. As the concept of culture is troublingly vague, it is challenging to precisely identify the channels through which culture influences individual behavior. We divide our analysis into three subsections: the impact of religion (Section 7.1), underlying preferences and norms (Section 7.2), and their cultural transmission (Section 7.3).[27]

[27] Differences in time preferences and future-oriented behavior could also partly be genetic. Analyzing Swedish twin data, Cronqvist and Siegel (2015) find that genetic differences can ex-

Table 4: Difference-in-differences in future-oriented behavior

	Retirement saving		Continuing education	Net wealth
	Ext. margin (1)	Int. margin (2)	(3)	(4)
German language	0.031***	389.506***	0.030***	1.152***
	(0.011)	(59.769)	(0.004)	(0.279)
German language × Period 2	-0.037***	10.120	-0.008*	0.018
	(0.013)	(53.445)	(0.004)	(0.139)
Mean dependent variable	0.55	3,528.32	0.08	7.12
Observations	420,117	232,563	556,036	556,036
Baseline controls	Yes	Yes	Yes	Yes

Notes: This table presents estimates of equation (5) for different outcomes. The dependent variables are the probability to save in voluntary private pension plans (column 1), the amount of contributions made given that a contribution was made (column 2), the probability to pursue continuing education and training (column 3), and net wealth (column 4). Net wealth is transformed using the IHS function (see footnote 17). All columns include a full set of control variables (as in Table 3, column 3). Retirement saving, net wealth, and gross income (control variable) are adjusted for inflation using the Consumer Price Index. Online Appendix Table C1 reports definitions and sources of the variables. Two-way cluster-robust standard errors in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

7.1 Religion

Apart from institutions, history, and language, culture is also "the result of and expressed through religion" (Temin, 1997, p. 268). At the individual level, religious affiliation is fairly stable over time and relatively easy to measure.[28] It is thus not surprising that the literature on the role of culture has used religion as proxy for culture (e.g., Guiso et al., 2006).

The German-French language border does not coincide with a religious border. In the canton of Bern, however, the proportion of Protestants is roughly 20 percentage points higher on the German-speaking side of the language border (see Table 2). Falk et al. (2018) show that patience is strongly correlated with the share of Protestants at the country level. In the spirit of Max Weber's Protestant ethic thesis (Weber, 1930), Protestantism could thus also be a possible cause for the observed differences in future-oriented behavior. We address this issue by

plain one third of the variation in saving propensities across individuals. The results further suggest that the individual's family environment moderates genetic predispositions and that the genes related to savings reflect genetic variation in time preferences.

[28]In our tax data, we observe if an individual is registered as a church member and thus pays a church tax. In Bern, as in most of the Swiss cantons, the parishes of the three national churches (Protestant, Roman Catholic and, if represented, Christian Catholic) have the privilege to collect a membership fee (church tax) through the ordinary tax returns.

controlling for the potentially confounding variable and by studying the effect of language group membership within groups of the same religious faith. This approach allows us to disentangle the role of language group membership from religious community membership.

Column (1) of Table 5 reports the results of our baseline estimates (column 3 of Table 3). Column (2) adds religious affiliation covariates (dummies for Catholic, Protestant, and other/no religion). Columns (3) to (5) split the sample by religious affiliation.

Table 5: Religion

	All (1)	All (2)	Protestants (3)	Catholics (4)	Other/none (5)
	A1. Retirement saving (extensive margin)				
German language	-0.003	-0.015	0.010	-0.013	-0.035**
	(0.012)	(0.012)	(0.018)	(0.019)	(0.016)
Protestant		0.070***			
		(0.005)			
Catholic		0.023***			
		(0.006)			
p-value of equality test		0.00		0.33	0.04
Mean dependent variable	0.62	0.62	0.67	0.61	0.55
Observations	218,681	218,681	117,091	42,276	59,314
	A2. Retirement saving (intensive margin)				
German language	435.055***	422.421***	462.442***	403.784***	263.630***
	(77.372)	(75.783)	(91.283)	(73.675)	(92.723)
Protestant		13.908			
		(21.233)			
Catholic		-51.884			
		(31.708)			
p-value of equality test		0.00		0.50	0.04
Mean dependent variable	4,100.93	4,100.93	4,154.20	3,977.18	4,071.18
Observations	136,035	136,035	77,873	25,725	32,437
	B. Continuing education and training				
German language	0.023***	0.022***	0.019***	0.023***	0.024***
	(0.004)	(0.004)	(0.004)	(0.006)	(0.009)
Protestant		0.002*			
		(0.001)			
Catholic		-0.004**			
		(0.002)			
p-value of equality test		0.00		0.53	0.62
Mean dependent variable	0.07	0.07	0.07	0.06	0.06
Observations	281,482	281,482	152,676	52,097	76,709

Table 5 (continued)

	All (1)	All (2)	Protestants (3)	Catholics (4)	Other/none (5)
	C. Gambling				
German language	-0.009***	-0.009***	-0.016***	-0.005	0.005
	(0.003)	(0.003)	(0.004)	(0.006)	(0.004)
Protestant		0.002***			
		(0.001)			
Catholic		0.002**			
		(0.001)			
p-value of equality test		0.77		0.10	0.00
Mean dependent variable	0.01	0.01	0.02	0.02	0.01
Observations	274,554	274,554	175,397	52,757	46,400
	D. Net wealth (IHS transf.)				
German language	1.140***	0.921***	1.011***	0.713***	0.785***
	(0.244)	(0.231)	(0.276)	(0.213)	(0.270)
Protestant		1.260***			
		(0.068)			
Catholic		0.189*			
		(0.099)			
p-value of equality test		0.00		0.21	0.44
Mean dependent variable	7.06	7.06	7.97	6.21	5.82
Observations	281,482	281,482	152,676	52,097	76,709
Baseline controls (all panels)	Yes	Yes	Yes	Yes	Yes
Religion controls (all panels)	No	Yes	No	No	No

Notes: This table presents estimates of equation (2) for different samples. Column (1) shows the baseline results from Table 3, column (2) adds religious affiliation covariates (dummies for Catholic, Protestant, and other/no religion). Columns (3)–(5) split the sample by religious affiliation. The dependent variables are the probability to save in voluntary private pension plans (panel A1), the amount of contributions made given that a contribution was made (panel A2), the probability to pursue continuing education and training (panel B), the probability of engaging in gambling activity (panel C), and net wealth (panel D). Net wealth is transformed using the IHS function (see footnote 17). All columns include a full set of control variables (as in Table 3, column 3). The table reports *p*-values for testing the equality of the coefficients *Protestant* and *Catholic* in column (2). In columns (4) and (5), the *p*-values are for testing the language coefficients of columns (3) and (4), and of (3) and (5), respectively. Online Appendix Table C1 reports definitions and sources of the variables. In contrast to the other outcomes, gambling is based on data from different years. Two-way cluster-robust standard errors in parentheses. Significance levels: $^{*}\ p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$.

Controlling for religious affiliation hardly affects the LBC. Moreover, the language effect is still mostly persistent when comparing individuals with the same religious faith. The estimates for Catholics and Protestants are not statistically different at conventional levels (see *p*-values of equality test in column 4). Although we need to be careful about causal interpretation, the estimates of model (2) suggest that religion may partially shape future-oriented behavior through its own channels.[29] Consistent with literature documenting related patterns (Basten and Betz, 2013; Nunziata and Rocco, 2016), primarily Protestantism seems to be associated with long-term orientation.[30] Protestants are significantly more likely to save in voluntary pension plans and dispose over much more wealth. Surprisingly, in the sample of individuals with other/no religious affiliation, speaking German seems to slightly reduce the probability of saving in voluntary pension plans. However, we do not attach too much weight to this result, since it is not robust to various (unreported) robustness tests.[31]

7.2 Preferences and Norms

In an experimental setting, Sutter et al. (2018) present evidence for a link between language group affiliation and time preferences. They further find that German speakers are more likely to save money than Italian speakers. The authors interpret their findings as evidence for a direct channel between intertemporal preferences and saving behavior. In the following, we attempt to assess this claim: Does patience promote future-oriented behavior? Analyzing additional outcomes in the tax data, we examine if there exist differences in other preferences that may also explain the documented LBC.

[29] In addition, differences in cultural values and norms across the language groups might have been historically shaped by religion.

[30] Basten and Betz (2013) show that religious affiliation affects political preferences and may also lead to differences in economic outcomes in Switzerland. Protestants favor less leisure time and less redistribution than Catholics. Nunziata and Rocco (2016) find that Protestants show a higher propensity for entrepreneurship.

[31] How could we reconcile the retirement saving result with the other findings? Differences in the level of information are one possible explanation. Specifically, individuals of foreign origin with a different cultural background may lack the necessary information on the Swiss pension system. The observed negative effect may arise, for example, if there are relatively more individuals (e.g., foreigners) on the German-speaking side who do no not understand the pension system and its tax-incentives. Similarly, the effect may occur if foreigners of francophone origin (and hence with an advantage in terms of economic, social, and cultural integration) settle on the French-speaking side, whereas many with a non-Swiss mother tongue (and hence with linguistic disadvantages) settle on the German-speaking side. In the light of these issues, we argue that the intensive margin provides a more accurate picture of the individuals' saving decision. It narrows the analysis to the behavior of individuals who understand the pension system and its tax-incentives. However, we do not have indications for heterogeneity in the composition of foreigners. Because we lack further information (e.g., on citizenship and other faiths), our answers necessarily remain speculative.

7.2.1 Altruism and Risk Sharing

According to Hofstede's cultural dimensions theory (Hofstede et al., 2010, p. 95), French-speaking Swiss place a higher value on collectivism (vs. individualism) than the German-speaking Swiss.[32] Whereas people in individualist societies primarily look after themselves, collectivist societies value a tightly knit social framework in which individuals also take care of other group members. We thus hypothesize – similar to Guin (2017) – that French speakers may show less future-oriented behavior because they expect their social network to look after them in times of need. For example, precautionary savings (leading to wealth accumulation) may seem less important if individuals can rely on a large personal network of friends and relatives (Ortigueira and Siassi, 2013).

Such risk sharing arrangements work either through altruism or reciprocity (e.g., Posner, 1980). Moreover, *baseline altruism* (i.e., altruism towards strangers) is related to altruistic behavior towards close friends (e.g., Leider et al., 2009). Hence, we use data on charitable donations as a proxy for the risk sharing hypothesis. If the French language group puts emphasis on supportive social networks, it should also show increased altruistic behavior.

Table 6 presents the results for the effect of culture on altruistic behavior. In panel A1, the dependent variable is binary indicating whether an individual makes a charitable contribution. Panel A2 shows the log amount of contributions made (conditional on having donated), panel A3 shows the contributions as a percentage of gross income. All three panels reveal no statistically robust differences between the language groups. In the few specifications where the German language coefficient is statistically significant, its sign is positive. Thus, our data do not support the risk sharing hypothesis.[33]

7.2.2 Risk Preferences

Studies have shown that time and risk preferences are related and that the latter can also drive intertemporal choices (e.g., Dohmen et al., 2010; Andersen et al., 2008). Cultural differences in future-oriented behavior could thus also be the result of systematic differences in risk attitudes.

[32] The difference between the two groups is, however, not huge: 69/100 (German speakers) vs. 64/100 (French speakers), lower scores indicating a more collectivist society. As a country, Switzerland is considered as an individualist society.

[33] However, it is a priori not clear how altruism would affect future-oriented behavior. We could also develop arguments for the existence of a positive relationship. For example, in a study of children, Angerer et al. (2015) find that altruistic behavior increases with patience, albeit the relation is non-linear. The authors explain this finding by the intertemporal nature of altruism. The costs occur immediately, while a possible beneficial effect of altruism (i.e., reciprocity) pays off only at a later date.

