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Multiple Pathways to Financial Literacy: Evidence on the Impact of Practical Applications of Financial Tasks and Analytical Learning

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Abstract

Financial literacy has become increasingly important for financial well-being. While studies show that formal schooling and its analytical learning methods enhances financial literacy, little is known about whether and, if so, how the practical applications in vocational education, contribute to it. We examine whether financial literacy differs across vocational occupation clusters with different requirements, practical applications or learning pathways, and what factors might explain such differences. Our results show two effective pathways to acquiring financial literacy: (1) analytical learning of financial concepts and (2) repeated practical applications of financial and economic concepts in everyday occupational tasks. Both demonstrate the important role that vocational education can play in fostering financial literacy.

Keywords: Financial Literacy; Vocational Education and Training; Human Capital Formation; Skill Acquisition; Occupational Heterogeneity

JEL Classification: J24; I21; D91

1. Introduction

As financial decisions—ranging from managing debt and saving for retirement to evaluating investment risks—grow increasingly prevalent and complex, financial literacy, defined as the knowledge and skills necessary for managing personal and professional financial matters (Lusardi and Mitchell 2023), becomes increasingly critical (OECD 2022). Given its crucial role in individuals' financial well-being, financial literacy has been widely studied over the past decade, with researchers finding that formal schooling—particularly school-based financial education programs—constitute a key pathway for enhancing individuals' financial literacy (e.g., A. Brown et al. 2014; Urban et al. 2020; Bernheim, Garrett, and Maki 2001; Kaiser et al. 2022).

Most of the research on financial education focuses on academic or general education contexts (e.g., Grohmann, Kouwenberg, and Menkhoff 2015; Kaiser, Oberrauch, and Seeber 2020; Klapper and Lusardi 2020). Given that VET represents an important educational pathway in many European countries, especially in Germany or Switzerland (European Centre for the Development of Vocational Training 2020), this lack of research attention to VET-based financial literacy is particularly striking.

VET is an upper-secondary education pathway that students often pursue through a dual format, i.e. students spend a large part of their training time in a firm, while attending vocational school for only a small part.[4] This learning environment of dual VET allows students to apply what they learn directly in real-world settings, thereby, reinforcing their understanding of abstract concepts through practical application (Schaap, Baartman, and De Bruijn 2012; Fletcher 2019). Indeed, in many VET occupations, VET graduates repeatedly apply financial and economic concepts—such as handling transactions, keeping balance sheets, or managing inventories—as part of their everyday occupational tasks. However, the question as to whether different VET occupations foster financial literacy differently remains unanswered.

In this paper, we examine whether financial literacy differs across clusters of VET occupations and, if so, what factors might explain such differences. Building on theories of applied and experiential learning (e.g., Kolb 1984), we argue that these practical applications of financial and economic concepts might enable direct acquisition of financial literacy. If so,

[4] VET programs can also be purely school based (i.e., without apprenticeship in a firm) (Bolli, Rageth, and Renold 2019; Cahuc and Hervelin 2020), depending on the occupation. However, on average only 7 % of each student cohort—in Switzerland—choose a school-based VET program, whereas the remaining share selects into a firm-based VET (SCCRE 2023). Throughout the paper, when we discuss the VET programs, we refer to both categories.

we would expect financial literacy to vary systematically across occupations depending on their everyday task content and analytical requirements.

We use data from Switzerland because it offers an excellent empirical setting for two reasons. First, the VET system includes more than 200 occupations, each taught according to a well-defined, nationally standardized and federally regulated curriculum. This institutional structure not only allows for substantial variation in the ways of acquiring skills across occupation but also ensures that graduates within an occupation acquire comparable skills (Gronning and Kriesi 2022). Second, a large part of the Swiss education system consists of dual VET. More than two-third of each Swiss student cohort choose to pursue a VET after compulsory schooling (SCCRE 2023), allowing us to capture a majority of the Swiss population by only including VET graduates in our analysis.

To analyze whether and, if so, how financial literacy acquisition differs across clusters of VET occupations, we combine two data sets. First, to measure financial literacy, we use a unique, nationally representative survey from Switzerland (for details see Davoli and Backes-Gellner 2024). The survey data includes the well-established "Big Three" questions on inflation, interest compounding, and risk diversification (Lusardi and Mitchell 2014), as well as information on respondents' post-compulsory VET education, enabling us to link respondents' financial literacy scores to their VET occupation. Second, we use a data set on requirement profiles for all Swiss VET occupations (Goetze and Aksu 2018)—developed by education and career guidance experts. We match these occupational requirement profiles to the survey respondents at the occupational level. The requirement profiles cover almost 200 Swiss VET occupations and assess the expected requirement of an occupation for 21 dimensions of competencies in mathematics, sciences, native language, and foreign languages, capturing variations in the requirements and content of these occupations.

To identify patterns in requirement profiles across VET occupations, we use the 21-dimensional requirement profiles to group occupations into clusters with most similar requirement profiles within the clusters and most different profiles across the clusters. To do so, we apply a non-hierarchical k-means clustering procedure (Aldenderfer and Blashfield 1984, Bortz and Schuster 2011) and identify eight homogenous occupational clusters. Afterwards we analyze whether the differences in requirement profiles across our occupational clusters are systematically related to differences in financial literacy.

Using regression analyses with financial literacy scores as the outcome variable and the occupational cluster of each respondent as our main explanatory variable we find significant differences in financial literacy across the eight occupational clusters. The highest financial

literacy levels appear in a cluster characterized by high requirements across all dimensions, particularly in mathematics and language requirements. This cluster includes occupations such as a technical draftsman, IT specialist, or electronics engineers. This result is in line with the literature showing the importance of high cognitive skills for financial literacy (e.g., Christelis, Jappelli, and Padula 2010).

