

# Culture and Financial Literacy

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## Abstract

We study the effect of culture on financial literacy by comparing secondary-school students along the German-French language border within Switzerland. We find that students in the French-speaking area have a lower level of financial literacy than students in the German-speaking area. The difference in financial literacy across the language groups is stronger among native students than among immigrant students. A mediation analysis suggests that the cultural divide in financial literacy is mainly related to systematic differences in financial socialisation across the language groups. Students in the German speaking region are more likely to receive pocket money at an early age and are more likely to have independent access to a bank account.

**Keywords:** culture, financial literacy, financial socialisation

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## 1 Introduction

A growing body of research documents that financial literacy is associated with better personal financial decision making. Individuals with a higher level of financial literacy perform better in retirement planning (Lusardi & Mitchell, 2007), are less prone to overindebtedness (Lusardi & Tufano, 2015) and participate more often in financial markets (van Rooij, et al., 2011) with better diversified portfolios (Gaudecker, 2015). Financial literacy is also related to yields on deposit accounts (Deuflhard, et al., 2015) and the propensity to withdraw deposits from distressed banks (Brown, et al., 2016).

Theory models the accumulation of financial literacy as an endogenous human capital choice (Lusardi et al. forthcoming; Jappelli & Padula, 2013), but is largely silent about heterogeneity in the initial stock of financial literacy across individuals. Recent empirical work focusses on the analysis of financial education interventions for the youth and adults (see Fernandes et al., 2014; Miller et al., 2015 and Kaiser and Menkhoff, 2016 for meta-studies on financial education programs). But again, there is little empirical work analysing potential heterogeneity in initial levels of financial literacy which may also influence the impact of financial education initiatives. Lusardi et al. (2010) document substantial differences in financial literacy among the youth in the US by ethnicity and race. This raises the question of how cultural background may influence initial financial literacy levels. Race and ethnicity are, however, often correlated with differences in socio-economic background making it difficult to identify the effect of cultural background on financial literacy.

In this paper we study the effect of culture on the initial stock of financial literacy among the youth. Following Guiso et al. (2006), we define culture as the set of beliefs, norms and preferences that are shared among the members of a social group. From an economics perspective, culture may thus affect financial knowledge and decision making through systematic variation in time and risk preferences (Falk, et al., 2015) or variation in social norms

regarding the incurrence and repayment of debt as well as informal insurance for households in financial distress (Lindbeck, 1997). From a psychological perspective, culture may further influence financial knowledge and decision making through differences in financial socialisation or attitudes towards money (Yamauchi & Templer, 1982).

Our aim in this paper is twofold: First, we examine the magnitude of differences in financial literacy among the youth across well-defined cultural groups. Second, we examine to what extent these differences may be accounted for by systematic variations in different dimensions of culture, i.e. preferences, financial socialisation, norms or money attitudes across these groups. In contrast to the recently formulated linguistic-savings hypothesis (Chen, 2013) which focuses on the one-dimensional influence of language on patience, we use language as a proxy for a broader range of cultural differences.

We study the impact of culture on financial literacy at the French-German language border within Switzerland. Two institutional features make this setting ideal to study questions related to culture. First, the language border allows cultural differences in preferences, norms and attitudes to coexist over time within a small geographic area.<sup>1</sup> Second, the language border runs through cantons, the first administrative division of Switzerland. Since most laws and policies are set either at the federal or cantonal level, there is no major change in institutions or policies at the language border within cantons. This setting allows to mitigate the two-way interaction between culture and institutions (Alesina & Giuliano, 2015) since a homogeneous set of institutions is applied to both groups independent of their respective culture. Further, there are no geographic barriers and the transport system is fully integrated across the language border. Consequently, economic conditions that potentially influence financial literacy hardly change at the language border.

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<sup>1</sup> The differences in norms and preferences are for example observed in the voting behaviour. There is a clear cut in support for example for work-time regulations (Eugster, et al., 2016) or left-of-centre referenda (Eugster & Parchet, 2013).

We study survey responses of 649 secondary-school students who are located in a narrow geographic region along the language border within the canton of Fribourg. Besides measures of financial literacy, our survey captures detailed information on economic preferences, financial socialisation, norms and money attitudes as well as the socio-economic background. Our subjects are on average 15 years old and in their final year of compulsory schooling. The survey covers students from all educational levels.<sup>2</sup>

Our survey population provides key advantages to studying the initial level of financial literacy at an age relevant for future financial decision making. First, the youth in our sample have already been strongly exposed to cultural influences in their parental home, from family friends as well as at school. However, as they are all still subject to mandatory schooling, their level of financial literacy is less influenced by endogenous education, labour market and financial decisions than this would be in an adult population. Second, the majority of the students in our sample are very likely to make significant independent financial decisions within a year of the survey. In particular, two-thirds of the surveyed students plan to continue their education with an apprenticeship which will provide them with a first salary. Thus we measure financial literacy at an age when independent financial decision making is looming.

We document substantial differences in financial literacy between the two cultural groups. Responding to ten questions on financial literacy, students at German-speaking schools scored on average 1.3 points (25 percent) higher than students at French-speaking schools. Students at French-speaking schools are also 16 percentage points (36 percent) more likely to report that they (subjectively) find financial matters confusing. We find that differences between the language groups are particularly strong among Swiss nationals, while they are negligible among students with a recent immigration history. This supports our conjecture that locally embedded

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<sup>2</sup> The Swiss school system has on secondary level (13 – 16 years old) three levels with increasing academic difficulty. Students are assigned after the 6<sup>th</sup> grade based on their academic performance to a class on basic, medium or high level.

culture influences financial literacy and suggests that the observed differences are hardly related to (unobserved differences) in school curricula across the language border.

In line with previous evidence we document that - at the individual level - financial literacy is strongly correlated with financial socialisation (receiving pocket money at an early age, having independent access to a bank account) and time preferences (patience), but less so with norms towards debt and attitudes towards money. While we document a substantial difference in financial socialisation between the two cultural groups, we find no significant difference in time preferences. In a formal mediation analysis, financial socialisation, thus emerges as the strongest mediator of financial literacy between the two cultural groups.

Our findings contribute to two main strands of literature: First, we contribute to the recent literature on the social and economic determinants of financial literacy. Financial literacy among adults has been modelled as an endogenous choice (Jappelli and Padula, 2013 and Lusardi et al., forthcoming) in which e.g. the inherent stock of financial literacy, expected lifetime income as well as time and risk preferences influence the personal investment in acquiring financial literacy. Meier and Sprenger (2013) show that participation in voluntary financial education programs is strongly related to patience. Numerous studies analyse the effect of financial education programs on financial literacy and financial behaviour (see Fernandes et al., 2014; Miller et al., 2015 and Kaiser and Menkhoff, 2016 for meta-studies). Their findings with respect to causal effects of education programs on financial literacy and financial behaviour are ambiguous. By contrast, there is scarce empirical evidence on the origins of the “initial” stock of financial literacy. Lusardi et al. (2010) analyse how sociodemographic characteristics and family financial sophistication influence the inherent level of financial literacy among the youth. In this paper, we document that the “initial” level of financial literacy – among 15-year olds – varies strongly across social groups and is related to cultural differences in financial socialisation.

Second, we contribute to the literature on the role of culture in financial decision making. Christelis et al. (2013) document cross-country differences in households' asset allocation. Using survey information from 76 countries, Dohmen et al. (2015) show that observed cross-country differences in saving rates are associated with differences in time preferences. Exploiting differences in the cultural origins of immigrants to Canada and the U.S., Carroll et al. (1994; 1999) argue that culture has little impact on household savings. More recently, Haliassos et al. (forthcoming) document substantial cultural differences in the financial behaviour of immigrants to Sweden, but also how exposure to Swedish institutions leads to an assimilation to Swedish behaviour. Related to our study, Guin (2015) studies household saving behaviour among adults at the language border within Switzerland. He documents a significantly higher propensity to save among German-speaking households. We extend this strand of literature by documenting substantial cultural differences in financial literacy among the youth which is very likely to influence subsequent financial decision making.

The remainder of the paper is organized as follows. Section 2 describes the institutional background. Section 3 introduces the survey design and the dataset. Section 4 presents the analysis for differences in financial literacy. Section 5 focuses on the mediation analysis and section 6 discusses the findings.

## **2 Institutional background**

Switzerland has four official languages, whereby the overwhelming majority of the population speaks either German (63.3%) or French (22.7%) as their main language.<sup>3</sup> The historical language border between the French-speaking and German-speaking regions is clear cut, leading to a sharp change in the main language spoken from one municipality to the next.

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<sup>3</sup> 8.1% declare Italian, 0.5% Romansh and 6.8% other languages as their main language. Source: Swiss federal statistics office in 2015.

This language border has allowed differences in attitudes, norms and preferences to persist over time within a narrow geographic area.<sup>4</sup> Thus, while neighbouring regions usually assimilate through social interaction, in this particular case the language border prevented the mixing of attitudes, norms and preferences. Thus, the French-German language border within Switzerland is equivalent to a cultural border.<sup>5</sup> While recent studies (Chen, 2013 and Sutter et al., 2015) focused on how language itself influences preferences and behaviour, we use language as a proxy for cultural group membership.