Table 6: Effect of culture on charitable contributions and life insurance holdings

Bandwidth	30 km					20 km	40 km
	(1)	(2)	(3) Baseline	(4)	(5)	(6)	(7)
	A1. Charitable contributions (extensive margin)						
German language	0.019	0.011	0.019	0.013	0.010	0.019	-0.016
	(0.037)	(0.036)	(0.030)	(0.031)	(0.029)	(0.035)	(0.033)
Mean dependent variable	0.76	0.76	0.76	0.76	0.76	0.77	0.74
Observations	281,482	281,482	281,482	281,482	281,482	145,540	521,507
	A2. Charitable contributions (log amount; intensive margin)						
German language	0.042	0.040	0.083*	0.071	0.074	0.112**	0.048
	(0.035)	(0.050)	(0.050)	(0.051)	(0.052)	(0.045)	(0.048)
Mean dependent variable	5.73	5.73	5.73	5.73	5.73	5.70	5.74
Observations	214,729	214,729	214,729	214,729	214,729	111,493	383,994
	A3. Charitable contributions (income share)						
German language	0.000	0.000	0.001*	0.001	0.000	0.001***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mean dependent variable	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Observations	281,482	281,482	281,482	281,482	281,482	145,540	521,507

Table 6 (continued)

Bandwidth	30 km					20 km	40 km
	(1)	(2)	(3) Baseline	(4)	(5)	(6)	(7)
	B. Life insurance policy						
German language	-0.006	-0.012	-0.010	-0.021	-0.019	-0.014	-0.015
	(0.020)	(0.015)	(0.015)	(0.015)	(0.014)	(0.020)	(0.013)
Mean dependent variable	0.22	0.22	0.22	0.22	0.22	0.23	0.19
Observations	281,482	281,482	281,482	281,482	281,482	145,540	521,507
Controls (all panels)							
Individual controls	No	Yes	Yes	Yes	Yes	Yes	Yes
Municipality characteristics	No	No	Yes	Yes	Yes	Yes	Yes
Wealth	No	No	No	Yes	No	No	No
Religion	No	No	No	No	Yes	No	No

Notes: This table presents estimates of equation (2) for different specifications and bandwidths. All columns show local border contrast estimates, controlling for the road distance to the language border, a year effect, and different sets of covariates. Column (2) adds individual controls (age, age squared, gender, marital status, number of dependents, income, dual earner couple, residential property, self-employed, and agricultural worker). Columns (3)–(7) also include municipality characteristics (education levels, foreign residents, foreign speakers, tax level, and large city). In addition, column (4) controls for net wealth, column (5) includes religious affiliation covariates (dummies for Catholic, Protestant, and other/no religion). The dependent variables are the probability of making a charitable contribution (panel A1), the log amount of contributions made given that a contribution was made (panel A2), the contributions as a percentage of gross income (panel A3), and the probability of life insurance holding (panel B). Online Appendix Table C1 reports definitions and sources of the variables. Two-way cluster-robust standard errors in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

One possible approach to disentangle time preferences from risk aversion is to analyze insurance choice. Assuming that insurers do not supply insurance contracts at actuarially fair prices, more risk averse individuals should buy more insurance. On the other hand, the literature suggests that patience may relate positively with (life) insurance uptake (e.g., Lambregts and Schut, 2020; Horn and Kiss, 2020).

Panel B of Table 6 shows the results for the effect of culture on the probability to own a life insurance policy. If German speakers were relatively less risk seeking, they would buy more insurance than their French-speaking fellow citizens. The results do not confirm such a hypothesis. The point estimates are rather close to zero in all specifications and not statistically significant.

In a further test, we repeat the main analysis from Section 5 but now controlling for charitable donations and life insurance uptake. As online Appendix Table B6 shows, including these proxies for risk sharing and risk preferences does not affect the LBC. Remarkably though, we find strongly significant correlations between the proxies and our outcomes. Whereas the effect of risk aversion is ambiguous, altruism seems to positively affect future-oriented behavior (except for gambling). However, the relationship may well be spurious and should not be interpreted causally.

The findings in Table 6 and online Appendix Table B6 suggest that the documented LBC is not caused by differences in altruism or risk aversion. Instead, the evidence, albeit not exhaustive, is consistent with the time preference hypothesis.

7.3 Cultural Transmission

Simply put, there are two possible channels of cultural transmission (Cavalli-Sforza and Feldman, 1981; Bisin and Verdier, 2011): First, parents transmit values to their offspring (*vertical transmission*). Second, an individual's values are shaped by the community, e.g., through colleagues and local neighbors (*horizontal transmission*).[34] Focusing on the latter, we analyze individuals that are particularly strongly exposed to other cultures. We examine individual behavior in the bilingual city of Biel/Bienne (Section 7.3.1), individuals whose mother tongue does not match the language of the region they live in (Section 7.3.2), and linguistically heterogeneous couples (Section 7.3.3). These analyses can provide important clues about the relevance of the two modes of transmission. If hori-

[34]Cavalli-Sforza and Feldman (1981) also discuss the mode of *oblique transmission*, i.e., cultural transmission from the parental generation (but not the parents themselves) to the offspring.

zontal transmission of culture plays an important role in future-oriented behavior, we would expect less pronounced differences between speakers of the two languages in these settings. Such results would contradict the linguistic-savings hypothesis of Chen (2013).

7.3.1 Bilingual City of Biel/Bienne

In this section, we take advantage of bilingualism in the city of Biel/Bienne, where 57% of the population speak German and 43% speak French.[35] Biel/Bienne provides an interesting setting as both language groups are highly integrated, share a similar cultural environment, and tend to speak the other language particularly well and regularly (Werlen, 2000, 2.5, 3.6).[36] Furthermore, there is no residential segregation by language (Werlen, 2005).

Do our results differ when restricting the analysis to people living in a bilingual environment? Column (1) in Table 7 states the baseline results (as in Table 3), column (2) contains the effect using only native speakers (as in Table B1). In columns (3) to (5), we present the results for the municipality of Biel/Bienne. Column (3) uses all data, column (4) excludes linguistically heterogeneous couples, column (5) only includes residents who have already been living in the municipality ten years before. By doing so, we make sure that there was time for horizontal cultural transmissions to take place. As we use the tax return language to assign individuals to the language regions, we consequently compare the results of the Biel/Bienne sample primarily with native speakers. We report p-values for testing the equality of the coefficients between the subsamples (Chow test), i.e., between columns (3) and (2), (4) and (2), and (5) and (2), respectively.

Interestingly, German-speaking residents in the city of Biel/Bienne are roughly 2 percentage points more likely to save in voluntary private pension plans. On the intensive margin, they also contribute substantially higher amounts than their French-speaking counterparts. Moreover, German speakers dispose over more wealth and are more likely to pursue continuing education

[35] These figures are based on the municipal register that only allows for the two official languages (as of January 2020). However, foreigners (accounting for roughly one third of the resident population) and multilingualism put the figures into perspective. According to survey data of 2020, 51.3% indicated (Swiss) German as their main language, 40.8% French, 9% Italian, and 29.9% stated a non-national language (FSO, 2022b). Individuals could indicate more than one language. The proportion of the French-speaking population and the number of foreigners have gradually increased over the years.

[36] Even though Switzerland is a multilingual country, only a small minority are bi- or even multilingual. Many are, however, proficient in at least one of the other national languages, which is also supported by the education system.

Table 7: Bilingual municipality of Biel/Bienne

	All municipalities excl. Biel/Bienne		Municipality of Biel/Bienne		
	Baseline	Native speakers	Baseline	No ling. heterog. couples	Long-term residents
	(1)	(2)	(3)	(4)	(5)
	A1. Retirement saving (extensive margin)				
German language	-0.003	0.000	0.021***	0.022***	0.026**
	(0.012)	(0.012)	(0.007)	(0.008)	(0.011)
p-value of equality test			0.07	0.06	0.03
Mean dependent variable	0.62	0.62	0.42	0.41	0.50
Observations	218,681	210,205	33,530	31,376	16,005
	A2. Retirement saving (intensive margin)				
German language	435.055***	530.614***	428.512***	461.461***	399.546***
	(77.372)	(75.088)	(49.189)	(53.531)	(66.992)
p-value of equality test			0.17	0.36	0.08
Mean dependent variable	4,100.93	4,105.04	3,828.39	3,866.39	3,906.48
Observations	136,035	130,832	14,129	12,995	8,054
	B. Continuing education and training				
German language	0.023***	0.030***	0.024***	0.025***	0.016***
	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)
p-value of equality test			0.12	0.22	0.00
Mean dependent variable	0.07	0.07	0.06	0.06	0.05
Observations	281,482	270,094	42,685	39,756	20,297
	C. Gambling				
German language	-0.009***	-0.012***	-0.003*	-0.003*	
	(0.003)	(0.003)	(0.002)	(0.002)	
p-value of equality test			0.00	0.00	
Mean dependent variable	0.01	0.01	0.01	0.01	
Observations	274,554	264,638	39,755	36,578	

Table 7 (continued)

	All municipalities excl. Biel/Bienne		Municipality of Biel/Bienne		
	Baseline	Native speakers	Baseline	No ling. heterog. couples	Long-term residents
	(1)	(2)	(3)	(4)	(5)
	D. Net wealth (IHS transf.)				
German language	1.140***	1.327***	0.654***	0.728***	0.638***
	(0.244)	(0.248)	(0.076)	(0.081)	(0.120)
p-value of equality test			0.01	0.02	0.01
Mean dependent variable	7.06	7.10	5.05	5.07	5.84
Observations	281,482	270,094	42,685	39,756	20,297
Baseline controls (all panels)	Yes	Yes	Yes	Yes	Yes

Notes: This table presents estimates of equation (2) for different samples. Column (1) shows the baseline results from Table 3, column (2) uses only native speakers. Columns (3) to (5) present results including only individuals living in the municipality of Biel/Bienne. Column (3) uses all individuals, column (4) excludes linguistically heterogeneous couples, column (5) excludes residents who have not already been living in the municipality ten years before (for details, see online Appendix C.1.1). The dependent variables are the probability to save in voluntary private pension plans (panel A1), the amount of contributions made given that a contribution was made (panel A2), the probability to pursue continuing education and training (panel B), the probability of engaging in gambling activity (panel C), and net wealth (panel D). Net wealth is transformed using the IHS function (see footnote 17). Columns (1) and (2) include a full set of control variables (as in Table 3, column 3), columns (3)–(5) only control for individual characteristics. The table reports p-values for testing the equality of the coefficients between columns (3) and (2), (4) and (2), and (5) and (2), respectively. Online Appendix Table C1 reports definitions and sources of the variables. In contrast to the other outcomes, gambling is based on data from different years. Two-way cluster-robust standard errors in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

and training. Only the coefficients on gambling activity are statistically only weakly significant, though still negative. The estimates thus confirm the results from Section 5 that there are substantial differences in future-oriented behavior between the two language groups – even in a rather integrated cultural environment. Comparing the Biel/Bienne coefficients with the native speakers in column (2), the estimates are quantitatively ambiguous. Hence, the results do not allow us to draw clear conclusions with respect to the transmission of culture.

7.3.2 Nonnatives

Another approach to examine if individuals adapt to local culture is to look at individuals whose mother tongue does not match the predominant language in the language region where they live. We are interested in the behavior of French-speaking (German-speaking) individuals who live on the German-side (French-side) of the language border. We refer to an individual as *native* or *nonnative* depending on the mother tongue and the predominant language in the municipality of residence. Using the bandwidth of 30 kilometers and dropping linguistically heterogeneous couples (separate analysis in Section 7.3.3), there are 6,206 French-speaking and 1,540 German-speaking nonnatives in our data.