Surprisingly, we find a similarly high level of financial literacy in a cluster characterized by low requirements across all dimensions, particularly so in mathematics and science requirements. However, training in these occupations requires repeated practical applications of financial and economic concepts in everyday occupational tasks, which likely contributes to the high level of financial literacy. This cluster includes hotel guest relations officers, customer relations managers or retail clerks, i.e. occupations that frequently requiring tasks such as managing projects or inventories, preparing budgets or balance sheets, and making financial decisions when dealing with customers.

At the other end of the financial literacy spectrum, we observe low financial literacy in two clusters with low requirements in mathematics, which is unsurprising, and limited practical applications of financial and economic concepts in everyday occupational tasks, suggesting that such practical applications may indeed play an important role particularly for occupations with low analytical requirements. These clusters include "health and care-related" and "personal services-oriented" occupations, such as healthcare specialists, pharmacy assistants, hotel housekeepers, or hairdressers. The remaining five clusters, which show financial literacy levels between the highest and lowest clusters, include occupations characterized by various combinations of high and low analytical requirements paired with some practical applications of financial and economic concepts in everyday occupational tasks.

These findings support our theoretical conjecture that acquiring financial literacy takes place not only through a high level of analytical learning but also through practical applications of financial and economic concepts in everyday occupational tasks. Therefore, these findings suggest that there are multiple ways for achieving a similar level of financial literacy and show new ways for increasing financial literacy through VET.

In further analyses, we expand the analysis to investigate whether VET differs systematically from academic education in supporting financial literacy outcomes. Although, upper-secondary academic education may have on average higher analytical learning possibilities, it does not include the practical application of financial or economic concepts. In contrast, VET pathways have on average much higher practical applications but may not have the same level of formal analytical learning. Thus, the total effect is unclear.

Our empirical results show that although a simple ordinary least squares (OLS) regression would suggest that academic education induces higher financial literacy levels, this result disappears once we account for potential endogeneity using an instrumental variable (IV) approach. As our instrument, we use variations in educational traditions across Swiss regions that manifest in distinct differences in VET graduation properties. Our results suggest that the descriptive difference from the OLS estimates likely reflect only selection effects rather than differences induced by educational pathways. Once selection is accounted for, there are no systematic differences in financial literacy outcomes between academic and VET pathways. This supports our theoretical explanation and our main findings of two main ways of acquiring financial literacy: One is through extensive analytical learning, the kind that is most prevalent in academic education, and the other is through repeated practical applications of financial and economic concepts in everyday occupational tasks, which is strongly prevalent in some of the VET occupations, or through an effective combination of both.

Our results offer two key contributions to the financial literacy literature. First, although most research focuses on analytical learning within targeted programs, and formal school curricula (e.g., Lusardi and Mitchell 2011, Kaiser et al. 2022, Cole, Paulson, and Shastry 2016), our findings highlight how financial literacy emerges through repeated practical applications of financial and economic concepts in everyday occupational tasks. We therefore add a new perspective to the financial literacy literature by emphasizing the importance of a more practical way of acquiring financial literacy through education.

Second, we contribute to the debate on how financial education can be effectively integrated into curricula. While other studies emphasize the inclusion of financial education in academic education to improve financial literacy (e.g., A. Brown et al. 2014; Urban et al. 2020; Bernheim, Garrett, and Maki 2001; Kaiser et al. 2022), our findings suggest an alternative pathway through VET education, i.e., practical applications of financial and economic concepts in everyday occupational tasks. Importantly, this effect is not limited to commercial or business-oriented occupations (e.g., administrative assistants or banking clerks—as previously suggested in the literature on Germany (e.g., Happ and Förster 2017)). It also occurs in other occupations whenever everyday occupational tasks involve practical applications of financial or economic concepts, such as budgeting, estimating costs, managing inventory, or planning projects, that could in the future also be integrated in all sorts of occupations from craftsmanship to care or hospitality occupations.

The remainder of the paper is structured as follows. Section 2 discusses the data, explains the operationalization of the variables, and describes the methodological approach. Section 3 contains the results of the empirical analysis, section 4 includes robustness checks, and section 5 discusses further analysis. Section 6 concludes.

2. Data, Operationalization, and Methods

2.1 Data

To empirically analyze whether financial literacy differs across VET occupational clusters and, if so, what factors might explain such differences, we combine two data sources. First, to measure financial literacy and to collect information on individuals' background, we rely on an online survey conducted in June 2023 as our primary data source. The survey—representative of the Swiss population in terms of age distribution[5], gender, educational level, and language region[6]—includes questions on financial literacy, respondents' socio-demographic characteristics, and detailed information on educational background. Specifically, the survey captures whether respondents completed academics or vocational upper-secondary education and, if vocational, the specific occupation they trained for—information essential for capturing variation across VET occupational clusters in our analysis. Given Switzerland's three main language regions, respondents could complete the questionnaire in German, French, or Italian (for more details on the survey, see Davoli and Backes-Gellner 2024).

Second, to classify variations in the requirements and content of respondents VET occupations, we use a data set on the requirement profiles for all Swiss VET occupations (Goetze and Aksu 2018) and match these profiles to the survey respondents by their reported VET occupation. Developed by education and career guidance experts[7] and widely used in research, these profiles offer detailed insights into the requirements of each occupation (see Goetze and Aksu 2018 for methodology; e.g., Kiener et al. 2022). The combination of the survey and occupational data enables us to investigate whether the acquisition of financial literacy differs across these eight occupational clusters.