Large parts of the German – French language border within Switzerland do not feature a geographical barrier or a major administrative border. Importantly, the language border runs through cantons, the first administrative subdivision of Switzerland. Since the institutional framework is mainly set at the federal and cantonal level, there is little change in major policies and institutions at the language border and it provides an optimal laboratory to explore cultural heterogeneity. That said, potential differences may exist in the implementation of policies, e.g. in the specificities of school curricula or the application thereof in schools.<sup>6</sup>

Several studies exploit the clear cut border between cultural groups within one institutional setting at the Swiss language border. Eugster et al. (2011) document a persistent, strong difference in the demand for social insurance between the French and German language region. In addition, work attitudes and unemployment durations sharply change at the language border (Eugster, et al., 2016). Both studies show that the differences persist even within groups with the same economic fundamentals. Guin (2015) documents that German-speaking

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<sup>4</sup> Eugster et al. (2011) provide a detailed discussion of languages in Switzerland and historical language borders.

<sup>5</sup> There is evidence that the difference at the within-country language border with respect to financial decisions is smaller than differences across countries (as for example exploited by Carroll et al. (1994)). Bachmann and Hens (2016) show that Swiss investors in all language groups are less prone to investor mistakes compared to investors in the same language region from neighbouring countries and that there are greater similarities in investment decisions of residents of Switzerland speaking different languages than there are between these and their linguistically closest neighbours.

<sup>6</sup> Differences in the implementation of policies may reflect the influence of culture since the local administration as well as teachers are also influenced by culture.

households are more likely to save and less prone to spend excessively compared to French-speaking households. The above mentioned studies all exploit within-canton variation provided by the French-German language border running through the three cantons Berne, Fribourg and Valais.<sup>7</sup>

Our study narrowly focuses on the language border region which runs through the bilingual canton of Fribourg. Fribourg has a francophone majority (125 municipalities with a total population of 235,769) in the west and a German-speaking minority (38 municipalities with a total population of 67,608<sup>8</sup>) in the east. Most municipalities have a distinct majority language and can therefore be clearly assigned to one language region (see figure 1). There are only few bilingual municipalities where the share of native French speakers is not below 20% or not above 80%.<sup>9</sup>

[Figure 1]

### **3 Data**

#### **3.1 Sample selection and procedure**

Our analysis is based on a survey of secondary school students located in a narrow geographic region along the French-German language border within the canton of Fribourg. The students are on average 15 years old and in their final year of compulsory education. From all secondary schools in the canton we pre-selected four German-speaking schools and three French-speaking schools based on the number of students and the schools' proximity to the language border. Figure 2 displays the location of the selected schools and the students'

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<sup>7</sup> Other studies exploit the Swiss language border to investigate inter-jurisdictional tax competition (Eugster & Parchet, 2013) or fertility and labour force participation (Steinhauer, 2013).

<sup>8</sup> The number of municipalities and population information refer to December 2014; Source: Federal statistics office permanent resident population by municipality

<sup>9</sup> One notable exception is the cantonal capital of Fribourg. We run a robustness check focusing on municipalities with a distinct majority language (Appendix 6).



municipality of residence. The study was supported by the cantonal department of education which encouraged all selected schools to participate in the survey.

The public secondary school system in Fribourg features three levels, which differ by the level of difficulty of the curriculum. Table 1 shows the number of observations by school level, gender and school language.<sup>10</sup> The aim was to survey a similar number of students for both genders on each of the three school levels for each language region. Within the seven selected schools, we randomly selected classes of students, stratified by educational level. Overall, 786 students in 40 classes were selected for the survey. Due to non-attendance, 63 students could not be surveyed. There is no indication that non-attendance was related to the survey.<sup>11</sup>

[Table 1]

[Figure 2]

The survey was conducted in November 2015 during regular school hours with paper and pen. The setting was similar to an exam situation and students were not allowed to communicate.<sup>12</sup> There was no reward for the completion of the survey and questions were not incentivized. The order of the questions was the same for all students. On average, it took students 30 minutes, with a minimum of 20 and a maximum of 45 minutes, to complete the survey.

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<sup>10</sup> In 2015 35% of students in the canton of Fribourg were in classes on the highest level that prepare for an academic high school which will later on qualify for the entry of university. 44% on the medium level and 19% on the lowest school level (Source: StatA Fribourg). Thus, the survey over-samples students from the lowest level.

<sup>11</sup> 12 students were participating in a program that allows them to retake the final year on a higher level or in a different language. These students are excluded from the sample.

<sup>12</sup> The survey was conducted by the authors and research assistants. They introduced the survey and replied to general questions. Instructions were always presented by a native speaker of the respective school language. During the completion of the survey no questions were answered and students were told to leave questions blank if they do not understand them. The teachers were present in the classroom but did not intervene in the process.

The custom-made survey contains 67 questions covering financial literacy, risk and time preferences, financial socialisation, debt norms, money attitudes and socioeconomic background. Survey questions were chosen with respect to the suitability for this particular age group. Given the bilingual setting, the translation of survey questions received particular attention. Students on both sides of the language border should perceive and understand questions with the same meaning. In order to obtain a high quality of translation, several bilingual translators assessed the translation of the survey. Many questions originate from similar studies that were conducted in English. Some questions were first translated to German and then to French while others were first translated to French and then to German.<sup>13</sup>

### **3.2 Financial literacy**

We define financial literacy as the degree to which students have acquired the knowledge and skills to make sound financial decisions.<sup>14</sup> The survey contains 10 financial literacy questions which are based on comparable studies and adjusted to the Swiss environment as well as to the students' age. The financial literacy questions cover the following topics: Simple interest, compound interest, percentage calculation of purchase decision, budgeting, understanding of bank statement, graphical understanding of stock price development, inflation, and diversification. Appendix 1 provides details and sources of the ten questions. The financial literacy score (*FL-score*) reflects the number of correct responses to the 10 questions. In addition, students gave a subjective assessment of their own financial literacy (see e.g. Gathergood, 2012a). They stated on a 6-point scale ranging from 1 (strongly disagree) to 6 (strongly agree) how strongly they agree to the statement: "*Financial matters are complicated*

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<sup>13</sup> English, French and German versions of the survey are available upon request.

<sup>14</sup> This is in line with the OECD definition of finance literacy (OECD, 2014).

*and confusing to me*". The variable is then transformed to a binary variable (*Fin-confusing*) equal to 1 if students stated 4 or higher.

### 3.3 Mediators of culture

Dohmen et al. (2012) provide evidence for a strong intergenerational transmission of risk and trust attitudes.<sup>15</sup> Hence, cultural differences in financial literacy may be related to systematic differences in preferences across the language groups. We assess risk and time preferences of students with qualitative and quantitative questions. The qualitative questions reflect the subjective assessment of the preference while the quantitative measure is based on a hypothetical choice. The two measures are combined with equal weights to yield one indicator of time preferences (*Patience*) and one indicator of risk preferences (*Risk seeking*) per subject.

Falk et al. (2016) suggest non-incentivized survey questions for the assessment of time and risk preferences that provide the best measure compared to values obtained from incentivized experiments.<sup>16</sup> We use the suggested general attitude questions addressing the subjectively perceived willingness to take risks and the attitude towards allocating consumption and work between present and future. For risk preferences, students state on a 6-point scale how strongly they agree with the statements (1 (strongly disagree) to 6 (strongly agree)): "I am a person who is willing to take risks". We construct a binary variable that takes on value 1 if a student stated 4 or higher. For the time preference measure, we use three questions in a 6-point scale: 1. "I rather go without something today in order to be able to afford more tomorrow". 2. "I tend to procrastinate tasks even though it would be better to get them done immediately". 3. "I am prepared to spend now and let the future take care of itself". We assign the value 1 to a

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<sup>15</sup> Our setting does not allow to identify the relative importance of vertical (intergenerational) and horizontal transmission of culture.

<sup>16</sup> The use of non-incentivized survey questions to elicit risk and time preferences may lead to different values compared to incentivized questions. For our study, this would only bias our results if the difference is influenced by cultural group membership.

question if the student indicated values 4 – 6. The qualitative measure of time preferences reflects the mean over the three questions.

Since the students are only 15 years old, we apply a framework based on the design used in Sutter et al. (2015) to obtain a quantitative measure of time and risk preferences. Students allocate a given amount between a future and an immediate payoff as well as between a safe and risky choice.<sup>17</sup> In contrast to Sutter et al. (2015), we do not make use of a choice list, responses are elicited by a pen and paper survey, and choices are not incentivized.

Parents play an important role in the financial education (Van Campenhout, 2015; Henchoz, 2016) of their children.<sup>18</sup> Through the dissemination of norms, the teaching of financial concepts and by giving their children the opportunity to handle their own money they influence financial decisions (Norvilitis & MacLean, 2010) as well as financial literacy (Lusardi, et al., 2010).<sup>19</sup> We capture *Financial socialisation* by constructing a measure related to observable actions of parents in fostering financial independence of their children. The measure covers the age at which the student first received pocket money, whether a student has a bank account and whether a student can independently access her bank account.

Norms towards saving and debt could be an important factor of how culture influences financial literacy.<sup>20</sup> We elicit the exposure of students to such norms by measuring how often they heard the following two statements from their parents<sup>21</sup>: 1. “You should not spend more than what you have”. 2. “You should not have debts”. Students rated the frequency on a 6-point

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<sup>17</sup> Sutter et al. (2015) elicit time preferences with the use of a choice list. Each child made decisions in three binary decision problems where the payoff was varied. Hence, their measure of time preferences is not fully comparable to ours.