Table 8 shows whether native and nonnative speakers show the same behavior. We also present estimates only including individuals who have already been living in the same language region ten years before.[37] Each column includes the p-value from a test of equality of the coefficients *Native* $\times$ *German l.* and *Nonnative* $\times$ *German l.*

Compared to native French speakers (reference group), nonnative and native German speakers contribute higher amounts into the pension scheme. Remarkably, this finding also applies to French-speaking individuals residing in the German language region, although to a lesser extent. A similar picture emerges analyzing continuing education and gambling. Nonnative French speakers gamble less and are probably more likely to pursue further education. An exception is wealth. For this outcome, the nonnative German speakers are not statistically different from the French-speaking natives. Except for wealth, there is no rejection of equality between the two German-speaking groups (at the 5% level). The results indicate that – at least for the French speakers –

[37] As in the baseline estimates, we exclude individuals living in the bilingual city of Biel/Bienne. To determine the language region history of an individual, we assign Biel/Bienne to the German language region (based on the language majority). The results remain unchanged if we categorize Biel/Bienne as being part of the French or both the German and French language region.

Table 8: Nonnatives

	Retirement saving				Continuing education		Gambling	Net wealth	
	Ext. margin		*Int. margin*						
	(1)	Long-term residents (2)	(3)	Long-term residents (4)	(5)	Long-term residents (6)	(7)	(8)	Long-term residents (9)
Native × German l.	0.000	0.010	533.047***	608.818***	0.030***	0.029***	-0.011***	1.312***	1.330***
	(0.012)	(0.015)	(76.511)	(79.211)	(0.004)	(0.004)	(0.003)	(0.242)	(0.328)
Nonnative × German l.	-0.005	-0.027	460.434***	635.296**	0.046***	0.035***	-0.009***	0.160	0.232
	(0.029)	(0.038)	(134.590)	(261.935)	(0.008)	(0.013)	(0.003)	(0.306)	(0.373)
Nonnative × French l.	-0.022	-0.033	232.163**	269.871**	0.011*	0.006	-0.009**	0.363	0.344
	(0.016)	(0.022)	(99.282)	(131.839)	(0.006)	(0.007)	(0.004)	(0.251)	(0.372)
p-value of equality test	0.88	0.37	0.60	0.92	0.06	0.62	0.49	0.00	0.01
Mean dependent variable	0.62	0.69	4,103.85	4,149.64	0.07	0.06	0.01	7.07	7.74
Observations	216,100	153,996	134,241	106,107	277,840	201,761	271,019	277,840	201,761
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table presents estimates of a modified version of equation (2) for different samples. *Natives* (*nonnatives*) are individuals whose tax return language (see Section 3) does (does not) match the predominant language in the language region where they live. For example, *Nonnative* × *German l.* denotes German-speaking individuals who live in the French language region. Except for gambling, the table also presents estimates only including individuals who have already been living in the same language region ten years before (for details, see online Appendix C.1.1). The dependent variables are the probability to save in voluntary private pension plans (columns 1 and 2), the amount of contributions made given that a contribution was made (columns 3 and 4), the probability to pursue continuing education and training (columns 5 and 6), the probability of engaging in gambling activity (column 7), and net wealth (columns 8 and 9). Net wealth is transformed using the IHS function (see footnote 17). All columns include a full set of control variables (as in Table 3, column 3). Each column includes the *p*-value from a test of equality of the coefficients *Native* × *German l.* and *Nonnative* × *German l.* Online Appendix Table C1 reports definitions and sources of the variables. In contrast to the other outcomes, gambling is based on data from different years. Two-way cluster-robust standard errors in parentheses. Significance levels: $^{*}\ p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$.

horizontal cultural transmissions may take place to some extent. However, we should be cautious in interpreting the results as they may suffer from endogeneity. The results are biased if there is some sort of selection regarding individuals moving across the language border.

7.3.3 Linguistically Heterogeneous Couples

While most of the couples in our sample are linguistically homogeneous, 6,552 individual/year observations differ in the spouses' tax return language (see Section 3).[38] This allows us to analyze whether there are linguistic spillovers within a linguistically heterogeneous household: Are French-speaking individuals with German-speaking spouses more likely to exhibit future-oriented behavior than spouses who both speak French?

In Table 9, we restrict the sample to married couples. For each outcome, we run two regressions: First, we compare couples in which both spouses speak French (reference group) to couples who both speak German and to linguistically heterogeneous couples, respectively (odd columns). Second, the even columns pay attention to whether the husband or the wife speaks German (French) in heterogeneous couples. The table also reports the *p*-values for testing the equality of means across treatments. In even columns, they test the equality across the coefficients of linguistically heterogeneous couples.

Except for the extensive margin in retirement saving, both German-speaking couples as well as linguistically heterogeneous couples exhibit increased future-oriented behavior. Although the point estimates of the latter are quantitatively lower (but over half the effect of German-speaking couples), we can reject the equality between the coefficients only for the retirement saving outcomes (at the 5% level).

The results indicate that there may be cultural spillovers within a household. As in the previous section, we should be cautious in interpreting the results as they may suffer from endogeneity. The results are biased if there is some sort of selection regarding the marriage choices. For example, we would overestimate the impact of language if linguistically homogeneous marriages reflected a stronger attachment to the own culture (Gay et al., 2018).

[38] Almost half of these couples living in the bilingual city of Biel/Bienne. We also include them in the following analysis.

Table 9: Linguistically heterogeneous couples

	Retirement saving				Continuing education		Gambling		Net wealth	
	Ext. margin		*Int. margin*							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Same × German l.	0.024***	0.024***	446.300***	447.221***	0.020***	0.021***	-0.007***	-0.007***	0.941***	0.935***
	(0.007)	(0.007)	(40.632)	(40.406)	(0.002)	(0.002)	(0.002)	(0.002)	(0.176)	(0.178)
Different	0.002		269.025***		0.014***		-0.006**		0.633***	
	(0.012)		(67.730)		(0.004)		(0.003)		(0.108)	
Different × wife German l.		-0.005		284.234***		0.015**		-0.003		0.645***
		(0.015)		(102.563)		(0.006)		(0.004)		(0.140)
Different × husband German l.		0.015		256.559***		0.013***		-0.009***		0.605***
		(0.010)		(70.870)		(0.004)		(0.003)		(0.133)
p-value of equality test	0.04	0.11	0.01	0.81	0.07	0.72	0.47	0.21	0.14	0.81
Mean dependent variable	0.70	0.70	3,812.09	3,810.46	0.05	0.05	0.02	0.02	6.45	6.45
Observations	138,142	137,682	97,264	96,913	190,988	190,326	206,942	206,910	190,988	190,326
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table presents estimates of a modified version of equation (2) restricting the sample to married couples. *Different* indicates a linguistically heterogenous couple. Odd columns compare French-speaking couples (reference group) to German-speaking and to linguistically heterogenous couples. Even columns differentiate between the spouses in linguistically heterogenous couples. For example, *Different × wife German l.* denotes a couple with a German-speaking wife and a French-speaking husband. The dependent variables are the probability to save in voluntary private pension plans (columns 1 and 2), the amount of contributions made given that a contribution was made (columns 3 and 4), the probability to pursue continuing education and training (columns 5 and 6), the probability of engaging in gambling activity (columns 7 and 8), and net wealth (columns 9 and 10). Net wealth is transformed using the IHS function (see footnote 17). All columns include a full set of control variables (as in Table 3, column 3; except for marital status). Each column includes the *p*-value from a test of equality of the coefficients *Same × German l.* and *Different* (odd columns) and *Different × wife German l.* and *Different × husband German l.* (even columns), respectively. Online Appendix Table C1 reports definitions and sources of the variables. In contrast to the other outcomes, gambling is based on data from different years. Two-way cluster-robust standard errors in parentheses. Significance levels: $^{*}\ p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$.

8 Conclusions

We empirically show that culture matters for economic outcomes. Individuals in the German-speaking part of Switzerland are more prone to future-oriented behavior than their French-speaking fellow citizens. We focus on the within-canton language border in the canton of Bern, where the share of German speakers jumps from roughly 20% to over 80% within a few kilometers. Compared to French speakers, they save more for retirement, are more likely to pursue continuing education and training, less likely to gamble, and dispose over higher wealth. The results are robust to various model specifications.

We find no evidence that our results are driven by religion or that they reflect differences in risk aversion or altruism (risk sharing). Our findings are thus consistent with Sutter et al. (2018), who explain the differences among the language groups by differences in time preferences. Additional analyses further reveal that individuals may indeed partially change behavior by adapting to local (or within-household) culture. However, these results may suffer from endogeneity. Moreover, remaining differences and, not least, the substantial treatment effects within the bilingual city of Biel/Bienne suggest that vertically transmitted values and norms are likely to play an important role in explaining future-oriented behavior.

The findings stress the benefits of federalism. Policies that aim to foster future-oriented behavior (e.g., through public campaigns or tax-incentives) could address the varying cultural contexts. By contrast, centralized "one size fits all"-solutions may not work everywhere and are hardly employed in a welfare-maximizing way.

Apart from personal choices, differences in discounting the future may also affect a broad range of policy preferences that entail (probably vague) future rewards but salient short-term costs. Examples include reforms of social security programs, market economy reforms, or measures to deal with climate change. Policy makers are thus well-advised to make economic policies that bear in mind the existing differences in preferences and behavior originating from different cultural backgrounds. In future research, it would be interesting to further investigate the links between culture, language, and behavior, and to identify which aspects help to facilitate long-term orientation.

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Online Appendices

Mind Your Language: The Role of Culture in Future-Oriented Behavior

Patrick Leisibach and Christoph A. Schaltegger

Contents

A Additional Figures

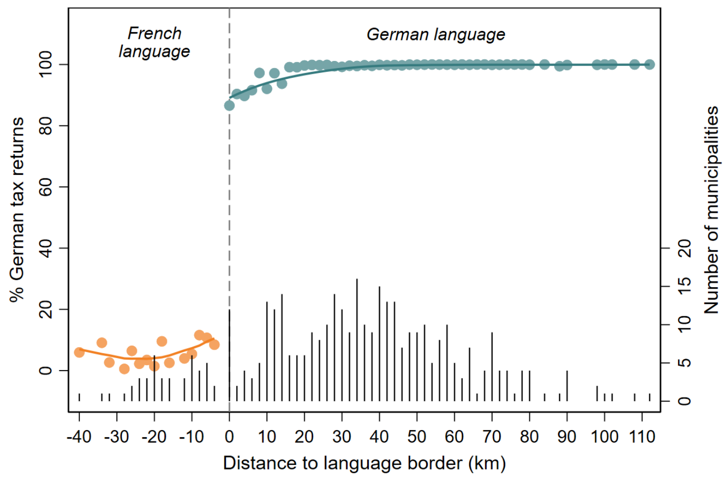

Figure A1: Share of German tax returns by distance to the language border in the canton of Bern

Notes: Share of individuals who deal with the cantonal administration in German as a function of the driving distance to the language border. There are two available options in dealings with the cantonal authorities (e.g., filling out the tax return): German and French. Positive distance values indicate German-speaking municipalities, negative distance values indicate French-speaking municipalities. Scatter points show individual level averages for distance bandwidths of 2 km (left axis). Lines are locally weighted regression estimates (bandwidth 0.8). The vertical lines show the number of municipalities for the binned 2-km-intervals (right axis). The sample is based on the year 2012 and includes individuals according to the restrictions discussed in Section 3. The figure excludes the bilingual city of Biel/Bienne.

Source: Own calculations based on tax data (tax return language), Federal Statistical Office (Swiss census 2000; language region data), and Google Maps (road distances).