[5] To capture cohorts who are still close to their graduation and at a life stage when they face important financial decisions, the survey intentionally oversamples individuals aged 18 to 29.

[6] Switzerland comprises four official language regions: German, French, Italian and Romansh. Although, a minority of Swiss citizens predominantly speak Romansh, these regions are relatively small, and most residents also speak one of the other official languages. Therefore, the questionnaire was not implemented in Romansh.

[7] The classification of the requirement profiles is derived from a systematic comparative rating process with input from experts and practitioners in the field, including vocational schoolteachers and human resource managers from training firms.

We define our analysis sample as all respondents aged 18 to 79 who have completed VET, resulting in a sample of 1,543 individuals, representative of the Swiss working population. Specifically, we include respondents who completed a 2-, 3-, or 4-year VET program with complete data for the control variables.

2.2 Outcome Variable

We construct financial literacy using the well-established "Big Three" financial literacy questions (Lusardi and Mitchell 2014), which cover fundamental and universal concepts underlying most financial decisions. These questions assess how well the respondents understand the concepts of: (1) interest compounding, (2) inflation, and (3) risk diversification (Lusardi and Mitchell 2014).[8] Asking these questions provides a reliable and standardized assessment tool, as demonstrated by their widespread adoption in national surveys worldwide (Lusardi and Mitchell 2023, 2014). We include the "Big Three" questions as a binary outcome variable in our analysis, indicating whether all three questions were answered correctly.[9]

2.3 Control Variables

In the analysis, we control for observable individual demographic and socio-economic characteristics (included in the survey) that may affect financial literacy: gender, age, highest education level, Swiss citizenship, residency location (urban or rural), and mother's education (see Table 1). To deal with potential translation differences, we account for the language of the questionnaire (German, French, or Italian).[10]

[8] The precise wording of the questions appears in Appendix Table A1.
[9] The OECD provides additional questions to measure financial literacy. We incorporate some of these questions into our questionnaire, as outlined in Table A1, and use them to assess the robustness of our results. Details of these robustness checks are provided in section 4.
[10] The language of the questionnaire largely aligns with the language regions. While we control for language of the respondent's completed questionnaire, completely disentangling the effects of language from the language region is not possible.

Table 1: Descriptive Statistics

	Mean	SD	Min	Max
Financial Literacy	.506	.5	0	1
Tertiary Education	.367	.482	0	1
Woman	.436	.496	0	1
Age	41.266	14.685	18	79
Swiss Citizenship	.94	.238	0	1
Rural Residency Area	.397	.489	0	1
Language of Questionnaire:				
German	.756	.429	0	1
French	.211	.408	0	1
Italian	.033	.179	0	1
Mother: Tertiary Education	.135	.342	0	1

Data: Cross-sectional Online Survey on Financial Literacy in Switzerland, own calculations. Note: Financial Literacy is defined as answering correctly all "Big Three"-Questions. Number of obs. N=1,543

2.4 Explanatory Variable

We construct our main explanatory variable using the requirement profiles. These profiles cover 183 Swiss VET occupations and assess the expected requirement levels of an occupation for 21 competencies in mathematics, sciences, school language, and foreign languages.[11] Each requirement is scored on a scale from 1 (least demanding) to 100 (most demanding), representing both the minimum required competencies.

To construct vocational occupational clusters, we apply a non-hierarchical k-means clustering procedure, using the 21-dimensional requirement profiles of these occupations. This procedure yields homogenous clusters with most similar requirement profiles within the clusters and most different profiles across the clusters (Aldenderfer and Blashfield 1984, Bortz and Schuster 2011, Distefano and Mindrila 2014), making it well-suited for identifying distinct occupational requirement groups.

To detect the optimal number of clusters we apply Cattell's scree test (Cattell 1966) and use a scree plot where we search for a kink in the curve generated from the within sum of squares (WSS) or its logarithm [log(WSS)] for all cluster solutions (Figure A2). This approach, commonly known as the 'elbow method', is a widely recognized and frequently applied technique across various fields for determining the optimal number of clusters (e.g., Syakur et al. 2018). However, the optimal number of clusters is not entirely clear only by looking at one graph, as the results of a traditional k-means algorithm always depend on the chosen initialization (that is, the initial cluster centers). Therefore, we repeat the clustering thirty times with different starting points (Figure A3). To consider the kink and to have enough occupations

[11] A complete list and description of the 21 competence dimensions is provided in Appendix Table A4.

in each cluster, while still having enough clusters for contextual interpretation, we opt for eight clusters.

To further check the validity of our choice of number of clusters, we additionally perform a hierarchical clustering (Ward 1963), thereby adapting the clustering method used by Geel and Backes-Gellner (2011). Hierarchical clustering supports the choice of eight optimal groups by visual inspection and using the Duda–Hart stopping rule. This rule identifies the optimal number of clusters by looking for the highest Je(2)/Je(1) ratio, paired with a low pseudo-T^2 value that has significantly higher T^2 values below and above it (Table A5 and Figure A4)

2.5 Estimation Method

In a simple ordinary least square (OLS) setting, we regress the probability of answering correctly the "Big Three" on our explanatory variable '*vocational occupational cluster*'. We estimate the following model:

$$LIT_{ic} = \beta_0 + \beta_1 VET_{ic} + \theta X_{ic} + \delta_c + \varepsilon_{ic} \quad (1)$$

where the binary outcome, LIT_{ic} denotes our financial literacy measure for individual i living in canton[12] c.[13] VET_{ic}, is a variable for individual's vocational occupational cluster. The vector X_{ic} includes individual-specific characteristics, such as tertiary education, gender, Swiss citizenship, age, urban versus rural residency, mother's level of education, and language in which the questionnaire was answered (German, French and Italian). Table 1 contains a description of all variables included in the estimations. To capture unobserved regional heterogeneities, such as workforce composition or economic activities, we introduce cantonal fixed effects, represented by δ_c, into our regression model, while ε_{it} displays the error term. Standard errors are clustered at the cantonal level. Using an OLS regression allows us to compare the average financial literacy of VET occupational clusters across respondents who completed different types of VET.