<sup>18</sup> Strong correlations in financial behaviour are reported across generations (Fagereng et al., 2015; Kreiner et al., 2016; Black et al., forthcoming).

<sup>19</sup> Webely and Nyhus (2013) provide numerous examples of parental practices that provide a learning experience.

<sup>20</sup> Gathergood (2012b) shows that the impact of problem debt on psychological health is less severe in localities in which problem debt is more widespread and therefore the social stigma is weaker.

<sup>21</sup> The survey also aimed at capturing norms towards saving. The question however suffers from an endogeneity bias and mainly students who save little state that they are often told to save. We therefore do not make use of this variable.

scale ranging from 1 (never) to 6 (very often). Each answer is transformed to a binary variable equal to 1 if students indicated values 4 – 6. The variable *Debt norms* then reflects the mean over the two answers. The indicator thus captures financial socialisation as passing on norms towards financial decision making.

Evidence from the psychology and consumer behaviour literature further suggests that personal attitudes towards money, e.g. the importance of money as a means to achieve social prestige and freedom, are associated with lower levels of financial literacy (Sohn, et al., 2012) of adolescents. Differences in money attitudes across the language groups in our study may therefore be one driver of cultural differences in financial literacy. We capture two dimensions of money attitudes similar to the attributes mentioned in Mitchell and Mickel (1999). First, we elicit the freedom and control component of money attitudes by measuring how strongly students agree to the following two statements: 1. “For me, money is a tool to accomplish goals”. 2. “I am living according to the motto: Money gives me the freedom to do what I feel like.” Students rated the statements on a 6-point scale ranging from 1 (strongly agree) to 6 (strongly disagree). Each answer is again transformed to a binary variable equal to 1 if students indicated values 4 – 6. The variable *Freedom & control* then reflects the mean over the two answers. Second, we construct a measure from two questions capturing how strongly money is connected to social status and power (Social prestige). Students rate the following two statements on a 6-point scale ranging from 1 (strongly agree) to 6 (strongly disagree): “1. For me, money is a tool to make friends.” 2. “I am prepared to do everything it takes to get money”. Again, each answer is transformed to a binary variable equal to 1 if students indicated values 4 – 6. The variable *Social prestige* reflects the mean over the two answers.

### 3.4 Socioeconomic background

We collect a broad set of information on the socioeconomic background of students. Besides personal characteristics such as gender and birth year we further elicit religion and citizenship. Citizenship provides a proxy of how long a family has been resident in the country.<sup>22</sup> Religion is reported to influence social norms and preferences (Basten & Betz, 2013). Further, we try to capture the economic background of students through several proxies. Having an own room at home, whether the home is owned or rented, as well as the number of weeks on holidays each year approximate parental wealth and income.<sup>23</sup>

### 3.5 Univariate comparison

We obtain responses from 711 students. Due to missing values we restrict the sample to 649 students.<sup>24</sup> Appendix 2 provides summary statistics and variable descriptions for this sample. Univariate comparisons in Table 2 show that students at French-speaking schools have on average a lower financial literacy score and perceive financial matters as more confusing. These descriptive results suggest that there may be a significant difference in financial literacy across the language groups. Importantly, the difference across the language groups are most pronounced for students with Swiss citizenship while they are negligible for non-Swiss students. This finding suggests that the observed differences in financial literacy may well be

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<sup>22</sup> In Switzerland citizenship is not birth place dependent. It depends on the citizenship of the parents. In the canton of Fribourg, adults can launch the process of naturalisation after they have lived 12 years in Switzerland. Thus, the measure does not only capture a recent immigration history but also many families who immigrated decades ago.

<sup>23</sup> We further gather information on parental education and parental cultural activities (cinema, theatre, classical music concerts and museums). For these variables students often ticked the *Do not know* option or left them blank. Hence, controlling for these variables comes at the cost of losing many observations. Controlling for these variables, however, has no effect on our main results. Appendix 4 displays pairwise correlations of parental education and parents' cultural activities with the control variables used in our specifications for the observations for which these information is available. The table shows that they are highly correlated and therefore we do not control for parental education in order to have a higher number of observations.

<sup>24</sup> 6 surveyed students come from another region and we therefore exclude them. For 12 observations, we lack information on gender, for 19 observations on the nationality, for 7 observations on the year of birth and for 18 observations on the home municipality.

rooted in a historical cultural divide between the two national language groups.<sup>25</sup> Figure 3 displays histograms of the financial literacy score for each school language. The share of French-speaking students with very low financial literacy scores is clearly higher than that of German-speaking students.

[Table 2]

[Figure 3]

Considering our measures of economic preferences, financial socialisation, norms and money attitudes, the most striking differences between the two language groups are observed for financial socialisation and debt norms (see Appendix 2a). Students at French-speaking schools report that they receive pocket money at a later age. Moreover, they less often have a bank account or independent access to an account. German-speaking students were more often discouraged from taking on debt by their parents. Looking at money attitudes, French-speaking students connect money more strongly with freedom while the importance of money for social prestige is only marginally different between the two groups. Appendix 2a also documents small differences for time preferences and risk preferences between the two groups: Students at French-speaking schools are on average less patient and more risk seeking.

Summary statistics of our socioeconomic control variables (Appendix 2b) show some significant differences in household characteristics across the language border. Students at French-speaking schools are less often Swiss citizens and are more likely to grow up in an urban municipality.<sup>26</sup> Significant differences also exist in the economic well-being as captured by the

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<sup>25</sup> Students without Swiss citizenship come from various backgrounds and are a clearly less homogeneous group compared to the group of Swiss citizens. That we find no clear difference for non-Swiss students indicates that the results are not driven by potential differences in the execution of education policies, i.e. in the specificities of school curricula and the implementation thereof in schools.

<sup>26</sup> Urban municipalities have a population of more or equal 10,000.

likelihood that all children of the family have a single room and whether the home is owned rather than rented.

## **4 Language group and financial literacy**

### **4.1 Methodology**

In the first step of our analysis, we examine how exposure to a language group influences financial literacy. We aim at estimating the Average Treatment Effect (ATE) for the population of youth where the exposure to the French-speaking language group is defined as treatment.<sup>27</sup> We use the school language as the mutually exclusive treatment variable.

$$ATE = E[Y_i(1) - Y_i(0)]$$

Each student in the sample is indexed by  $i = 1, \dots, N$ . The variable  $T_i$  is a dummy variable.  $T_i = 1$  indicates that a student attends a French-speaking school and is treated.  $T_i$  is equal to 0 for students of German-speaking schools.  $Y_i(1)$  indicated the potential outcome of student  $i$  if she is exposed to the French-speaking region while  $Y_i(0)$  indicates the potential outcome if she is exposed to the German speaking region. The survey data allow only for the observation of the average difference in the actual outcomes for students exposed to the French-speaking and German-speaking language region:

$$E[Y_i(1) | T_i=1, X=x] - E[Y_i(0) | T_i=0, X=x] = ATE$$

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<sup>27</sup> The treatment effects literature suggests that only mutable characteristics should be considered as treatment (e.g. Holland, 1986). Even though culture is nearly immutable post-birth, the exposure to a language group is a treatment that can be manipulated. Our strategy focuses on the ATE since the definition of the treatment could be easily reversed.



Our treatment variable – the language of the school which the student attends – deserves particular discussion. We argue that by defining treatment as the school language we assign students to the cultural group they are most exposed to. First, we note that for most students the school language is exogenously determined by the majority spoken language in the municipality where the family resides. However, in some bilingual municipalities parents can actively choose which school their children attend. In these municipalities, most parents choose the school according to the language spoken at home.<sup>28</sup> Moreover, where parents are bilingual or speak a third language it is reasonable to assume that they choose the school language they feel is closer to their own cultural values. In any case, children are influenced by the culture of their peers and for our subject pool of 15-year-old students school is also an important location of socialisation.

Our empirical strategy differs from the spatial regression discontinuity design applied by other studies exploiting the language border.<sup>29</sup> We argue that using school language as treatment allows for a more precise classification of cultural group membership than the classification by the majority language of the home municipality which is typically used in RDD analyses. This is especially important since students in our sample reside in municipalities very close to the language border.<sup>30</sup> Our approach, however, comes at the cost that we primarily capture the exposure to culture in school and the parental home and may not fully capture the effect from the neighbourhood's culture. In a robustness tests we therefore redefine the

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<sup>28</sup> The parental language for Swiss students is highly correlated with the school's language. Only 4 students in the sample attend French-speaking schools while they speak to their parents predominantly in German (And 14 students attending German-speaking schools vice versa). 31% of students from German-speaking schools state that they speak sometimes or often in French to their parents (6% of students at French-speaking schools sometimes or often speak in German to their parents). The exposure to both cultural groups leads to a downward bias of our estimate.

<sup>29</sup> For the spatial RDD, distance to the language border is used as the forcing variable. At 0 – the language border – the treatment status suddenly changes (e.g. Eugster et al., 2011 and Guin, 2015). We perform this strategy in a robustness check (Appendix 5).