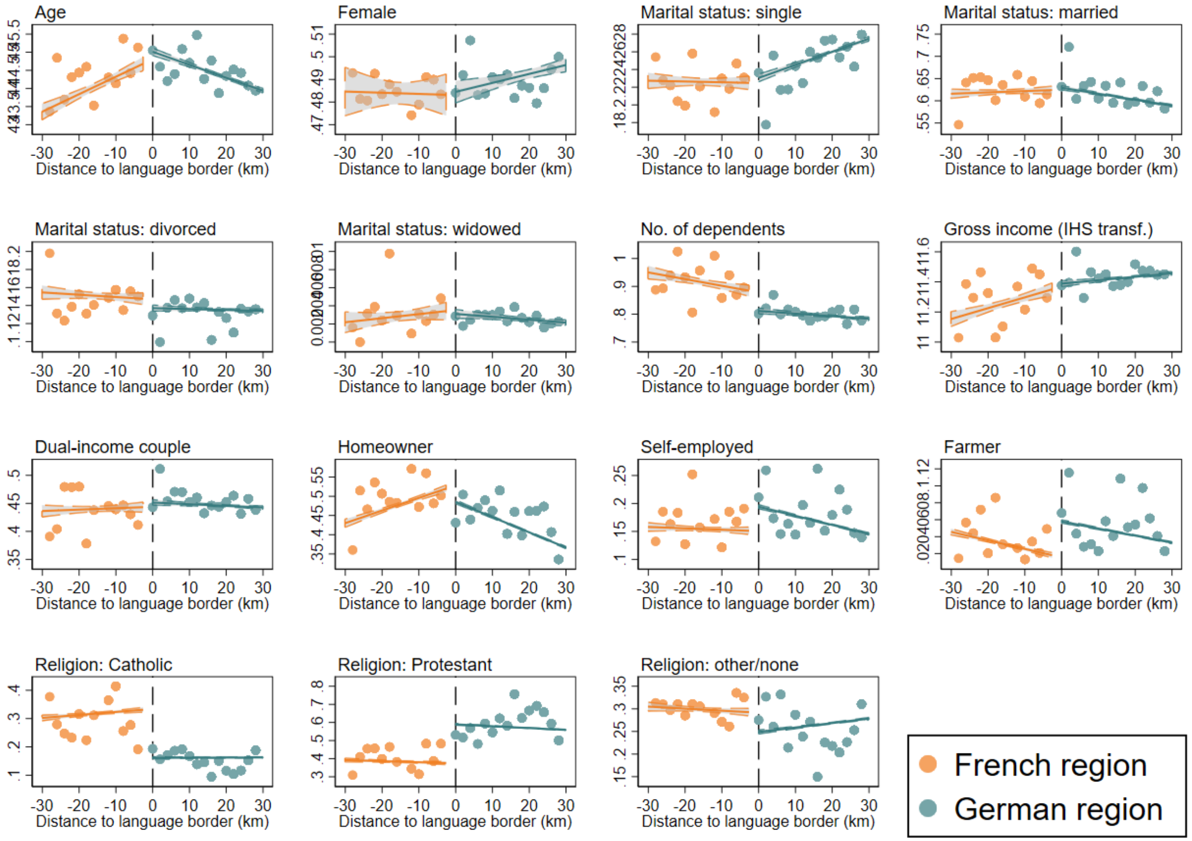

Figure A2: Individual characteristics

Notes: The figure plots individual characteristics by distance to the language border. See online Appendix Table C1 for definitions of the variables. The distance to the language border is negatively coded for French-speaking municipalities and positively for German-speaking municipalities. Dots correspond to data aggregated into 2-km bins, while the lines are linear regression estimates based on all underlying observations with 95% confidence intervals displayed.

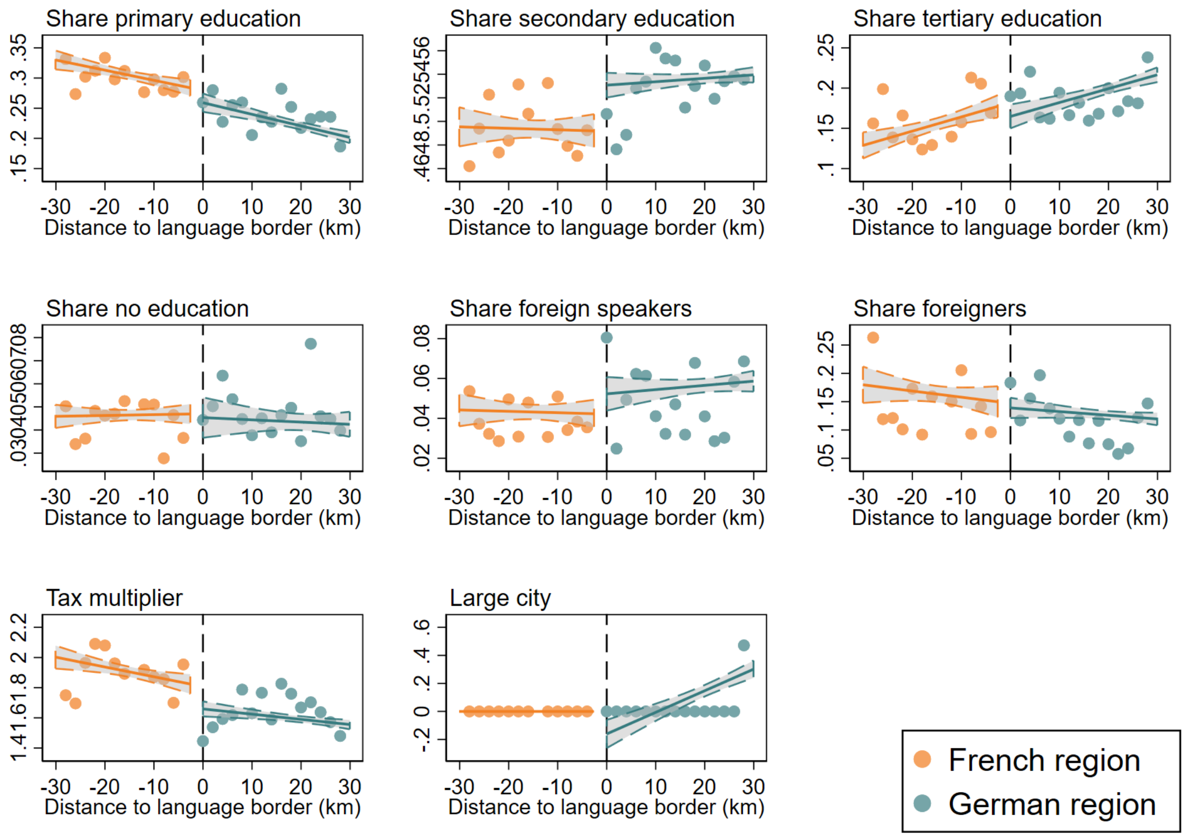

Figure A3: Municipality characteristics (basic)

Notes: The figure plots municipality characteristics by distance to the language border. See online Appendix Table C1 for definitions of the variables. The distance to the language border is negatively coded for French-speaking municipalities and positively for German-speaking municipalities. Dots correspond to data aggregated into 2-km bins, while the lines are linear regression estimates weighted by the number of observations in the sample with 95% confidence intervals displayed.

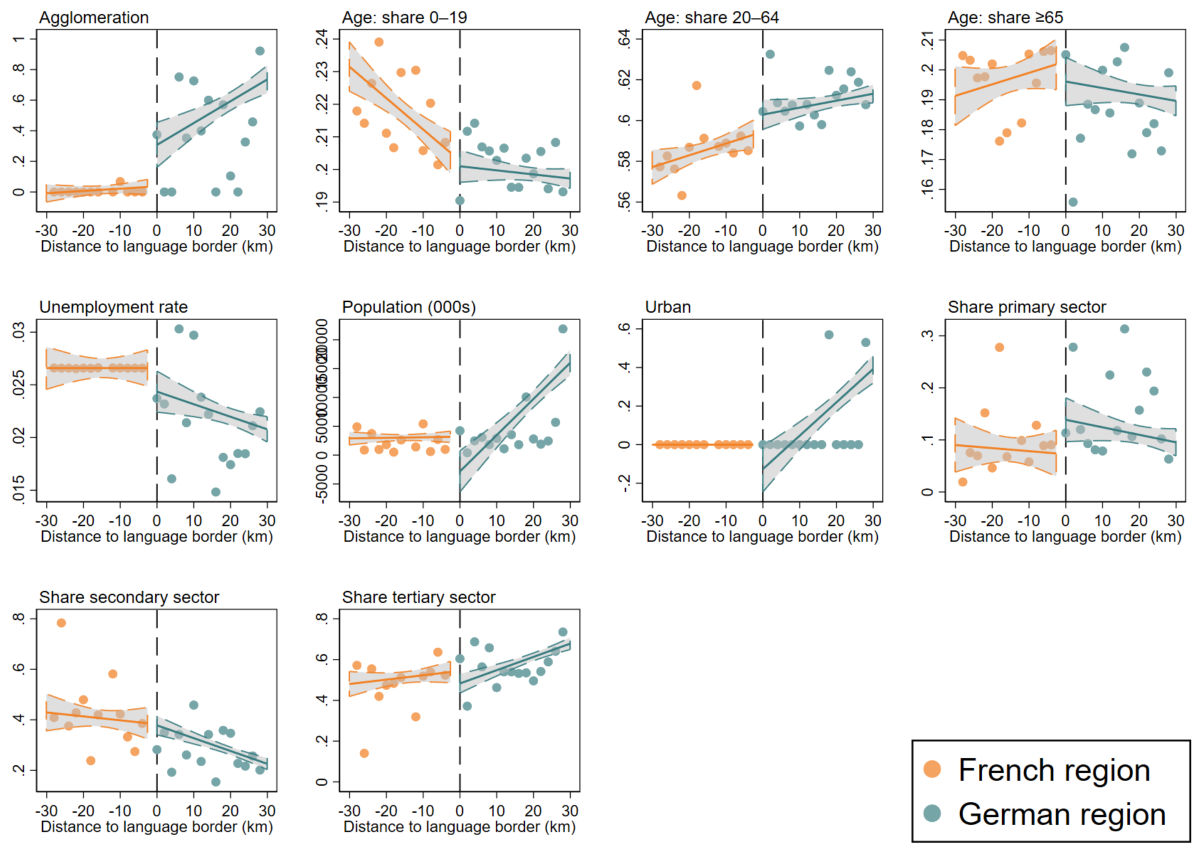

Figure A4: Municipality characteristics (extended)

Notes: The figure plots municipality characteristics by distance to the language border. See online Appendix Table C1 for definitions of the variables. The distance to the language border is negatively coded for French-speaking municipalities and positively for German-speaking municipalities. Dots correspond to data aggregated into 2-km bins, while the lines are linear regression estimates weighted by the number of observations in the sample with 95% confidence intervals displayed.