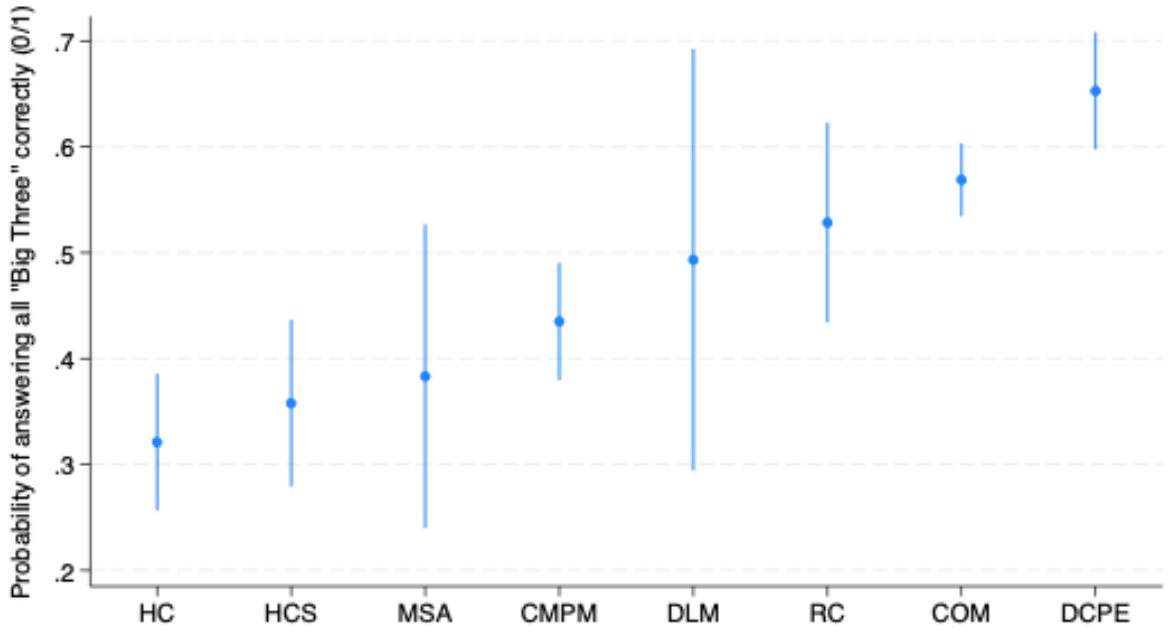
[12] Switzerland consists of consists of 26 major subdivisions, called cantons. They are member states of the Swiss Confederation, functioning as semi-sovereign states with their own constitutions, governments, and laws. Cantons have considerable autonomy, especially in areas such as education or healthcare and policing. They are comparable US states or German "Bundesländer".

[13] Because logistic regression (logit) or probit regression are often preferred over OLS regression for binary dependent variables, we conduct estimations using logit and probit models. For interpretability reasons, OLS model is often preferred.

3. Results: Financial Literacy across Occupational Clusters

Figure 1 shows the probability of correctly answering the "Big Three" for respondents who belong to one of the eight distinct clusters. Figure 1 shows great heterogeneity in financial literacy across occupational clusters, and it confirms the relevance of these eight clusters to explain differences in financial literacy. Therefore, in the next step, we examine these occupational clusters more closely to investigate what characteristics and contents they share, and how these may determine how respondents in these clusters acquire financial literacy.