<sup>30</sup> Related studies typically use a radius of 50km (Eugster, et al., 2011) around the language border while 99% of students in our sample reside not more than 10km away from the language border.

treatment based on the majority language in the municipality of residence and yield similar results.

Our identification strategy relies on the conditional independence assumption (CIA) and thus we assume that, after controlling for observable confounders  $X$ , potential outcomes are not correlated with the treatment. What could violate the conditional independence assumption in our setting and thus bias the estimate?

First, any characteristics that cause a student with higher (or lower) potential financial literacy to attend a French-speaking rather than a German-speaking school may bias our results. As discussed above, for the overwhelming majority of students in our sample school language is exogenously determined. To rule out that the endogenously chosen school language biases our results we run a robustness check where we limit our sample to students whose home municipality has a clear majority language, meaning their school language is exogenous (Appendix 5).

Second, we assume that the vector of observable confounders  $X$  captures all differences in socioeconomic characteristics of students, as well as institutions, policies and economic conditions across the language border which may influence financial literacy but are not caused by the treatment. Which student-level and household-level control variables should be considered in our setting? The CIA requires us to control for any  $X$  mutually influencing  $Y$  and  $T$  but not for variables influenced by  $T$  (endogenous control variables). Controlling for household characteristics could lead to endogenous controls since they are influenced by local culture (for example discussed in Rosenbaum (1984) and applied to the case of gender in Huber (2015)). Thus, observed differences in household characteristics between the two language groups may simply reflect the influence of culture. In particular, the exposure to a language region may potentially influence the parents' preferences for education, potentially implying a

different composition of students at each school level. Through differences in curricula the school level may then influence financial literacy.

Institutions and policies are in many cases endogenous and influenced by local culture (Alesina & Giuliano, 2015). Thus, potential heterogeneity should be considered in detail. One major advantage of our chosen sample is that we are comparing students across language groups, but within the same institutional setting. In particular, relevant policies such as the school curriculum are set at the cantonal level. There are, however, two administrative subdivisions, one for each language region, which are responsible for the detailed curriculum. This may cause some differences in the specificities and implementation of the curriculum between the two language regions within the canton of Fribourg. The two school curricula marginally cover the topic of financial literacy. The decisions to cover the topic in class is given to the teachers. In our sample, 39% of French-speaking students and 25% of German-speaking students state that topics related to financial education were covered in class.<sup>31</sup> However, again it is unclear whether local differences in institutions and policies – such as the details of the school curriculum – should be controlled for as these may be endogenous and influenced by local culture.

Descriptive statistics of economic conditions by municipality in Appendix 3 reveal that there are clear differences between the municipalities in the two language regions. Students attending a French-speaking school are more often from larger municipalities with a higher share of non-Swiss residents. Further, there are differences in the sector allocation of employees, the number of cars per inhabitant, the number of bank branches as well as in religious affiliation. The financial situation measured by the tax potential index is very similar. This suggests that schools' financial resources are comparable across the language border.

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<sup>31</sup> The measure is vague, since for example interest rate calculations discussed in math classes can be considered as part of financial literacy. The coverage of financial literacy in class is not significantly related to the financial literacy score.

While certain characteristics just reveal given differences, others may again display the influence of culture. For example, the level of tax could simply reflect differences in preferences resulting in stronger support for redistribution and social services (Eugster & Parchet, 2013).

Given the potential for endogenous confounders at the household and municipal level we perform our empirical analysis with two main specifications. In a first estimation, control variables are limited to student-level variables which we consider to be less prone to the influence of culture (age, gender and citizenship). However, in the extreme case also gender or age in the last year of mandatory schooling can be potentially influenced by locally embedded culture. In a second estimation, we include student characteristics, household characteristics and the size of municipality which are potentially influenced by culture.

Finally, a bias may arise from measurement error related to the language region. Many qualitative questions ask the students to assess how often they perform an action or how strongly they agree. These are relative measures and the choice could be influenced by the reference point determined by the social environment. This may potentially cause a downward bias of our estimate.

We estimate the following equation in an OLS model:

$$Y_i = \alpha + \beta \text{French}_i + \gamma X_i + \varepsilon_i$$

where French is a dummy that is equal to one for students from French-speaking schools and vector X contains a set of control variables. Y represents the outcome variables. For all estimations, standard errors are clustered on class level. As a robustness check, we apply a semi-parametric propensity score matching estimation.

## 4.2 Results

Table 3 presents results of the OLS regression relating school language to financial literacy. Students at French-speaking schools obtained on average one point less on the financial literacy score (*FL-score*). This corresponds to 40% of the standard deviation and nearly one-fifth of the full-sample mean. French-speaking students are also 10 percentage points more likely to state that financial matters are confusing. The magnitude of the point estimate corresponds to almost one-fifth of the total sample mean. Estimates are only slightly lower than the average mean difference displayed as univariate statistics. Thus, even though there are considerable differences in observed control variables, they hardly account for the observed differences in financial literacy between students of the two language regions.

For both outcome variables, the choice of control variables does not strongly influence the estimated coefficient. Results of a semi-parametric propensity score matching estimation support estimates of the parametric model (Appendix 7). Results from a Probit model applied to the binary outcome variable *Fin-confusing* are in line with the OLS estimates.<sup>32</sup>

[Table 3]

The subsample analysis in Appendix 6 confirms that there is considerable heterogeneity in the effect of language group on financial literacy between Swiss nationals and students with an immigrant background. As suggested by our univariate comparisons in Table 2, we find a large and statistically significant treatment effect among Swiss nationals, while there exists no significant difference in financial literacy among immigrants. This finding again suggests that the observed difference in financial literacy is rooted in a historical cultural divide between the

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<sup>32</sup> Results are available upon request.

two language groups. Subsample comparisons by gender show similar treatment effects in both subsamples for the financial literacy score. By contrast, the subjective measure of financial literacy only shows a significant language group effect in the male subsample.

As several of our financial literacy questions require mathematical calculations the observed difference in the financial literacy score could potentially be driven by differences in the math curriculum between the two groups. Our Table 4 results suggest, however, that this is not the case. We group our financial literacy questions by their “math intensity” and document significant language group differences in the number of correct responses for questions with high, low and medium math intensity. To do so we first relate correct answers for each question in a within class regression to the math grade of students. Then we group the financial literacy questions according to the measured correlation with the math grade. Table 4 reports the average difference in financial literacy questions by how strongly questions are correlated with the math grade. Students managed on average to correctly answer 62% of the three questions most strongly related to the math grade. The value of students for French-speaking schools is 16.7 percentage points lower compared to students at German-speaking schools, corresponding to 27% of the sample mean. For the questions with the lowest correlation with the math grade, students at French-speaking schools were 10 percentage points less likely to answer them correctly compared to students at German-speaking schools. The estimated effect reflects 19% of the mean score for the three questions. Thus, the language group difference is also strong for questions which require the understanding of concepts such as inflation or diversification and the graphical interpretation of graphs.

[Table 4]

In an unreported analysis, we group the financial literacy questions by their context and estimate the effect of culture separately for each group. Five of the questions refer to a bank account, three refer to other financial products (stocks) and two were related to a purchase

decision and budgeting. The estimated difference in financial literacy between students from German- and French-speaking schools is strongest for questions related to a bank account (32% of the mean) and weaker for questions related to stocks (11% of mean) and purchasing and budgeting (14% of mean). This finding is particularly interesting since we show in the following section that the observed cultural difference in financial literacy is mainly mediated by differences in financial socialisation, i.e. the age at which the subjects receive pocket money and have access to a bank account.

## **5 Explaining cultural differences in financial literacy**

In this section we examine to what extent the observed differences in financial literacy across the language groups can be explained by systematic differences in time and risk preferences, financial socialisation, norms or money attitudes. We disentangle the previously estimated average treatment effect of culture on financial literacy into a direct effect and an indirect effect, going through the above mentioned mediators.

### **5.1 Methodology**

Our analysis aims to identify the mediation effect of different potential mediators (see e.g. Barron and Kenny (1986), Pearl (2011) and Imai et al. (2011) for a detailed discussion of the methodology). In addition to the outcome  $Y_i$  and the treatment  $T_i$  we observe the value of the mediator  $M_i$  for student  $i$ .  $M_i(1)$  denotes the potential mediator value for treated students while  $M_i(0)$  denotes the potential mediator value in case of non-treatment.  $Y_i(t,m)$  denotes the potential outcome under treatment status  $t$  and mediator value  $m$ . We can now define the direct effect and the mediation effect (defined as ACME: Average Causal Mediation Effect).

$$\text{Direct effect} = E[Y(1, M(t)) - Y(0, M(t))]$$

$$\text{ACME} = E[Y(t, M(1)) - Y(t, M(0))]$$

The direct effect is based on the idea of exogenously varying the treatment - the exposure to a language region - under fixed values for the mediator variable. For the ideal estimation of the ACME, an exogenous variation in the mediating variable is required while the treatment status is kept constant. In our setting, it would for example require an exogenous change in economic preferences of students that remain in their native language region.