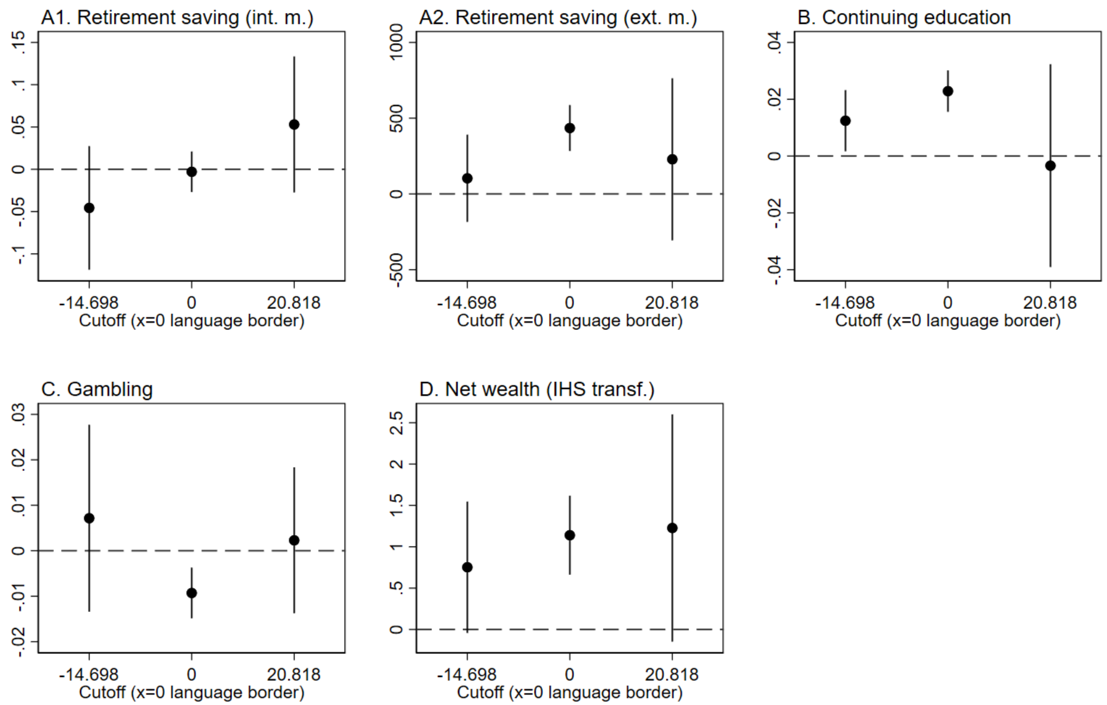

Figure A5: Placebo cutoffs

Notes: The figure shows LBC estimates (see equation 2) for the effect of culture on different outcomes at the true cutoff value along with placebo cutoffs, with 95% confidence intervals displayed. For the placebo test, we split both language region subsamples at the median of the running variable on either side of the cutoff value. Thus, estimates at the placebo cutoffs use only observations on the same side of the true language border. The bandwidth is 30 kilometers. The dependent variables are (A1) the probability to save in voluntary private pension plans, (A2) the amount of contributions made given that a contribution was made, (B) the probability to pursue continuing education and training, (C) the probability of engaging in gambling activity, and (D) net wealth. Net wealth is transformed using the IHS function (see footnote 17). All regressions include a full set of control variables (as in Table 3, column 3). Online Appendix Table C1 reports definitions and sources of the variables. In contrast to the other outcomes, gambling is based on data from different years.

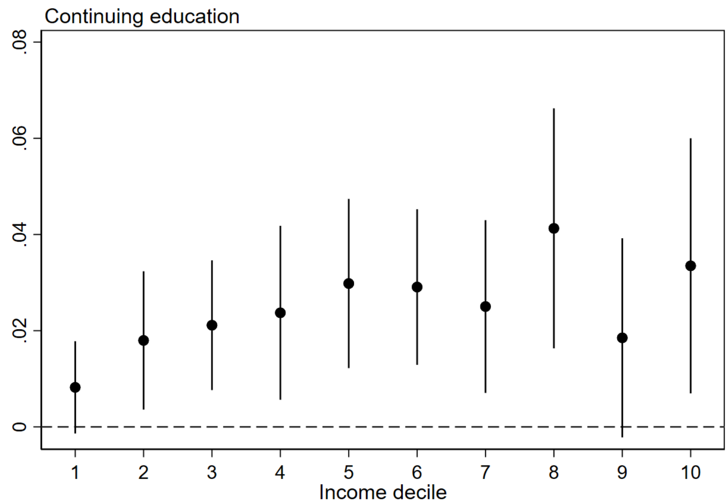

Figure A6: Effect of culture on continuing education by income decile

Notes: The figure plots the estimated LBC (see equation 2) for the effect of culture on the probability to pursue continuing education and training by income decile. The bandwidth is 30 kilometers. Each marker is the coefficient from running a regression including a full set of control variables (as in Table 3, column 3) but only using individuals of a given income decile, with 95% confidence intervals displayed. Online Appendix Table C1 reports definitions and sources of the variables.

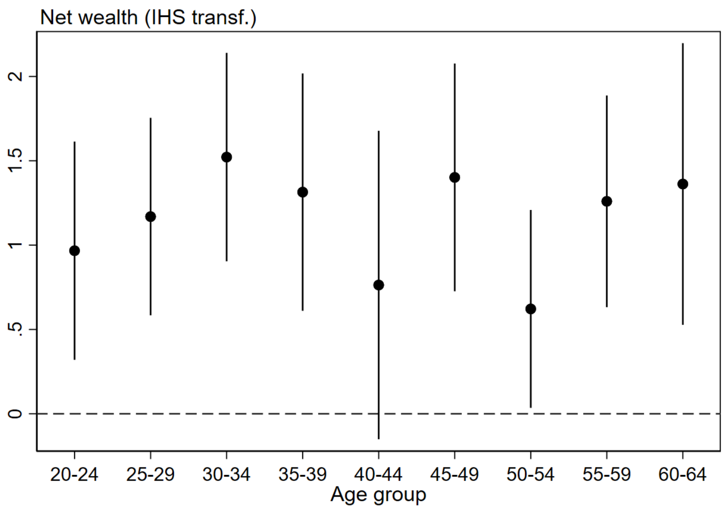

Figure A7: Effect of culture on net wealth by age group

Notes: The figure plots the estimated LBC (see equation 2) for the effect of culture on net wealth by age group. The bandwidth is 30 kilometers. Each marker is the coefficient from running a regression including a full set of control variables (as in Table 3, column 3) but only using individuals of a given age group, with 95% confidence intervals displayed. In contrast to the baseline sample, we also include the age group 20–24. Net wealth is transformed using the IHS function (see footnote 17). Online Appendix Table C1 reports definitions and sources of the variables.

B Additional Tables

Table B1: Baseline results using only natives

	Retirement saving		Continuing education	Gambling	Net wealth
	Ext. margin (1)	Int. margin (2)	(3)	(4)	(5)
German language	0.000	530.614***	0.030***	-0.012***	1.327***
	(0.012)	(75.088)	(0.004)	(0.003)	(0.248)
Mean dependent variable	0.62	4,105.04	0.07	0.01	7.10
Observations	210,205	130,832	270,094	264,638	270,094
Baseline controls	Yes	Yes	Yes	Yes	Yes

Notes: This table presents estimates of equation (2) restricting the sample to individuals whose tax return language (see Section 3) matches the predominant language in the language region where they live. The dependent variables are the probability to save in voluntary private pension plans (column 1), the amount of contributions made given that a contribution was made (column 2), the probability to pursue continuing education and training (column 3), the probability of engaging in gambling activity (column 4), and net wealth (column 5). Net wealth is transformed using the IHS function (see footnote 17). All columns include a full set of control variables (as in Table 3, column 3). Online Appendix Table C1 reports definitions and sources of the variables. In contrast to the other outcomes, gambling is based on data from different years. Two-way cluster-robust standard errors in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B2: Robustness tests

	Base-	Additional controls		Quadratic	Distance	Language	Language border
	line	Municipality	Wealth	model	in minutes	majority > 65%	municipalities
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	A1. Retirement saving (extensive margin)						
German language	-0.003	-0.004	-0.019	0.001	-0.006	-0.006	0.006
	(0.012)	(0.012)	(0.013)	(0.024)	(0.015)	(0.013)	(0.013)
Mean dependent variable	0.62	0.62	0.62	0.62	0.57	0.62	0.63
Observations	218,681	218,681	218,681	218,681	325,294	171,252	161,022
	A2. Retirement saving (intensive margin)						
German language	435.055***	427.703***	326.680***	425.246***	429.109***	512.832***	266.839***
	(77.372)	(86.545)	(64.980)	(124.961)	(84.059)	(83.197)	(69.074)
Mean dependent variable	4,100.93	4,100.93	4,100.93	4,100.93	4,312.22	4,039.70	4,014.81
Observations	136,035	136,035	136,035	136,035	185,932	105,945	102,021
	B. Continuing education and training						
German language	0.023***	0.022***	0.021***	0.020***	0.022***	0.026***	0.020***
	(0.004)	(0.004)	(0.004)	(0.007)	(0.004)	(0.004)	(0.004)
Mean dependent variable	0.07	0.07	0.07	0.07	0.08	0.06	0.06
Observations	281,482	281,482	281,482	281,482	410,685	222,134	204,545

Table B2 (continued)

	Base-	Additional controls		Quadratic	Distance	Language	Language border
	line	Municipality	Wealth	model	in minutes	majority > 65%	municipalities
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	C. Gambling						
German language	-0.009***	-0.008***	-0.009***	-0.014***	-0.010***	-0.010***	-0.007**
	(0.003)	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)	(0.003)
Mean dependent variable	0.01	0.01	0.01	0.01	0.01	0.01	0.02
Observations	274,554	274,554	274,554	274,554	396,352	216,262	197,722
	D. Net wealth (IHS transf.)						
German language	1.140***	1.164***		1.222***	1.062***	1.378***	0.747***
	(0.244)	(0.255)		(0.343)	(0.273)	(0.270)	(0.240)
Mean dependent variable	7.06	7.06		7.06	7.13	6.98	6.86
Observations	281,482	281,482		281,482	410,685	222,134	204,545
Baseline controls (all panels)	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table presents estimates of equation (2) for different specifications. Column (1) shows the baseline results from Table 3. Column (2) adds additional municipality covariates (age groups, economic sectors, unemployment rate, population, agglomeration, and urban), column (3) controls for net wealth. Column (4) uses a second-degree polynomial function of the running variable. Column (5) uses the distance in driving minutes instead of kilometers, column (6) drops municipalities with a language majority of less than 65%. In column (7), we only allow municipalities in the canton of Bern to function as language border municipalities. The dependent variables are the probability to save in voluntary private pension plans (panel A1), the amount of contributions made given that a contribution was made (panel A2), the probability to pursue continuing education and training (panel B), the probability of engaging in gambling activity (panel C), and net wealth (panel D). Net wealth is transformed using the IHS function (see footnote 17). All columns include a full set of control variables (as in Table 3, column 3). Online Appendix Table C1 reports definitions and sources of the variables. In contrast to the other outcomes, gambling is based on data from different years. Two-way cluster-robust standard errors in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B3: Alternative specifications

	Retirement saving			Continuing education	Gambling	Net wealth
	OLS (full sample) (1)	Probit (ext. margin) (2)	OLS log(y) (int. margin) (3)	Probit (4)	Probit (5)	OLS (No IHS transf.) (6)
German language	304.386***	0.005	0.123***	0.024***	-0.013**	218,781.046**
	(50.387)	(0.020)	(0.028)	(0.005)	(0.006)	(102,857.638)
Mean dependent variable	2,551.07	0.62	8.12	0.07	0.01	158,551.74
Observations	218,681	218,681	136,035	281,482	274,554	281,482
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table presents estimates of equation (2) using alternative specifications. The dependent variables are the contribution into voluntary private pension plans (column 1), the probability to save in voluntary private pension plans (column 2), the amount of (log) contributions made given that a contribution was made (column 3), the probability to pursue continuing education and training (column 4), the probability of engaging in gambling activity (column 5), and net wealth (column 6). All columns include a full set of control variables (as in Table 3, column 3). Online Appendix Table C1 reports definitions and sources of the variables. In contrast to the other outcomes, gambling is based on data from different years. Two-way cluster-robust standard errors in parentheses. Significance levels: $^{*}\ p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$.