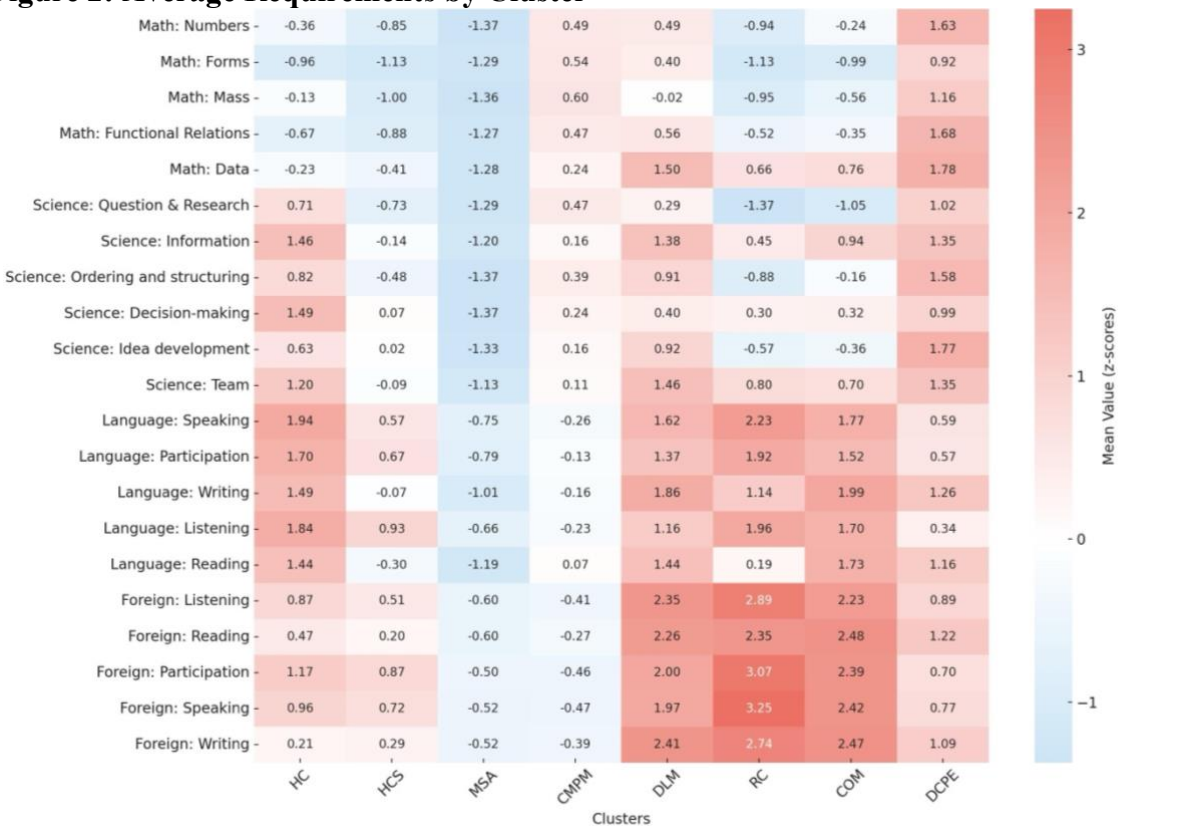
Figure 1: Financial Literacy per Cluster



Data: Cross-sectional Online Survey on Financial Literacy in Switzerland, own calculations. Note: Each dot represents the estimated coefficient of one of the eight occupation clusters on the probability of correctly answering the Big Three. The dotted line represents the overall average financial literacy level. Cluster variables are unweighted and standardized. HC = Health and Care (N=134); HCS = Hospitality, Customer- and Service (N=97); MSA= Manual and Service Assistance (N=74); CMPM = Construction, Manufacturing, Production and Mechanical (N=315); DLM = Digital Layout and Media (N=43); RC=Retail and Costumer (N=99); COM=Commercial (N=553); DCPE = Digitized Construction, Planning, and Engineering (N=228)

The heatmap in Figure 2 displays the relative requirements in each cluster, with values above 0 indicating higher than average requirements compared to all clusters (marked in red) and values below 0 indicating lower than average requirements (marked in blue). The clusters are ordered according to the average financial literacy level, on the right side are clusters with higher financial literacy, on the left side are clusters with lower financial literacy.

Figure 2: Average Requirements by Cluster



Data: Cross-sectional Online Survey on Financial Literacy in Switzerland, own calculations. Note: The graph illustrates the average requirement for similar occupations grouped into clusters. The values are standardized at the mean, meaning that requirements are expressed as deviations from the average level across all occupations (i.e., z-scores). Values above zero (shaded in red) indicate higher than average requirements, while values below zero (in blue) indicate lower than average requirements for the specific category. HC = Health and Care (N=134); HCS = Hospitality, Customer- and Service (N=97); MSA= Manual and Service Assistance (N=74); CMPM = Construction, Manufacturing, Production and Mechanical (N=315); DLM = Digital Layout and Media (N=43); RC=Retail and Costumer (N=99); COM=Commercial (N=553); DCPE = Digitized Construction, Planning, and Engineering (N=228)

A comparison of the descriptive results from Figures 1 and 2 reveals less-straightforward results. The cluster with the highest financial literacy also shows above-average requirements across all dimensions. This finding is unsurprising, given the proven link between financial literacy and cognitive skills (Christelis, Jappelli, and Padula 2010). However, the patterns emerging from the remaining clusters reveal inconsistencies.

Two other clusters display particularly high financial literacy while showing below-average requirements in most mathematical and scientific competencies and standing out in language requirements. At the lower end of the financial literacy distribution, the patterns remain inconsistent: the two clusters with the lowest financial literacy show above-average language and scientific requirements. These patterns suggests that high overall skills alone do not fully explain the variation in financial literacy.

To understand these patterns, we analyze each of the eight clusters separately and interpret financial literacy and requirements in combination with the specific occupational tasks within each cluster. To do so, we use the official training description of each VET occupation (*berufsberatung.ch*). These descriptions include academic information on the occupation and its working conditions, the structure of the apprenticeship, the learning content and descriptions of common everyday tasks and responsibilities. For example, for retail clerks, these tasks include work in various sectors of sales. Retail clerks advise and serve customers in retail stores, manage online shops, and are responsible for the presentation, purchasing, storage, and management of goods and services.

The highest financial literacy appears in the "construction, planning, and engineering" (DCPE) cluster with high requirements across all dimensions, particularly in the analytical competencies of mathematics and science, including for example working with calculations and data analysis (see Figures 1 and 2, DCPE). This cluster includes high-demand, technical occupations such as technical drawers, IT specialists, and electronics engineers, occupations that emphasize precision, systems thinking, and digital construction and planning. Typical tasks involve calculating project costs, estimating material and labor expenses, and planning technical systems such as heating or automation installations. These tasks are analytically demanding and often require the use of specialized software and digital tools. The combination of high analytical requirements and regular engagement with financially and economically relevant planning tasks likely contributes to the high financial literacy of the individuals in this cluster. Moreover, this result aligns with previous literature emphasizing the importance of general cognitive ability for high financial literacy (Callis et al., 2023, Muñoz-Murillo et al., 2020).