The sum of the two effects equals to the previously observed ATE or the total effect.

$$\text{ATE} = \text{Total effect} = \text{Direct effect} + \text{ACME} = Y_i(1, M_i(1)) - Y_i(0, M_i(0))$$

We are able to estimate the average causal mediation effect assuming sequential ignorability (Imai, et al., 2010). The first component of sequential ignorability requires an unbiased estimation of ATE for Y and for M (as previously discussed in 4.1). The second underlying assumption requires that:

$$Y_{i(t,m)} \perp\!\!\!\perp M_i | T_i = t, X_i = x$$

Any factor mutually influencing Y and M may bias our result. Since mediators potentially influence other mediators, this might be a source of bias. We apply the methodology suggested by Imai and Yamamoto (2013) to control for other mediators that could potentially influence the mediator of interest and the outcome Y in a robustness check (Appendix 8).

In order to distinguish between a direct and a mediation effect, we estimate the following two linear regressions:

$$M_i = \alpha_2 + \beta_2 T_i + \xi_2 X_i + \varepsilon_{i2}$$

$$Y_i = \alpha_3 + \beta_3 T_i + \gamma M_i + \xi_3 X_i + \varepsilon_{i3}$$

The mediation effect is defined as  $\text{ACME} = \beta_2 \times \gamma$  while the Direct effect =  $\beta_3$ .



## 5.2 Results

By construction, a strong mediator needs to be highly correlated with the outcome variable (financial literacy) and needs to vary significantly with the treatment (language group). Table 5 shows that all potential mediators are significantly correlated with financial literacy in a simple pairwise correlation test. Students who are less risk seeking and more patient have a higher financial literacy score. Financial socialisation, debt norms and money attitudes are also strongly correlated with the financial literacy score. Considering the magnitude of the pairwise correlations we find that *Patience* and *Financial socialisation* have the highest correlation with the financial literacy score. Moreover, these two variables are the only mediators which are significantly correlated with our subjective measure of financial literacy.

[Table 5]

Table 6 presents the estimated differences in preferences, financial socialisation, norms and money attitudes between the two language groups estimated in a linear model. Our OLS estimates reveal only small differences in relevant economic preferences between the language groups. Students at French-speaking schools are slightly more willing to take risks. By contrast our estimates do not yield significant differences for *Patience*. In line with the linguistic-savings hypothesis (Chen, 2013), Sutter et al. (2015) report significant differences in time preferences among students of a bilingual town in Southern Tirol. German-speaking students are reported to be significantly more patient. Our findings therefore do not support the linguistic-savings hypothesis.

The OLS estimates show a strong and significant effect for our measure of financial socialisation. Students at French-speaking schools obtain on average a by 0.14 lower value in *Financial socialisation*, which corresponds to one half of the standard deviation and nearly one

third of the mean in the full sample. Students at French-speaking schools also report a significantly lower value for *Debt norms*, indicating that their parents less often discourage them from taking on debt. This point estimate corresponds to one-quarter of a standard deviation and one-seventh of the mean in the full sample. Further, students at French-speaking schools report money as more important in attitude questions assessing the *Freedom & control* component. The estimated effect of 0.22 is economically significant and represents one half of the standard deviation and 46% of the mean in the full sample. We do not observe any significant difference in money attitudes assessing social prestige. Combining the results from Tables 5 and 6, we would expect that the strongest mediator of culture on financial literacy is financial socialisation. This mediator is both strongly correlated with financial literacy and differs significantly across the language groups.

[Table 6]

In Table 7 we present the results of our formal mediation analysis. The table reports for the two outcome variables and our six mediators of culture the average causal mediation effect (ACME) and the direct effect as well as the proportion of the estimated total effect that is mediated. In line with our findings from Tables 5 and 6, we find that *Financial socialisation* is the only statistically significant mediator of cultural group membership on financial literacy. For our objective measure of financial literacy, financial socialisation can account for 12% of the observed difference in financial literacy between the language groups. For our subjective measure of financial literacy, financial socialisation can account for 27% of the total treatment effect.

The mediation analysis presented above may suffer from a potential violation of the sequential ignorability assumption since it implicitly assumes that the multiple mediators are causally independent of another. We apply the methodology suggested by Imai and Yamamoto

(2013) to control for potential causal effects between mediators. Results from this analysis (Appendix 8) do not strongly deviate from results presented in Table 7.

[Table 7]

Cultural differences in financial literacy may be transmitted from one generation to another (vertical transmission) as well as via peers (horizontal transmission) (see for example Bisin and Verdier (2001)). Our analysis does not allow us to identify the relative importance of vertical as opposed to horizontal transmission. Specifically, our measure of *Financial socialisation* is related to actions of the students' parents; i.e. giving their children pocket money and access to a bank account. However, we do not know whether parents give their children pocket money (or set up a bank account) because they themselves received pocket money at an early age (intergenerational transfer). Alternatively, parents may give their children pocket money because these report that all other children in their neighbourhood (or at school) receive pocket money (peer effects). Thus, while our mediation analysis does allow us to identify financial socialisation as an important driver of cultural differences in financial literacy, we remain silent on the role of parents and peers in this process.

## **6 Discussion**

This paper studies to what extent and through which channels culture influences financial literacy among the youth. We employ detailed survey data for 15-year old secondary school students located in a narrow geographic region along the German-French language border within the Swiss canton of Fribourg.

We find that students from the German-speaking area are more financially literate as revealed by their responses to a standard set of financial literacy questions as well as by their own subjective assessment. A mediation analysis suggests that financial socialisation is a significant driver of cultural difference in financial literacy. Systematic variation in the age at which children receive pocket money and whether they have their own bank account is the predominant mediator through which culture translates into a difference in financial literacy.

Financial literacy of the youth has gained considerable awareness among policy makers in recent years. Substantial investments in financial education initiatives have been made by the public and private sector with many countries implementing financial education initiatives on a countrywide scale, e.g. in public schools. The findings of our study are especially relevant for programs targeting a very heterogeneous group of students. Our findings point towards the important role of cultural background in determining financial literacy. Awareness of these cultural determinants may help design more effective programs especially in countries with a culturally diverse population for example as result of a large migrant population or historical language or religious borders.

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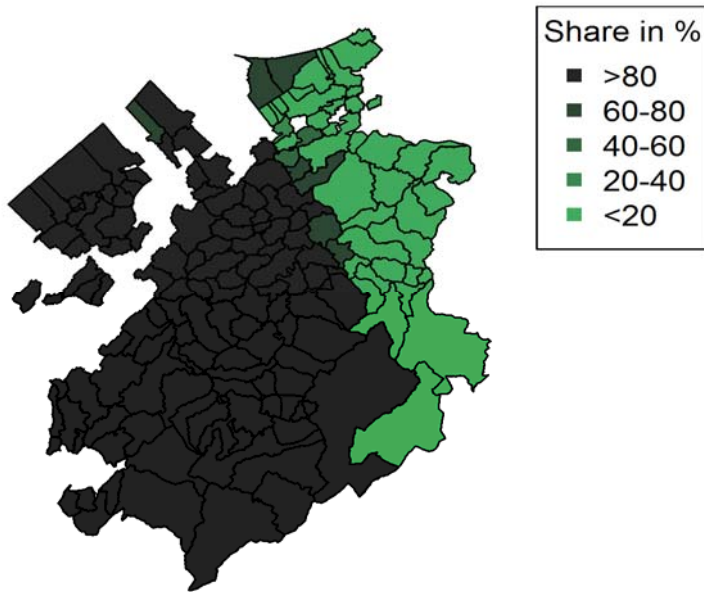
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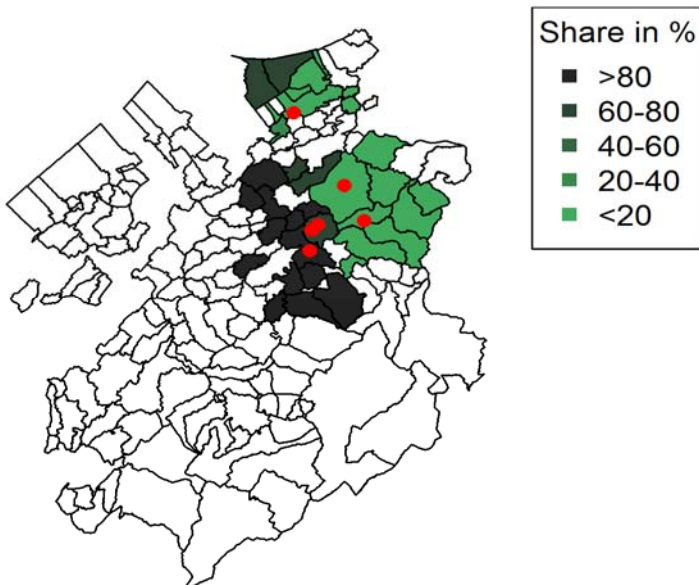
**Figure 1. Municipalities of the canton of Fribourg**

The colours in the map display the share of the population that states French as the main language. Individuals who state other languages than French and German as their main language are excluded. (Source: StatA Fribourg)