Table B4: Household data

	Retirement saving		Gambling	Net wealth
	Ext. margin (1)	Int. margin (2)	(3)	(4)
German language	-0.003	649.591***	-0.008***	1.165***
	(0.013)	(114.893)	(0.003)	(0.237)
Mean dependent variable	0.58	6,092.86	0.01	7.38
Observations	162,404	94,405	181,089	195,671
Baseline controls	Yes	Yes	Yes	Yes

Notes: This table presents estimates of equation (2) using households as units of observations (i.e., we treat married couples as single units). The dependent variables are the probability to save in voluntary private pension plans (column 1), the amount of contributions made given that a contribution was made (column 2), the probability of engaging in gambling activity (column 3), and net wealth (column 4). Net wealth is transformed using the IHS function (see footnote 17). All columns include a full set of control variables (as in Table 3, column 3). Online Appendix Table C1 reports definitions and sources of the variables. In contrast to the other outcomes, gambling is based on data from different years. Two-way cluster-robust standard errors in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B5: Cross-sectional regressions

	Retirement saving		Continuing education	Gambling	Net wealth
	Ext. margin (1)	Int. margin (2)	(3)	(4)	(5)
German language	0.016**	496.721***	0.029***	-0.005***	0.945***
	(0.007)	(36.919)	(0.002)	(0.002)	(0.113)
Mean dependent variable	0.62	4,100.93	0.07	0.01	7.06
Observations	218,681	136,035	281,482	274,554	281,482
Baseline controls	Yes	Yes	Yes	Yes	Yes

Notes: This table presents estimates of cross-sectional regressions of future-oriented behavior on tax return language (see Section 3). The dependent variables are the probability to save in voluntary private pension plans (column 1), the amount of contributions made given that a contribution was made (column 2), the probability to pursue continuing education and training (column 3), the probability of engaging in gambling activity (column 4), and net wealth (column 5). Net wealth is transformed using the IHS function (see footnote 17). All columns include a full set of control variables (as in Table 3, column 3). Online Appendix Table C1 reports definitions and sources of the variables. In contrast to the other outcomes, gambling is based on data from different years. Two-way cluster-robust standard errors in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B6: Baseline results controlling for preferences

	(1) Baseline	(2)	(3)	(4)	(5)
	A1. Retirement saving (extensive margin)				
German language	-0.003	-0.004	-0.004	-0.003	-0.003
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Charitable contr. (dummy)		0.106***			0.101***
		(0.004)			(0.004)
Charitable contr. (%)			0.020***		0.004**
			(0.002)		(0.002)
Life insurance policy				0.053***	0.050***
				(0.005)	(0.005)
Mean dependent variable	0.62	0.62	0.62	0.62	0.62
Observations	218,681	218,681	218,681	218,681	218,681
	A2. Retirement saving (intensive margin)				
German language	435.055***	433.931***	431.695***	434.187***	430.636***
	(77.372)	(78.398)	(76.789)	(77.089)	(76.805)
Charitable contr. (dummy)		65.289***			16.445
		(25.113)			(24.702)
Charitable contr. (%)			76.513***		74.615***
			(8.493)		(8.000)
Life insurance policy				-62.939***	-62.280***
				(19.971)	(19.984)
Mean dependent variable	4,100.93	4,100.93	4,100.93	4,100.93	4,100.93
Observations	136,035	136,035	136,035	136,035	136,035
	B. Continuing education and training				
German language	0.023***	0.022***	0.023***	0.023***	0.022***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Charitable contr. (dummy)		0.020***			0.018***
		(0.002)			(0.002)
Charitable contr. (%)			0.005***		0.003***
			(0.001)		(0.001)
Life insurance policy				-0.001	-0.002
				(0.002)	(0.002)
Mean dependent variable	0.07	0.07	0.07	0.07	0.07
Observations	281,482	281,482	281,482	281,482	281,482

Table B6 (continued)

	(1) Baseline	(2)	(3)	(4)	(5)
			C. Gambling		
German language	-0.009***	-0.009***	-0.009***	-0.009***	-0.009***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Charitable contr. (dummy)		0.001**			0.003***
		(0.001)			(0.001)
Charitable contr. (%)			-0.002***		-0.002***
			(0.000)		(0.000)
Life insurance policy				0.003***	0.003***
				(0.001)	(0.001)
Mean dependent variable	0.01	0.01	0.01	0.01	0.01
Observations	274,554	274,554	274,554	274,554	274,554
			D. Net wealth (IHS transf.)		
German language	1.140***	1.119***	1.120***	1.157***	1.128***
	(0.244)	(0.259)	(0.245)	(0.249)	(0.264)
Charitable contr. (dummy)		1.077***			0.869***
		(0.054)			(0.058)
Charitable contr. (%)			0.318***		0.197***
			(0.019)		(0.020)
Life insurance policy				1.771***	1.743***
				(0.057)	(0.056)
Mean dependent variable	7.06	7.06	7.06	7.06	7.06
Observations	281,482	281,482	281,482	281,482	281,482
Baseline controls (all panels)	Yes	Yes	Yes	Yes	Yes

Notes: This table presents estimates of equation (2) controlling for preferences. Column (1) shows the baseline results from Table 3. Column (2) controls for a dummy based on whether an individual makes a charitable contribution, column (3) includes charitable contributions as a percentage of gross income. Column (4) controls for a dummy for whether an individual holds a life insurance policy, column (5) includes all three controls. The dependent variables are the probability to save in voluntary private pension plans (panel A1), the amount of contributions made given that a contribution was made (panel A2), the probability to pursue continuing education and training (panel B), the probability of engaging in gambling activity (panel C), and net wealth (panel D). Net wealth is transformed using the IHS function (see footnote 17). All columns include a full set of control variables (as in Table 3, column 3). Online Appendix Table C1 reports definitions and sources of the variables. In contrast to the other outcomes, gambling is based on data from different years. Two-way cluster-robust standard errors in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

C Data

C.1 Individual Tax Return Data

C.1.1 Sample

Our main data source is confidential individual-level administrative tax data from the canton of Bern provided by the cantonal tax administration. We obtained data on all tax returns for tax years 2002, 2003, 2012, and 2013. The data include 2,311,596 entries: 553,902 (2002), 556,603 (2003), 597,634 (2012), and 603,457 (2013). We drop all entries that are not subject to taxation for the entire calendar year. This is the case in events such as relocations to/from other countries, death, or changes in family status. We further drop duplicate entries. Various (positively defined) variables occasionally contain inexplicably negative values, which we code as missing. We also code as missing if there are irregularities in the data (e.g., impossible year/age entries). As described in Section 3, we duplicate each married couple (one tax return entry) so that we have an observation for each of the spouses.

We restrict the sample to individuals aged 25 to 64 who are not claiming any kind of state or private pension. Specifically, we drop individuals who are claiming pension from at least one of the following schemes: public old age pension (*AHV*), mandatory occupational pension (*BVG*), or private pension (*Säule 3a*). This also includes individuals who are only partially retired. In the case of married couples, we drop both spouses if one of them is partially or fully retired.

Although the tax data are in anonymized form, we are able track tax units over time using a time-invariant ID-variable assigned to each tax unit. This variable allows us to restrict the sample in some specifications to residents who likely have been living in the same municipality or language region for years. However, in the case of changes in family status, unit tracking may be inaccurate: If two individuals marry, they adopt the ID from the husband, whereas the ID of the wife does not appear in the data again. Thus, for a recently married couple, we are not able to track back one spouse (i.e., usually the wife).

We are then left with 1,723,181 entries: 422,468 (2002), 423,405 (2003), 436,481 (2012), and 440,827 (2013). For the main analysis, we drop the bilingual city of Biel/Bienne and apply a bandwidth of 30 kilometers on both sides of the language border. The final sample consists of 281,482 (2012 and 2013) individual-year observations (2002 and 2003: 274,554).

C.1.2 Outcome Variables

Retirement saving. The Swiss pension system has three pillars: state pension provision (1st pillar), occupational pension scheme (2nd pillar), and private pension (3rd pillar).

In contrast to the 1st pillar, the occupational pension scheme is fully funded, i.e., the individuals save (and pay) for their own benefits. All employees with an annual salary exceeding some threshold are obliged to pay contributions. Depending on the individual funding gap, employees can also make voluntary purchases into the pension fund. Very similar to the 3rd pillar (see below), a voluntary contribution to the 2nd pillar has attractive tax benefits. By contrast, however, the amount that can be paid into the schemes is subject to fewer restrictions in the 2nd pillar. The individual maximum amount is usually significantly higher in the 2nd pillar. It depends on factors such as income, age, and pension savings.

The 3rd pillar consists of tied pension (Pillar 3a) and flexible pension provision (Pillar 3b). Even though the 3rd pillar is voluntary, tax benefits subsidize it (applies only to Pillar 3a): pension contributions are deductible from taxable income up to a maximum amount (2013: CHF 6,739; self-employed are subject to higher amounts) and there are no wealth or income taxes on contributions and interest. Upon retirement, the withdrawal of the capital saved is taxed at a reduced rate. Before retirement, the assets in Pillar 3a accounts can only be withdrawn in a few exceptional cases (e.g., self-employment or a first-time home purchase). Pillar 3a pension plans are available in the form of a bank account (pension account or saving with securities) or life insurance policy.

Only persons with employment income (subject to state pension contributions) can benefit from the tax advantages of Pillar 3a accounts. This also includes individuals who receive compensation for loss of earnings (e.g., unemployment or sickness benefits). We only include individuals with the required income when analyzing pension contributions.

Self-employed workers must file additional forms with their tax return, declaring their income and assets from self-employment (income statement and balance sheet). Unfortunately, we have incomplete information on these forms. However, we can determine whether someone is self-employed or not. In case of self-employment, the declaration of pension contributions is not straightforward as there are different rules and practices on how these are accounted for. In addition to missing information, a clear distinction between business and private accounts is unfeasible with our data. We thus exclude self-employed workers (including self-employed agricultural workers) when analyzing pension contributions.

Category (tax return): Beiträge Säule 3a (Summe Mann und Frau im Steuerjahr)

Continuing education and training. Individuals are entitled to deduct several work-related expenses. This includes costs related to professional continuing education and training. Expenses are tax-deductible only to the extent that they were borne by the individual and not by the employer. Continuing education costs, retraining costs, and reintegration costs are tax-deductible but not costs within the scope of initial education.

Category (tax return): Netto Aus- und Weiterbildungskosten (Mann/Frau)

Gambling. Gambling = 1 if the individual declared gambling winnings, i.e., at least one of the following three categories (tax return) is > 0:

- Bargewinne mit Verrechnungssteuerabzug: Bruttoertrag
- Bargewinne ohne Verrechnungssteuerabzug: Bruttoertrag
- Lotteriesteuern Kanton und Gde je 10% / Kirche 0.8%

In Switzerland, all winnings from gambling (e.g., lotteries) must be declared in the tax return, including tax-free winnings. A 35% federal withholding tax is levied on winnings from gambling that exceed a certain amount. The aim of this tax is to ensure that the recipients of the taxable benefits declare their earnings (means of combating tax evasion). The tax will be refunded if the winner declares the gambling winnings in the tax return. It is always worth declaring the winnings as the taxation is always lower than 35% in total. Until 2013, the withholding tax was levied on lottery winnings of CHF 50 or more. As of 2013, the exemption limit was increased to CHF 1,000. As a result, the number of observations with declared gambling winnings is greatly reduced from 2013 – implying that taxpayers seem to declare their profits incompletely if they are not subject to withholding tax. Since a high gambling winning is a relatively rare event, we require large samples to estimate precise effects in the empirical analyses. Therefore, to give a better picture of gambling activities, we use tax data of earlier years (2002/2003).

Net wealth. In Switzerland, the cantons and municipalities levy a wealth tax based on the balance of the total amount of assets minus debt. In their tax return, individuals must declare in detail assets such as bank accounts, securities, cars, and real estate, as well as debt (e.g., mortgages and other loans). The proven debt can then be deducted from the gross wealth, which results in the net wealth that is subject to wealth tax. Wealth does not include tax-exempt retirement saving (mandatory occupational pension schemes and voluntary saving in the Pillar 3a).

Furthermore, the canton of Bern applies tax deductions for married couples and for the number of dependent children. Our variable shows the net wealth after those deductions. Because we control for marital status and children in most of the specifications, we do not adjust the numbers. Net wealth is rounded to CHF 500.