We find a similarly high level of financial literacy as in the first cluster in two other clusters: 1) a "commercial" (COM) cluster and 2) a "retail and customer-relations" (RC) cluster.

The "commercial" cluster includes occupations, such as bookseller, information and documentation specialists or commercial employees. These occupations include tasks like financial accounting, creating quotes and invoices, carrying out inventories, budgeting, and general accounting. Thus individuals in these occupations practically apply financial and economic concepts every day. The high financial literacy observed in this cluster confirms prior findings from the literature on German occupations, where commercial and business-related occupations—such as administrative assistants and banking clerks—also tend to show high financial literacy (Happ and Förster, 2017).

The "retail and customer-relations" cluster consists of occupations such as guest relations officers, customer relations managers, and retail clerks. These occupations—although not the core of their occupation— further involve repeated practical applications of financial and economic concepts in everyday tasks, such as managing inventories, preparing budgets or balance sheets, and customer-facing decision making. These tasks implicitly include financial learning through hands-on experience, contributing to the high financial literacy of individuals in these occupations. Together, these findings reveal a distinct pathway to acquiring financial literacy: repeated practical application of financial and economic content in everyday tasks.

We observe the lowest financial literacy in two clusters with above-average language (and scientific) requirements, however, low mathematical requirements: 1) a cluster with "health and care" (HC) occupations and 2) a cluster with "hospitality, customer, and service-related" (HCS) occupations.

The "health and care" cluster includes occupations such as health care specialists and pharmacy specialists. These occupations require strong social competence and frequent interaction with customers or patients. However, their tasks rarely involve mathematical or economic reasoning and thus offer few opportunities to develop financial competencies through practical application. Financial decision-making, budgeting, or exposure to economic concepts is mostly absent from their occupational tasks.

The "hospitality, customer, and service-related" cluster includes occupations such as cooks, hospitality services staff, and hotel housekeepers. These occupations focus on customer service, operational tasks, and maintaining service quality. Similar to the health and care cluster, these occupations provide limited exposure to financial concepts in practice, barely offering possibilities to develop financial literacy.

The remaining clusters, which show financial literacy levels between the highest and lowest clusters, include occupations characterized by specific combinations of high and low analytical requirements paired with some practical applications of financial and economic concepts everyday occupational tasks. These clusters include: 1) a cluster with "digital layout and media" (DLM) occupations[14], 2) a cluster with "manual and service assistance" (MSA) occupations[15], and 3) a cluster with "construction, manufacturing, production, and mechanical"

[14] This cluster comprises occupations like mediamaticians and photographers, combining creativity with technical expertise and focusing on digital media and technology management.

[15] The lowest overall requirements are found in manual and service assistance occupations, which include most two-year VET programmes, such as commercial employee EBA or hairdresser EBA. The EBA (Eidgenössisches Berufsattest), or federal vocational education certificate, is a two-year programme designed for roles with lower academic or practical demands compared to the more advanced three- or four-year Federal VET Diploma (EFZ).

(CMPM) occupations[16]. We find that these occupational clusters either exhibit very low requirement levels across all dimensions—as it is the case for manual and service assistance occupations—or offer little to no opportunities to acquire financial literacy in everyday practical application of financial or economic tasks. This is particularly true for the clusters including digital layout and media occupations or the cluster with construction, manufacturing, production and mechanical occupations. While these occupations may require technical or operational skills, they generally do not involve financially relevant decision-making or budgeting tasks that could contribute to the development of financial literacy.

These findings support our theoretical explanation that there are at least two distinct pathways to acquiring financial literacy: one grounded in formal, school-based analytical learning and the other developed through the repeated practical application of financial and economic content in everyday tasks. These findings suggests that individuals can acquire similar levels of financial literacy via different types of learning pathways and highlight the potential of practical learning in vocational education for enhancing financial literacy.

4. Robustness

To ensure the robustness of our results, we conduct three additional analyses examining potential concerns related to 1) the measurement of financial literacy, 2) the sample and, 3) model specification.