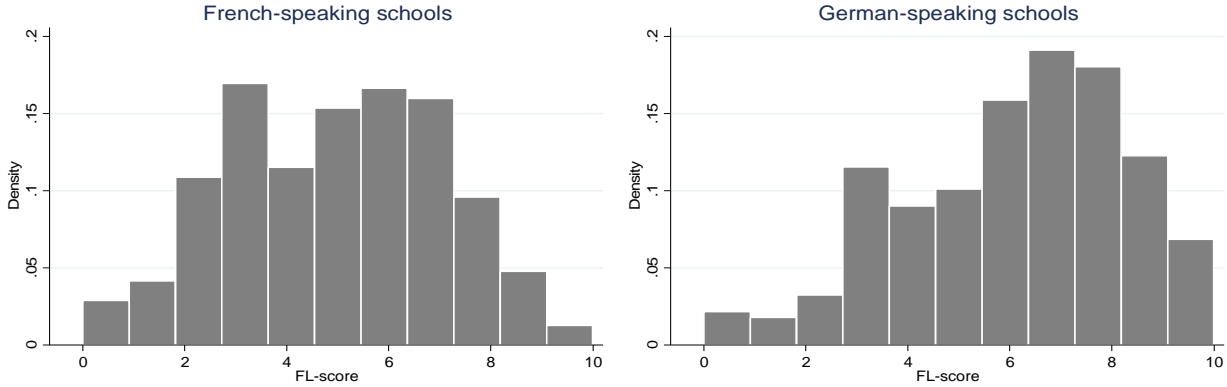


**Figure 2. Students' home municipalities in the sample**

The map displays home municipalities of students in the sample and the share of French-speakers in the respective municipalities. White coloured municipalities are not in the sample. Red dots mark locations of schools. (Source: StatA Fribourg)



**Figure 3. Distribution financial literacy score by school language**



**Table 1. Sample composition: Number of observations****Total sample by school level and gender**

School level	German-speaking		French-speaking		Total
	Male	Female	Male	Female	
Basic	40	36	65	43	184
Medium	77	45	55	54	231
High	51	56	57	70	234
Total	168	137	177	167	649

**Total sample by school level and citizenship**

School level	German-speaking		French-speaking		Total
	Swiss	Non-Swiss	Swiss	Non-Swiss	
Basic	66	10	51	57	184
Medium	112	10	58	51	231
High	105	2	106	21	234
Total	283	22	215	129	649

**Table 2. Outcome variables: Difference in mean**

The p-value denotes the level of significance of a t-test.

	FL-score				Fin-confusing			
	Mean		Diff	p-value	Mean		Diff	p-value
German	French	German			French			
Total sample	6.20	4.94	1.25	0.00	0.44	0.60	-0.16	0.00
<i>by gender</i>								
Male	6.55	5.25	1.29	0.00	0.30	0.53	-0.23	0.00
Female	5.77	4.62	1.15	0.00	0.61	0.68	-0.07	0.22
<i>by school level</i>								
Basic	4.18	3.79	0.40	0.21	0.51	0.69	-0.18	0.02
Medium	6.12	4.41	1.71	0.00	0.48	0.60	-0.12	0.06
High	7.71	6.39	1.32	0.00	0.36	0.54	-0.18	0.00
<i>by citizenship</i>								
Swiss	6.30	5.22	1.08	0.00	0.42	0.60	-0.18	0.00
Non-Swiss	4.86	4.48	0.38	0.43	0.73	0.62	0.11	0.32

**Table 3. Multivariate regression: Difference in financial literacy**

This table reports results of the OLS regression French on financial literacy. Basic control variables, considered as unaffected by culture, include: Female, Swiss, Born in 2000, Born after 2000. Extended controls include: Urban, School level, Single room, Rent home, Holidays, Catholic, Protestant, Other religion, Not religious. Standard errors are clustered at class level and are reported in brackets. \*\*\*, \*\*, \* denote significance at the 0.01, 0.05 and 0.10-level. Due to missing values, the number of observations fluctuates across specifications.

	Financial literacy			
	(1) FL-score	(2) FL-score	(3) Fin-confusing	(4) Fin-confusing
French	-0.904** (0.428)	-1.140*** (0.214)	0.125** (0.049)	0.117** (0.046)
Constant	5.057*** (0.380)	4.775*** (0.508)	0.458*** (0.071)	0.459*** (0.109)
Mean	5.53	5.51	0.53	0.53
Observations	649	588	640	579
R-squared	0.126	0.357	0.084	0.103
Basic controls	Yes	Yes	Yes	Yes
Extended controls	No	Yes	No	Yes

**Table 4. Correlation with math grade**

This table reports results of the OLS regression French on financial literacy questions grouped by how highly correct answers are correlated with a higher math grade. We run a linear regression on a dummy variable indicating a correct answer on the math grade using class fixed effects and the basic and extended controls. The groups are then formed based on the magnitude of the coefficient of the math grade variable. Most math is the share of correctly answered questions 2.1, 2.3 and 2.6b). Medium math is the share of correctly answered questions 2.2, 2.4, 2.5b) and 2.6a). Least math is the share of correctly answered questions 2.5a), 2.7 and 2.8. Basic control variables, considered as unaffected by culture, include: Female, Swiss, Born in 2000, Born after 2000. Extended controls include: Urban, School level, Single room, Rent home, Holidays, Catholic, Protestant, Other religion, Not religious. Standard errors are clustered at class level and are reported in brackets. \*\*\*, \*\*, \* denote significance at the 0.01, 0.05 and 0.10-level.

	Most math (1)	Medium math (2)	Least math (3)
French	-0.167*** (0.030)	-0.084*** (0.025)	-0.100*** (0.030)
Constant	0.584*** (0.063)	0.386*** (0.071)	0.493*** (0.059)
Mean	0.62	0.51	0.53
Observations	588	588	588
R-squared	0.315	0.210	0.190
Basic controls	Yes	Yes	Yes
Extended controls	Yes	Yes	Yes

**Table 5. Pairwise correlations of outcome variables and mediators**

This table reports pairwise correlations. \*\*\*, \*\*, \* denote significance of the correlation coefficient at the 0.01, 0.05 and 0.10-level.

	FL-score	Fin- confusing	Risk seeking	Patience	Financial socialisation	Debt norms	Freedom & control	Social prestige
FL-score	1.00							
Fin-confusing	-0.32***	1.00						
Risk seeking	-0.1**	-0.01	1.00					
Patience	0.27***	-0.2***	-0.18***	1.00				
Financial socialisation	0.23***	-0.17***	-0.04	0.08*	1.00			
Debt norms	0.1**	-0.05	-0.04	0.03	0.11***	1.00		
Freedom & control	-0.08**	-0.05	0.17***	-0.03	-0.04	0.01	1.00	
Social prestige	-0.18***	0.06	0.1**	-0.1**	-0.05	0.04	0.22***	1.00







### Appendix 1. Source of financial literacy questions

The table displays the individual topics covered in the financial literacy score and the source of the question. It further provides the share of correctly answered questions by school language. The sample means are compared using a Chi Square test. \*\*\*, \*\*, \* denote significance at the 0.01, 0.05 and 0.10-level.

Question	Concept	Question adapted from:	Share correctly answered		
			German-speaking	French-speaking	Difference
2.1	Simple interest	Atkinson and Messy (2012)	0.77	0.42	0.35***
2.2	Compound interest	Lusardi and Tufano (2015)	0.37	0.22	0.15***
2.3	Percentage calculation of purchase decision	FSA (2006)	0.80	0.71	0.09***
2.4	Budgeting	OECD (2012)	0.50	0.42	0.08**
2.5 a)	Understanding of bank statement	OECD (2012)	0.63	0.58	0.05
2.5 b)	Understanding of bank statement	OECD (2012)	0.70	0.54	0.16***
2.6 a)	Graphical understanding of stock price development	OECD (2012)	0.64	0.71	-0.07*
2.6 b)	Graphical understanding of stock price development	OECD (2012)	0.62	0.47	0.15***
2.7	Inflation	Lusardi and Mitchell (2011)	0.37	0.25	0.12***
2.8	Diversification	Lusardi and Mitchell (2011)	0.80	0.62	0.18***