Category (tax return): Steuerbares Vermögen (nach Steuerausscheidung Kanton)

In addition, in Section 7 (mechanisms), we study two additional outcomes:

Charitable contributions. Charitable donations to eligible Swiss organizations can be deducted from taxable income if they add up to at least CHF 100 per year. In the years 2012 and 2013, the law allowed a tax deduction of up to 20% of the taxable net income. The variable does not include donations (or membership fees) to political parties, which are additionally deductible from taxable income.

Category (tax return): Total Vergabungen

Life insurance policy. Life insurance is subject to wealth tax (if the policy can be surrendered) and must thus be declared in the tax return. In addition to policy holders, we also code the dummy = 1 for individuals who are claiming (taxable) pensions from life insurance policies. The variable does not include linked life insurance policies within the pillar 3a (tied pension provision) and policies without a surrender value.

Categories (tax return): Total Steuerwert Kapital- und Rentenversicherungen; Rente aus Lebensversicherungen inkl. Leibrente

C.2 Running Variable: Distance

We determine the distance to the language border as follows. First, we create a dataset with all municipalities at the German-French language border, i.e., a list of all municipalities that border a municipality with another language majority. Second, we calculate the driving distance (in kilometers) between each municipality in our dataset and each language border municipality. For our distance variable, we use the shortest driving distance out of these calculations for each municipality (i.e., the driving distance between a municipality and its nearest municipality in the other language region). Third, we assign a distance value of zero kilometers to all German-speaking municipalities that serve as the nearest municipality for at least one municipality in the French language region. Finally, we set the distance values negative for municipalities in the French-speaking region. We proceed similar to Eugster et al. (2017) but with reversed signs. We calculate the driving distance using Google Maps, double checking the midpoints indicated by Google Maps.

As depicted in Figure 2, there are three German-speaking *exclaves* in the French-speaking territory (municipalities of Châtelat, Mont-Tramelan, and Rebévelier). For these municipalities, we assign the distance to the nearest surrounding municipality as the distance value because the distance to the more distantly located language border would give a false indication of the prevailing circumstances.

C.3 Description of Variables

Table C1 provides information on the construction, source, and level of the variables used in the empirical analysis.

Table C1: Description of variables

Variable	Definition/construction	Level	Source	Notes
Panel A. Future-oriented behavior outcomes				
Retirement saving	Dummy = 1 if the individual saves in voluntary private pension plans (contribution into Pillar 3a account)	Individual (couple if married)	Tax return	
Retirement saving (CHF 000s)	Amount of contributions (Pillar 3a) made given that a contribution was made (in Swiss Francs)	Individual (couple if married)	Tax return	
Continuing education and training	Dummy = 1 if the individual attends any sort of continuing education and training program	Individual	Tax return	
Gambling	Dummy = 1 if the individual declares gambling winnings (e.g., from lotteries)	Individual (couple if married)	Tax return	
Net wealth (IHS transf.)	Total amount of assets minus debt (in Swiss Francs)	Individual (couple if married)	Tax return	IHS transformed; see footnote 17
Panel B. Individual characteristics				
Age	Age (based on year of birth)	Individual	Tax return	
Female	Dummy = 1 if female	Individual	Tax return	
Marital status	4 dummies for being single, married, divorced, and widowed	Individual	Tax return	
No. of dependents	Number of dependent persons (mostly children)	Individual	Tax return	
Gross income (IHS transf.)	Annual gross income (in Swiss Francs)	Individual (couple if married)	Tax return	IHS transformed; see footnote 17
Dual-income couple	Dummy = 1 if dual earner married couple	Individual	Tax return	
Homeowner	Dummy = 1 if individual owns residential property	Individual (couple if married)	Tax return	
Self-employed	Dummy = 1 if self-employed	Individual (couple if married)	Tax return	
Farmer	Dummy = 1 if agricultural worker	Individual (couple if married)	Tax return	
Religion	3 dummies for an individual's religious affiliation: Protestant, Catholic, and other/none	Individual	Tax return	

Table C1 (continued)

Variable	Definition/construction	Level	Source	Notes
Panel C. Municipality characteristics: Basic				
Education	Share of residents with no, primary, secondary, and tertiary education (4 variables)	Municipality	Federal Statistical Office	time of measurement: 2000 (census)
Foreign speakers	Share of residents indicating no Swiss language as their main language	Municipality	Federal Statistical Office	time of measurement: 2000 (census)
Foreigners	Share of foreigners among the population	Municipality	Finance Administration, canton of Bern	
Tax multiplier	Municipal surcharge on the cantonal statutory tax schedule; expressed in % of cantonal taxes	Municipality	Tax Administration, canton of Bern	
Large city	Dummy = 1 if the municipality is a large city. Applies to Bern (distance to language border: 31.2 km), Biel/Bienne (0 km), and Köniz (28.2 km)	Municipality	Own construction	
Panel D. Municipality characteristics: Extended				
Agglomeration	Dummy = 1 if the municipality is part of an agglomeration area or not	Municipality	Federal Statistical Office	time of measurement: 2000 (census)
Age groups	Share of residents aged 0 to 19, 20 to 64, and 65 and above (3 variables)	Municipality	Federal Statistical Office	time of measurement: 2000 (for 2002/2003)
Unemployment rate	Unemployment rate	District	State Secretariat for Economic Affairs SECO	
Population (000s)	Population in 1,000	Municipality	Finance Administration, canton of Bern	
Urban	Dummy = 1 if population $\geqslant$ 10,000	Municipality	Finance Administration, canton of Bern	
Economic sectors	Share of local employees in the primary, secondary, and tertiary sector (3 variables)	Municipality	Federal Statistical Office	time of measurement: 2001 (for 2002, 2003)

Table C1 (continued)

Variable	Definition/construction	Level	Source	Notes
Panel E. Running variable				
Distance to language border	Driving distance to the language border in kilometers	Municipality	Own calculations based on Google Maps	time of measurement: 2017
Panel F. Miscellaneous				
German	Dummy = 1 if the majority of the resident population in a municipality speaks German as main language (i.e., = 0 if the majority speaks French)	Municipality	Own calculations based on Federal Statistical Office	time of measurement: 2000 (census)
Tax return language	Individually chosen language in dealing with the cantonal administration (either German or French), e.g., for filling out the tax return	Individual	Tax return	
Distance in minutes	Driving distance to the language border in minutes	Municipality	Own calculations based on Google Maps	time of measurement: 2017
Panel G. Outcomes in Section 7 (mechanisms)				
Charitable contributions	Dummy = 1 if the individual makes a charitable contribution	Individual (couple if married)	Tax return	
Charitable contributions (log amount)	Log amount of charitable contributions made given that a contribution was made	Individual (couple if married)	Tax return	
Charitable contributions (income share)	Charitable contributions as a percentage of gross income	Individual (couple if married)	Tax return	
Life insurance policy	Dummy = 1 if the individual holds a life insurance policy	Individual (couple if married)	Tax return	

D Future-Time Reference in French and (Swiss) German

In Switzerland's French-speaking region, the residents speak the standard French. While through the Middle Ages various local dialects (*Patois*) existed, they have disappeared with few exceptions by the end of the 19th century (Knecht, 2000; Pap, 1990).[39]

By contrast, the German-speaking Swiss do not speak standard German but various local Alemannic dialects that are collectively called *Swiss German*. These dialects differ strongly from standard German and vary greatly among themselves. The German-speaking Swiss use their dialects in everyday conversation among all social classes, in public life, politics, school (besides standard German), and media (excl. printed press) (Ris, 1979). Because Swiss German lacks a standardized written form, the written language generally uses standard German. In the canton of Bern, there are numerous dialect variants (belonging to the High Alemannic), collectively called *Berndeutsch*.[40] In terms of grammar, they are largely identical to other Alemannic dialects and thus differ strongly from standard German.

French and (Swiss) German grammatically differ in the ways in which their speakers talk about the future. In French, there are two main variants to express the future: the synthetic future and the periphrastic future (composed of the semi-auxiliary verb *aller* ("to go") + infinitive). Additionally, there are situations in which French speakers may also chose a third option, the futurate present (use of the present tense combined with a time reference expression).[41] Although there exist certain linguistic constraints governing the use of the three variants, there is no consensus on which functional meaning to associate with each variant (Poplack and Dion, 2009). As discussed in Dahl (2000), French speakers primarily use the present tense in intention-based future-time reference (in contrast to prediction-based future-time reference). However, compared with the synthetic and the periphrastic future, French speakers use the present only marginally in future contexts (Comeau and Villeneuve, 2016).

The future-time reference is grammaticalized in French to an extent it is not in (Swiss) German. When talking about the near and far future, German-speaking Swiss use the present tense, often in conjunction with adverbs of time and/or an extended date/time specification (Marti, 1985, pp. 163–169; Hodler, 1969, pp. 484–490).[42] In doing so, the dialect speakers are able to grasp the difference between the present and the future. Although there also exists a pe-

[39]Though, a few (partly regional) peculiarities are still noticeable, particularly in terms of pronunciation and vocabulary.

[40]Like the other dialect variants, Berndeutsch is mainly a spoken language. Nonetheless, there exists a relatively extensive literature using the dialect even though there is no uniform spelling.

[41]Examples of the three forms are (Comeau and Villeneuve, 2016):

(i) *Je quitterai la semaine qui vient.* ("I will leave next week.")

(ii) *Je vais quitter la semaine qui vient.* ("I'm going to leave next week.")

(iii) *Je quitte la semaine qui vient.* ("I'm leaving next week.")

[42]For example, in the following sentence the adverb *grad* complements the present tense to signal that the speaker is talking about the future:

riphrastic future tense – a combination of the auxiliary verb *werden* ("become") + infinitive –, it is not common in colloquial terms.[43]

Following an example in Chen (2013), Table D1 shows how French and (Swiss) German grammatically differ when talking about the future. French speakers must switch from the present tense (*fait*) to a future tense (*fera*). German-speaking Swiss use the present tense in both cases. Thus, whereas the German speakers are part of a "futureless area" (Dahl, 2000), the French language requires its speakers to grammatically differentiate the future from the present in many situations.

I	*chume*	*grad*
I	come.PRS	immediately

"I will be right there"

[43]Old High German (i.e., the oldest written form of the German language) did not have a special form to express future events (Marti, 1985, p. 163). The future tense in today's written language is derived from the classical and Romance languages. There is no temporal difference between the present and the future tense.

Table D1: Marking of the future in French and (Swiss) German

	Present *It is cold today*				Future *It will be cold tomorrow*			
French	*Il*	*fait*	*froid*	*aujourd'hui*	*Il*	*fera*	*froid*	*demain*
	It	do/make.PRS	cold	today	It	do/make.FUT	cold	tomorrow
German								
Standard	*Heute*	*ist*	*es*	*kalt*	*Morgen*	*ist*	*es*	*kalt*
Dialect	*Hütt*	*isch*	*es*	*chalt*	*Morn*	*isch*	*es*	*chalt*
	Today	is.PRS	it	cold	Tomorow	is.PRS	it	cold

Notes: PRS and FUT indicate present and future morphemes. The specific German dialect varies depending on the region. However, the choice of the present tense is a common characteristic.
Sources: French example: Chen (2013); German example: von Greyerz and Bietenhard (1976).

E Historical Background

E.1 Historical Development of the German-French Language Border in Switzerland

Note: The short historical account in this section draws on four sources: Zimmerli (1891), Büchi (2000), Werlen (2000, pp. 31–42), and Haas (2000). For the sake of readability, we will not refer to them individually hereinafter. We restrict the account to the German-French language border (with an emphasis on the canton of Bern) and thus refrain from discussing the development of the Italian and Romansh language regions.

The multilingual Switzerland of today is the result of a slow process taking place over centuries. The German-French language border has been shaped by different historical processes of migration: the entry and expansion of German-speaking Alemanni (who did not assimilate) into regions occupied by Burgundians (also a Germanic tribe but Romanized).