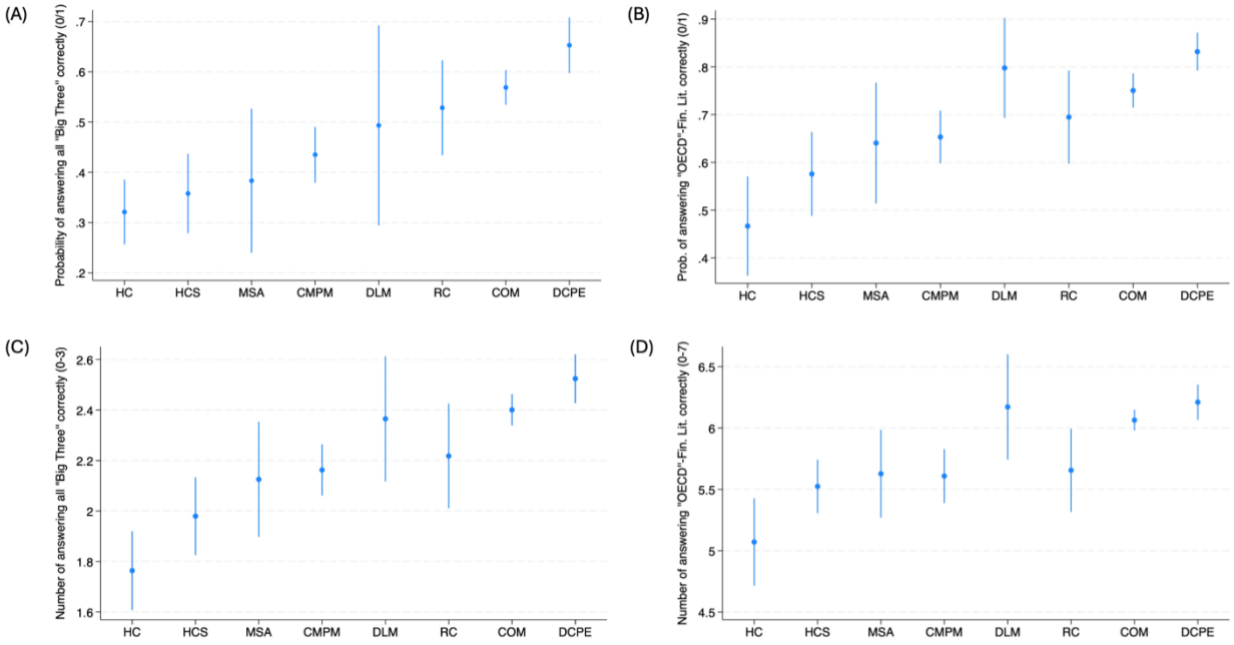
First, to ensure the robustness of our findings and account for potential concerns regarding the specific definition of financial literacy, we construct three alternative outcome variables as introduced by Atkinson and Messy (2011, 2012): 1) we use the full OECD financial literacy module (seven questions) to create a count variable ranging from 0 to 7, representing the number of correct answers;[17] 2) we transform the OECD count variable into a dummy that equals 1 if respondents correctly answered at least five of the seven questions; 3) we construct a count variable ranging from 0 to 3 for the number of correct answers among the "Big three" questions. We replicate our main regression model, using financial literacy as the outcome and VET occupational cluster as the explanatory variable (see Figure 3, Panel B-D).

These occupations focus on operational support tasks, including assisting with customer service or routine maintenance, rather than independent management or planning responsibilities.

[16] Workers in these roles (e.g. carpenter or mechanical engineer) apply knowledge of material properties like wood, metal, and plastics to select appropriate materials for producing, repairing, or maintaining goods, including furniture, tools, and construction elements.

[17] For the detailed survey questions on financial literacy see Table A1.

Figure 3: Alternative Outcome Measurements Across Occupational Clusters



Data: Cross-sectional Online Survey on Financial Literacy in Switzerland, own calculations. Note: Panel A shows the probability of correctly answering all "Big Three" financial literacy questions (0/1). Panel B shows the probability of answering at least five out of seven questions from the OECD financial literacy module correctly (0/1). Panel C displays the number of correctly answered "Big Three" questions (range: 0–3). Panel D shows the number of correct answers in the full OECD financial literacy module (range: 0–7). Each dot represents the estimated coefficient of one of the eight occupational clusters. Error bars denote 95% confidence intervals. All cluster variables are unweighted and standardized. Cluster labels: HC = Health and Care (N=134); HCS = Hospitality, Customer- and Service (N=97); MSA = Manual and Service Assistance (N=74); CMPM = Construction, Manufacturing, Production and Mechanical (N=315); DLM = Digital Layout and Media (N=43); RC = Retail and Customer (N=99); COM = Commercial (N=553); DCPE = Digitized Construction, Planning, and Engineering (N=228).

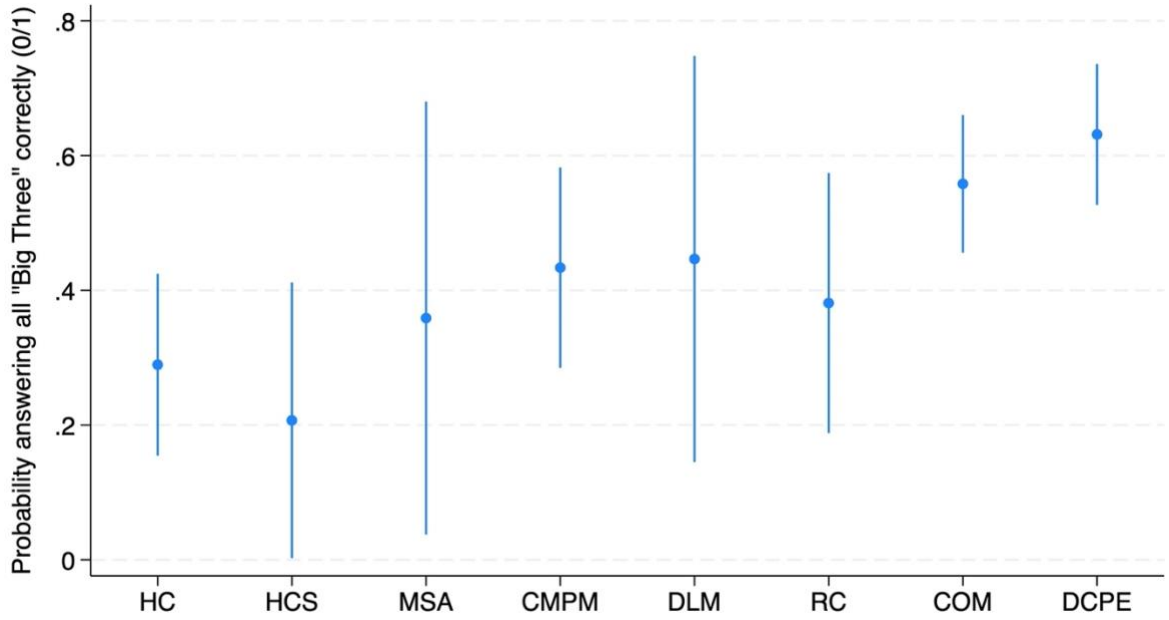
Our results remain qualitatively robust. We continue to find differences in financial literacy across the eight VET occupational clusters. However, we observe a shift in relative ranking of the clusters.