**Appendix 2a. Summary statistics and variable definitions**

Variable	Obs	Mean	SD	Min	Max	Mean German	Mean French	Diff	P-value t-test	Description
FL-score	649	5.53	2.44	0.00	10.00	6.20	4.94	1.25	0.00	Financial literacy score; 10 = highest FL
Fin-confusing	640	0.53	0.50	0.00	1.00	0.44	0.60	-0.16	0.00	Financial matters are confusing; Binary variable = 1 if agree
Patience	584	0.67	0.16	0.07	1.00	0.69	0.66	0.02	0.06	Average of quantitative and qualitative time preference measure
Time preferences quant. measure	599	0.74	0.25	0.00	1.00	0.77	0.70	0.07	0.00	Share allocated to patient choice in time preference game
Time preferences qual. measure	633	0.61	0.18	0.07	1.00	0.60	0.61	-0.02	0.27	General qualitative patience questions; High if more patient
Risk seeking	581	0.41	0.18	0.00	1.00	0.39	0.43	-0.05	0.00	Average of quantitative and qualitative risk preference measure
Risk preferences quant. measure	593	0.26	0.23	0.00	1.00	0.25	0.27	-0.01	0.47	Share allocated to risky choice in risk preference game
Risk preferences qual. measure	635	0.64	0.21	0.17	1.00	0.60	0.67	-0.06	0.00	General risk attitude from qualitative question; High if high willingness to take risks
Financial socialisation	598	0.52	0.32	0.00	1.00	0.61	0.43	0.18	0.00	Average over next 3 variables
Bank account	642	0.75	0.43	0.00	1.00	0.88	0.63	0.25	0.00	Binary variable = 1 if student has a bank account
Independent bank account	638	0.33	0.47	0.00	1.00	0.40	0.27	0.13	0.00	Binary variable = 1 if can independently use bank account
Dummy pocket money	611	0.45	0.50	0.00	1.00	0.55	0.37	0.18	0.00	Binary variable = 1 if first pock money received <12 years old (median 12 years)
Debt norms	629	0.67	0.41	0.00	1.00	0.74	0.62	0.12	0.00	Average over next 2 variables
Not spend more than what you have	641	0.66	0.47	0.00	1.00	0.73	0.60	0.13	0.00	Binary variable = 1 if parents told student sometimes or often not to spend more than what she/he has
Should not make debt	633	0.68	0.47	0.00	1.00	0.74	0.62	0.12	0.00	Binary variable = 1 if parents told student sometimes or often not to make debt
Freedom & control	642	0.48	0.41	0.00	1.00	0.35	0.59	-0.24	0.00	Average over next 2 variables; high = money important for freedom and control
Tool to obtain goals	642	0.56	0.50	0.00	1.00	0.45	0.65	-0.21	0.00	Binary variable = 1 if student agrees or tends to agree that money is a tool to obtain goals
Provides freedom	647	0.39	0.49	0.00	1.00	0.26	0.51	-0.26	0.00	Binary variable = 1 if student agrees or tends to agree that money provides freedom to do what I feel like
Social prestige	639	0.12	0.23	0.00	1.00	0.11	0.14	-0.03	0.09	Average over next 2 variables; high = money important for social prestige
Tool to make friends	644	0.06	0.23	0.00	1.00	0.09	0.02	0.07	0.00	Binary variable = 1 if student agrees or tends to agree that money is a tool to make friends
Willing to do everything required to obtain money	641	0.19	0.40	0.00	1.00	0.12	0.26	-0.13	0.00	Binary variable = 1 if student agrees or tends to agree that he/she is willing to do everything required to obtain money

**Appendix 2b. Summary statistics control variables and variable definitions**

Variable	Obs	Mean	SD	Min	Max	Mean German	Mean French	Diff	P-value t-test	Description
<i>Basic controls: Variables independent of cultural group membership</i>										
Female	649	0.47	0.50	0.00	1.00	0.45	0.49	-0.04	0.36	Binary variable = 1 if female
Swiss	649	0.77	0.42	0.00	1.00	0.93	0.63	0.30	0.00	Binary variable = 1 if Swiss citizen
Born in 2000	649	0.63	0.48	0.00	1.00	0.65	0.60	0.04	0.24	Binary variable = 1 if born in year 2000
Born after 2000	649	0.21	0.41	0.00	1.00	0.23	0.19	0.04	0.17	Binary variable = 1 if born after year 2000
<i>Extended controls: Variables potentially influenced by cultural group membership</i>										
Urban	649	0.29	0.45	0.00	1.00	0.17	0.39	-0.22	0.00	Binary variable = 1 if home municipality has >=10,000 inhabitants
Basic school level	649	0.28	0.45	0.00	1.00	0.25	0.31	-0.06	0.07	Binary variable = 1 if basic school level
Medium school level	649	0.36	0.48	0.00	1.00	0.40	0.32	0.08	0.03	Binary variable = 1 if medium school level
High school level	649	0.36	0.48	0.00	1.00	0.35	0.37	-0.02	0.63	Binary variable = 1 if high school level
Single room	615	0.86	0.35	0.00	1.00	0.91	0.81	0.10	0.00	Binary variable = 1 if student has own room
Rent home	633	0.42	0.49	0.00	1.00	0.27	0.56	-0.29	0.00	Binary variable = 1 if family rents home
Holidays	640	3.02	1.56	0.00	5.00	3.08	2.97	0.11	0.36	Weeks of holidays together with parents this year
Catholic	637	0.59	0.49	0.00	1.00	0.55	0.62	-0.08	0.05	Binary variable = 1 if catholic
Protestant	637	0.14	0.35	0.00	1.00	0.23	0.06	0.17	0.00	Binary variable = 1 if protestant
Other religion	637	0.14	0.34	0.00	1.00	0.10	0.17	-0.07	0.02	Binary variable = 1 if other religion
Not religious	637	0.14	0.35	0.00	1.00	0.13	0.15	-0.02	0.39	Binary variable = 1 if not religious
<i>Variables not used in specifications</i>										
Father university	570	0.31	0.46	0.00	1.00	0.34	0.29	0.05	0.24	Binary variable = 1 if father attended university
Father no add. educ	570	0.12	0.33	0.00	1.00	0.03	0.22	-0.19	0.00	Binary variable = 1 if father neither attended university nor completed an apprenticeship
Mother university	551	0.27	0.45	0.00	1.00	0.28	0.27	0.01	0.73	Binary variable = 1 if mother attended university
Mother no add. educ	551	0.21	0.41	0.00	1.00	0.10	0.33	-0.23	0.00	Binary variable = 1 if mother neither attended university nor completed an apprenticeship
Parents culture	626	0.29	0.45	0.00	1.00	0.30	0.27	0.03	0.42	Binary variable = 1 if parents attend concerts, visit museums and visit theatres

### Appendix 3. Heterogeneity of home municipalities

The table displays the mean by language group of certain municipality characteristics in our sample. The variables are weighted by the number of students in the sample from the respective municipality.

Variable	German-speaking	French-speaking	Diff	p-value t-test
Nr of students	305	344		
Nr of municipalities	31	23		
<i>Main language spoken</i>				
Share German	0.67	0.17	0.49***	0.00
Share French	0.25	0.72	-0.47***	0.00
Share other language	0.08	0.11	-0.02***	0.00
<i>Population</i>				
Population in 1000	9.04	17.02	-7.98***	0.00
Urban municipalities (>=10000 residents)	0.17	0.39	-0.22***	0.00
Share of non-Swiss residents	0.18	0.29	-0.1***	0.00
<i>Economic activity</i>				
Share employed in primary sector	0.09	0.04	0.05***	0.00
Share employed in secondary sector	0.28	0.21	0.08***	0.00
Share employed in tertiary sector	0.63	0.75	-0.12***	0.00
Nr of cars per 1000 inhabitants	568.09	517.28	50.81***	0.00
Nr of bank branches in municipality	4.8	8.0	-3.2***	0.00
Municipalities without bank branch	0.16	0.13	0.04	0.16
Tax on income and wealth as share of cantonal tax	0.79	0.81	-0.02***	0.00
Municipal tax potential; Index cantonal average: 100	102.24	102.39	-0.15	0.93
<i>Religion</i>				
Share catholic	0.66	0.78	-0.12***	0.00
Share protestant	0.23	0.10	0.13***	0.00
Share other	0.05	0.05	0.00	0.86
Share not religious	0.06	0.07	-0.01***	0.00

Source: StatA Fribourg; bank branch information from Brown and Hoffmann (2016)

#### Appendix 4. Pairwise correlations of control variables capturing socioeconomic background with parental education

This table reports pairwise correlations. \*\*\*, \*\*, \* denote significance of the correlation coefficient at the 0.01, 0.05 and 0.10-level. Parental education variables and parents culture have some missing values. The pairwise correlations are reported for all the available observations in the sample.

	Swiss	Urban	Basic school level	High school level	Rent home	Single room	Holidays
Father university	0.079*	0.188***	-0.194***	0.214***	-0.094**	-0.037	0.207***
Father no add. educ	-0.377***	0.112***	0.133***	-0.107***	0.261***	-0.152***	-0.011
Mother university	0.01	0.199***	-0.163***	0.126***	-0.119***	0.023	0.245***
Mother no add. educ	-0.351***	0.138***	0.133***	-0.048	0.250***	-0.204***	-0.01
Parents culture	0.198***	0.056	-0.172***	0.233***	-0.240***	0.117***	0.140***

### Appendix 5. Treatment by municipal majority language: OLS regression

This table reports results of the OLS regression French municipality on financial literacy. The framework corresponds to the RDD framework applied in other studies exploiting the language border (e.g. Eugster et al. 2011; Guin 2015). Since our observations stem from municipalities very close to the language border we do not apply a Local Border Contrast. The French municipality dummy takes on value 1 for 419 students and 0 for 215 students. A home municipality is defined as French-speaking if more than 50% of its inhabitants state French as their main language. The cantonal capital Fribourg is classified as a French-speaking municipality since 64% of the population state French as their first language. Consequently, 98% of students at the German-speaking school in Fribourg are classified as French-speaking according to the majority language definition. Basic control variables, considered as unaffected by culture, include: Female, Swiss, Born in 2000, Born after 2000. Extended controls include: Urban, School level, Single room, Rent home, Holidays, Catholic, Protestant, Other religion, Not religious. Standard errors are clustered at class level and are reported in brackets. \*\*\*, \*\*, \* denote significance at the 0.01, 0.05 and 0.10-level.