Romanization and Germanization. The territory of present-day Switzerland has been inhabited since the Paleolithic Age. The first written historical records of tribes settling in the region came from the Celts, who have been speaking Celtic languages. After the Roman's victory at Bibracte in 58 BC, the Celtic population in the area of present-day Switzerland came under Roman rule for more than 400 years. Switzerland thus came under the influence of the Latin language and culture. For a long period of time, Celtic an (Vulgar) Latin coexisted.

In 401 AD, the Romans withdrew their forces from the areas north of the Alps under the threat of the Germanic pressure. Soon after, Alemannic tribes began to settle in today's German-speaking Switzerland. The first Germanic settlement on Swiss soil is attributed to the Burgundians in 443. They soon extended their influence in western Switzerland and established a kingdom with the city of Geneva as its center. Soon, they embraced the Roman way of life and gradually assimilated into the culture of the people they had conquered. Although the new settlers originally spoke a Germanic dialect, they gave it up in favor of the Gallo-Romanic language of the locals.

Emergence of the German-French Language Border. While the Burgundians advanced from the west (Savoy), Alemannic tribes invaded in large numbers from the north. The Alemanni soon turned westwards where fertile cultivated land beckoned. The behavior of the Alemanni towards the natives was diametrically different from that of the Burgundians. They saw themselves as representatives of the German language and the German way of life. As ruthless conquerors, they did not seek a compromise with Roman culture. Thus, during the expansion, the Alemannic language (a precursor of today's dialects) gradually displaced the local language. The Alemannic expansion in the Central Plateau came to a halt shortly after 600 in the area of today's German-French language border. In the area south of Lake Biel, the Alemannic encountered a densely populated Romance population and political structures that had been built up by the Burgundians. Consequently, the invaders moved to the scarcely populated mountain ranges of the Jura and the ridges between Fribourg and Lausanne. This led to a culturally mixed and bilingual zone between Lake Biel, Lake Neuchâtel and Lake Geneva as far as the city of Lausanne. During this transitional period, a clear-cut language border began to emerge gradually. Around the beginning of the 8th century, the boundaries were already more or less fixed.

Particularly at the south-eastern foot of the mountain range of the Jura Mountains (this includes, inter alia, today's within-canton border in the canton of Bern), the language border was reached early on. The border was only marginally shifted westwards in the following centuries (e.g., the medieval town of Murten became German-speaking only in the 15th century). In contrast, the border section between Lake Murten and the Alpine ridge took longer to develop. It was not until the 10th century that the Alemanni and the Romanized Burgundians urbanized the forested hills in this region. The language border emerged as a result of the gradual movement of the two settlements towards each other. In the 13th century, the language border between Fribourg and Rougemont reached its present course. Subsequently, apart from a few minor movements (e.g., today's bilingual city of Biel/Bienne, see below), the language border proved to be very persistent and stayed remarkably stable.

On the left bank of Lake Biel, the language border continued to move into the 19th century. The German language took over the majority in the former municipality of Vingelz up to Ligerz. In the city of Biel/Bienne, the changes even reached into the 20th century. In the 1840s, many French-speaking industrial workers (predominantly watchmakers) from the Jura settled in the originally German-speaking town. Biel/Bienne gradually became a bilingual city. Shortly thereafter, the French-speaking inhabitants received a French-language school, but the official recognition of the city's bilingualism did not take place until 1952.

Founding of the Confederation. Traditionally, Switzerland was founded in 1291 when the communities of three rural valleys in the Central Alps (Uri, Schwyz, and Unterwalden) formed an alliance to protect their freedoms. In the 14th and 15th centuries, other communities (i.e., cantons) joined the loose confederation, which soon became a strong military power in Europe. The city state of Bern (founded in 1191) joined the Confederation in 1353. During the 14th century, the city of Bern expanded its territory by acquisition or by conquest to the present German-speaking area of the canton. In 1536, Bern conquered the Vaud, which meant that for the first time Bern had not only a German-speaking but also a French (or rather Gallo-Romanic-speaking) population. The dependencies of Bern in the western part, preceded by the entry of Fribourg into the confederation in 1481, let the Confederation became gradually multilingual to some degree. Although Switzerland was no longer a confederation of exclusively German speakers, the German-speaking elite ruled over large parts of the French-speaking territory. At that time, the population spoke a variety of local dialects (*Patois*) of the Franco-Provençal type (except for some parts of the Jura). These dialects were different from the so-called *langues d'oïl* from which modern French emerged. In the 16th century (dominated by the Reformation), the people began to speak more and more standard French. By the end of the 18th century, standard French had already pushed back the dialects in the reformed cities. In the 19th and 20th centuries, the dialects disappeared almost completely. In written communication, the replacement of Latin by standard French had already begun in the 13th century.

In contrast, the German-speaking Swiss kept their dialects as spoken language, although they adopted the German writing standard between 1550 and 1800.

Birth of the (Multilingual) State. Until 1798, Switzerland was a rather loose Confederation of German-, French-, as well as Italian- and Rhaeto-Romanic-speaking territories. It was not an actual state and certainly not a multilingual state. In 1798, French revolutionary troops invaded Switzerland and set up a centralized state, the *Helvetic Republic*. In 1803, Napoleon's *Act of Mediation* partially restored the sovereignty of the cantons, while some territories became cantons with equal rights for the first time (e.g., Vaud). At the same time, the equality of languages was also recognized. In 1815, the Congress of Vienna reestablished Swiss independence, recognized Swiss neutrality and extended the country's territory to its present-day boundaries. As compensation for the loss of its former territories Vaud and Aargau, the canton of Bern received the Jura region and thus a significant French-speaking population. Bern was once again bilingual. The old part of the canton was German-speaking and Protestant. The Jura was French-speaking, Protestant and Confederation-oriented in the south but Catholic and aligned with France in the north. Thus, the incorporation of the Jura region not only recreated a language border within the canton of Bern but also a new confessional border. This led to conflicts later.

In 1848, the Swiss federal state was created with the adoption of a federal constitution and a federal parliament. It established a more centralized government with federal responsibility for areas such as defense and trade. Moreover, Switzerland's first modern constitution recognized German, French, and Italian as national and equal languages. Romansh was only added as a fourth national language in 1938. Romansh, however, remains a special case. It is an official language only insofar as it can be used in communication with the federal government. The federalist principle enshrined in the constitution defused potential language problems. In most areas in which problems between language communities may have arisen, the cantons remained autonomous (e.g., education and culture).

While Switzerland remained neutral in the First World War (and in the Second World War), the sympathies were divided among the language regions. This political divide led to tensions between the regions. In the Second World War, sympathies were evenly distributed. Moreover, the German-speaking Swiss put emphasis on using dialects to differentiate themselves from Nazi Germany.

Jura Separatism. After the Second World War, the conflict between the French-speaking population in Jura and the predominantly German-speaking government in Bern became a political problem. After several incidents, pressure from separatists, lengthy political disputes, and a multi-stage voting process, the conflict led to the creation of the canton of Jura in 1979. Only the Catholic northern part of the Jura opted to secede. The also French-speaking but predominantly Protestant southern part of the Jura (including the bilingual city of Biel/Bienne) voted to stay with the Protestant canton of Bern. The political separation thus took place along a confessional border and not along the language border. The Jura conflict was not a Swiss dispute but a conflict between the government of the canton of Bern and part of its French-speaking minority.

Apart from the jura separatism, the second half of the 20th century was characterized by a homogenization of the language regions. The formerly locally and on cantonal level organized media started to regionalize, confessional boundaries lost importance, and mobility increased (which also led to more diverse French-speaking cantons). In the German-speaking part, the use of the dialects expanded into the literature, advertising, media, and school. More recently, English as the world's lingua franca is threatening the balance between the different communities in Switzerland causing a debate over which language at what level to teach in school.

Historically, the language border has remained relatively constant over the centuries. While the proportion of French speakers in the Bernese Jura has increased, German monolingualism is still very high in the German-speaking part of the canton. In recent times, international migration has been adding a new layer to the language map. The proportion of foreign speakers is constantly increasing in the city of Bern but also in other municipalities.

E.2 Language Regions in 1860

Switzerland has been carrying out a population census every ten years since 1850. From 1860, the censuses have asked the entire population about the mother tongue. Later, the definition changed, and people were asked about their main language(s) (i.e., the language(s) in which a person thinks and which he/she masters best). Since 2010, the population census has been carried out annually but only using sample surveys. Thus, data about the spoken languages at municipality level are nowadays less exact than from 1860 to 2000. For very small municipalities, the data may even be misleading. Consequently, we use data from the year 2000 to assign municipalities to the language regions. However, using more recent years would not alter the language regions at all in the canton of Bern.

Figure 1 in the main text shows the majority language of the resident population according to the census 2000. Figure D1 replicates this figure but using data from the census 1860. Comparing the two figures reveals the stability of the German and French language regions and the border between them. From 1860 to 2000, only 28 municipalities ever experienced a change in the majority language from German to French or vice versa (out of 2896 Swiss municipalities in 2000). Many of them saw the change reversed.

In the canton of Bern, the majority language changed in only five munic-

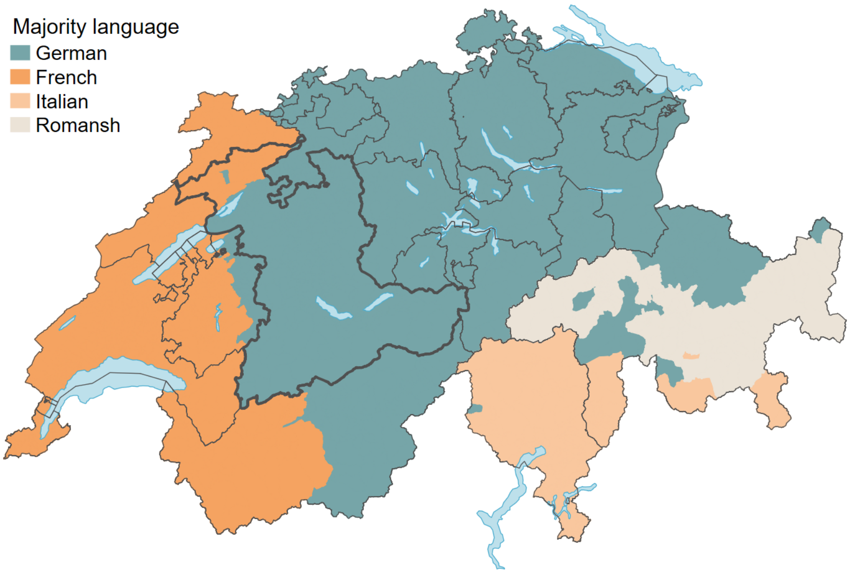

Figure D1: Language regions in Switzerland 1860

Notes: Majority language of the resident population in Switzerland according to the Swiss census 1860 (data at municipality level). Dark lines show cantonal borders. The canton of Bern is highlighted using an increased line width.

Source: Schuler et al. (2005, Table 11), Federal Statistical Office (language data) and Federal Office of Topography swisstopo (municipalities' boundaries).

ipalities: Evilard (formerly French; German since 1950) moved the language border to the west. Mont-Tramelan (since 1880), Châtelat (since 1880), and Rebévelier (since 1941) are German-speaking exclaves in the Bernese Jura (formerly French-speaking). All of them have (or had, as some of them are no longer independent municipalities) an extremely low population size. The only German-speaking municipality in an otherwise consistently French-speaking Bernese Jura in 1860 is the municipality of Corgémont. However, the muncipality became predominantly French-speaking in 1888.

While the language regions are very stable in most parts of Switzerland, the spatial distribution has been altered significantly in the canton of Grisons in the east. There is a steady expansion of German at the expense of the Romansh.

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