	(1)	(2)	(3)	(4)
OLS regression	FL-score	FL-score	Fin-confusing	Fin-confusing
French municipality	-0.572 (0.430)	-0.954*** (0.233)	0.196*** (0.053)	0.211*** (0.049)
Constant	4.778*** (0.432)	4.318*** (0.557)	0.404*** (0.075)	0.436*** -0.108
Observations	629	570	620	561
R-squared	0.100	0.330	0.099	0.122
Basic controls	Yes	Yes	Yes	Yes
Extended controls	No	Yes	No	Yes





**Appendix 7 a) Propensity score matching: Difference in financial literacy**

This table reports the ATE of the propensity score matching model. The propensity score is estimated in a probit model. The table reports three matching procedures: NN(2) refers to 2 nearest neighbours; NN(5) refers to 5 nearest neighbours; IPW refers to inverse probability weighting. Basic control variables, considered as unaffected by culture, include: Female, Swiss, Born in 2000, Born after 2000. Extended controls include: Urban, School level, Single room, Rent home, Holidays, Catholic, Protestant, Other religion, Not religious. Standard errors are bootstrapped. The p-value indicates the level of significance.

		Financial literacy			
		(1)	(2)	(3)	(4)
		FL-score	FL-score	Fin-confusing	Fin-confusing
NN(2)	ATE	-0.79***	-1.14***	0.1**	0.08
	SE	0.21	0.27	0.04	0.06
	p-value	0.00	0.00	0.02	0.14
NN(5)	ATE	-0.73***	-1.07***	0.09**	0.08
	SE	0.21	0.24	0.04	0.05
	p-value	0.00	0.00	0.02	0.14
IPW	ATE	-0.81***	-1.12***	0.09**	0.09*
	SE	0.20	0.19	0.04	0.05
	p-value	0.00	0.00	0.02	0.06
Observations		649	588	640	579
Pscore estimation:					
Basic controls		Yes	Yes	Yes	Yes
Extended controls		No	Yes	No	Yes

## Appendix 7 b)

### Propensity score matching: Balancing properties

The tables below display the balancing properties of variables used in the propensity score estimation with basic (1) and extended (2) controls

#### Specification (1) NN(5)

Variable	Mean			t-test	
	Treated	Control	%bias	t	p> t
Obs	344	305			
Female	0.49	0.49	-0.5	-0.06	0.95
Swiss	0.63	0.63	0.0	0.00	1.00
Born in 2000	0.60	0.64	-6.8	-0.90	0.37
Born after 2000	0.19	0.16	8.1	1.15	0.25

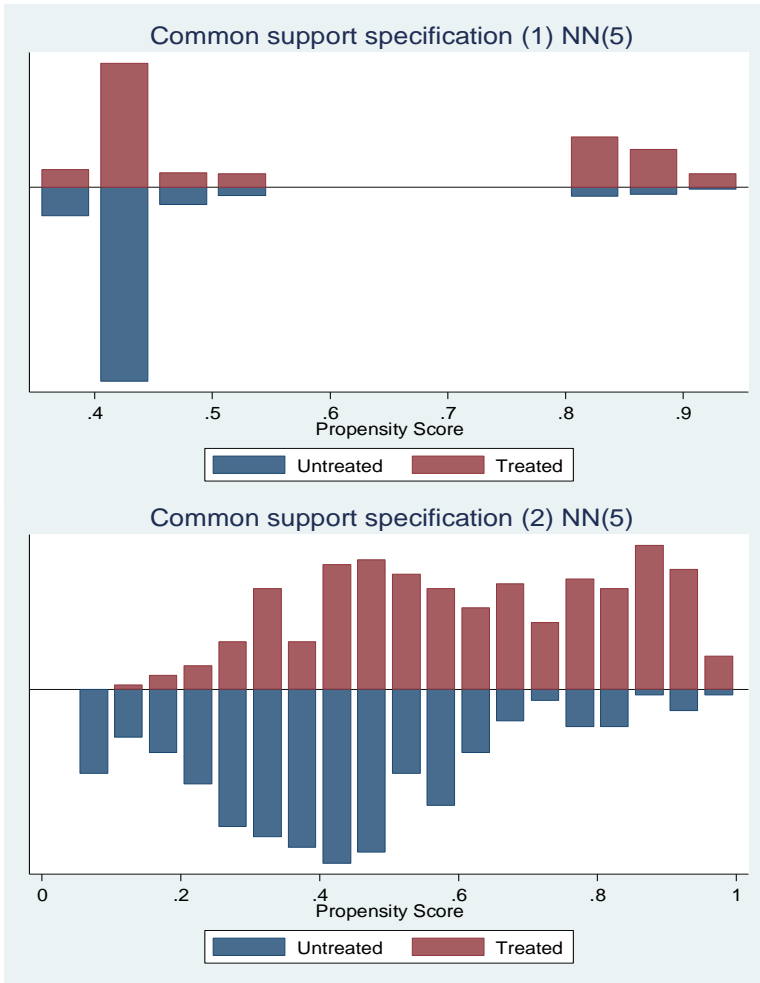
#### Specification (2) NN(5)

Variable	Mean			t-test	
	Treated	Control	%bias	t	p> t
Obs	307	281			
Female	0.50	0.52	-3.10	-0.39	0.70
Swiss	0.64	0.64	0.30	0.03	0.97
Born in 2000	0.60	0.59	2.10	0.26	0.79
Born after 2000	0.20	0.21	-3.50	-0.44	0.66
Urban	0.36	0.32	10.50	1.19	0.23
Rent home	0.54	0.52	3.60	0.42	0.68
Single room	0.81	0.82	-4.10	-0.46	0.65
Holidays	2.98	2.98	0.10	0.01	0.99
Medium school level	0.34	0.34	-1.10	-0.14	0.89
High school level	0.37	0.35	3.70	0.45	0.65
Catholic	0.62	0.64	-3.60	-0.45	0.65
Not religious	0.15	0.15	-0.20	-0.02	0.98
Protestant	0.06	0.04	7.30	1.41	0.16
Other religion	0.17	0.18	-1.90	-0.21	0.83

**Appendix 7 c)**

**Propensity score matching: Common support for (1) and (2)**

The two figures show the distribution of propensity scores of the treated (French-speaking) and untreated (German-speaking) group.



### Appendix 8. Mediation analysis with confounding by alternative mechanisms

This table reports results of the mediation analysis taking into account causally dependent multiple mechanisms as described in Imai & Yamamoto (2013). The R package mediation (Tingley et al. 2014) was used to implement the analysis. The Diff column reports the difference of the estimate in this table compared to the estimate reported in Table 7. Alternative mediators included in the analysis are listed in the rightmost column. Basic control variables, considered as unaffected by culture, include: Female, Swiss, Born in 2000, Born after 2000. Extended controls include: Urban, School level, Single room, Rent home, Holidays, Catholic, Protestant, Other religion, Not religious.

		FL-score				Fin-confusing				Mediators used as potentially confounding mediators
		Estimate	95%-CI		Diff	Estimate	95%-CI		Diff	
Risk seeking	ACME	-0.01	-0.07	0.04	-0.02	-0.01	-0.02	0.01	0.00	Patience
	Direct effect	-1.01	-1.42	-0.61	0.01	0.11	0.01	0.21	0.00	Financial socialisation
	Total effect	-1.03	-1.44	-0.65	0.00	0.10	0.01	0.20	0.00	
	Prop. mediated	0.01			0.02	-0.06			0.00	
Patience	ACME	-0.04	-0.10	0.03	-0.02	0.01	-0.01	0.02	0.00	Financial socialisation
	Direct effect	-0.99	-1.39	-0.59	0.02	0.10	0.00	0.20	0.00	
	Total effect	-1.03	-1.40	-0.60	-0.01	0.10	0.01	0.21	0.00	
	Prop. mediated	0.03			0.02	0.06			0.02	
Financial socialisation	ACME	-0.11	-0.22	-0.01	0.01	0.02	0.00	0.05	-0.01	Patience
	Direct effect	-0.91	-1.30	-0.52	-0.02	0.08	-0.02	0.18	0.01	Debt norms
	Total effect	-1.03	-1.40	-0.64	0.00	0.10	0.02	0.20	0.00	
	Prop. mediated	0.11			-0.01	0.24			-0.03	
Debt norms	ACME	-0.02	-0.08	0.04	0.01	0.01	-0.01	0.02	0.00	Patience
	Direct effect	-1.00	-1.40	-0.61	-0.01	0.10	0.00	0.20	0.00	Financial socialisation
	Total effect	-1.03	-1.42	-0.63	-0.01	0.10	0.01	0.21	0.00	
	Prop. mediated	0.02			0.00	0.05			-0.01	
Freedom & control	ACME	0.00	-0.13	0.12	0.01	-0.03	-0.06	0.01	0.00	Patience
	Direct effect	-1.02	-1.43	-0.61	-0.01	0.13	0.03	0.24	0.00	Social prestige
	Total effect	-1.03	-1.43	-0.65	0.00	0.10	0.00	0.21	0.00	
	Prop. mediated	0.00			-0.01	-0.26			-0.06	
Social prestige	ACME	-0.02	-0.07	0.03	-0.00	0.00	-0.01	0.01	0.00	Patience
	Direct effect	-1.00	-1.40	-0.61	0.00	0.10	0.01	0.20	0.00	Freedom & control
	Total effect	-1.03	-1.44	-0.64	0.00	0.10	0.01	0.20	0.00	
	Prop. mediated	0.02			0.00	0.01			0.00	
Obs		461				459				
Basic controls		Yes				Yes				
Extended controls		Yes				Yes				