The financial literacy of the "digital and media" cluster (DLM) is higher than that of the "retail and customer-relations" (RC) cluster in the three alternative specifications.[18] This cluster—including occupations such as opticians, digital layout specialists, and interactive media designers—shows a financial literacy level in the middle range of our main analysis, with a high variance. The occupations in this cluster combine moderately high overall requirements (see Figure 2) with practical application of financial and economic tasks in some occupations (e.g., budgeting for media projects or cost estimation in design work). These results

[18] The separate analysis of the "Big Three" questions reveals that the shift in cluster rankings may be driven by differences in the probability of answering inflation and risk diversification correctly (see Figure A1). The digital and media cluster shows almost as high levels in these questions as the digitized construction, planning and engineering cluster, reinforcing that analytical learning plays a key role in mastering these questions.

reinforce our overall interpretation that financial literacy can emerge through different combinations of analytical learning and practical application of financial and economic tasks. Second, to better isolate the effects of VET education from potential cohort effects, we conduct an analysis focusing exclusively on younger cohorts (ages 18 to 29).[19] This age group closer in time to their VET training, meaning their financial literacy is more likely to reflect the direct influence of their VET education—including the occupation-specific learning environment—rather than life experience, further education, or labor market exposure.[20] Figure 4 displays the predicted probabilities of correctly answering all "Big Three" financial literacy questions across occupational clusters for the younger sample.

Figure 4: Financial Literacy in Young Population (Age 18 to 29) across Clusters



Data: Cross-sectional Online Survey on Financial Literacy in Switzerland, own calculations. Note: Probabilities of answering correctly all "Big Three" with standard errors clustered on cantonal level. Obs.: HC = Health and Care (N=17); HCS = Hospitality, Customer- and Service (N=75); MSA= Manual and Service Assistance (N=10); CMPM = Construction, Manufacturing, Production and Mechanical (N=27); DLM = Digital Layout and Media (N=52); RC=Retail and Costumer (N=89); COM=Commercial (N=149); DCPE = Digitized Construction, Planning, and Engineering (N=23)

We find that the overall pattern of differences across clusters is consistent with our main results. Specifically, the "digitized construction, planning and engineering" cluster and the "commercial" cluster continue to show the highest levels of financial literacy. The "digital layout and media" cluster remains in the upper-middle range, slightly outperforming the "retail

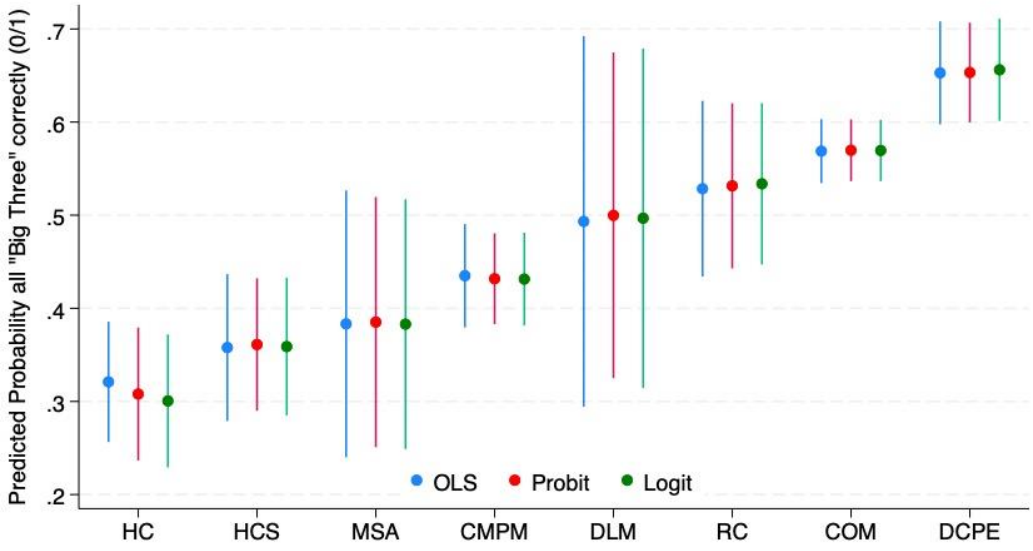
[19] We additionally estimated the regressions with a sample aged 15 to 29 years, resulting in similar levels in financial literacy as for the 18- to 29-year-old sample.
[20] We do not use this sample as for our main analysis because of relatively small sample sizes across clusters.

and customer-relations" cluster, consistent with our earlier robustness checks based on alternative financial literacy measurement definitions. "Health and care" and "hospitality, customer and service-oriented" clusters again show lower financial literacy, reinforcing our interpretation that the absence of both analytical learning and practical financial and economic occupational tasks limits financial literacy acquisition.

Third, we may face a specification error if our linear model oversimplifies and therefore fails to accurately capture the relationship between occupational clusters and financial literacy. To test the robustness of our results, we additionally employ two alternative specifications: logit and probit models. Both methods are designed for binary outcomes, such as correctly answering the "Big Three" financial literacy questions and transform the predicted probabilities to fall within a [0,1] range. While the logit model uses a logistic function, the probit model applies a normal distribution function. Our results remain robust across these specifications (see Figure 5. Accordingly—and for easier readability and interpretability—we retain the OLS model as our primary specification.

In summary, these robustness checks confirm the stability of our main findings while further underscoring the need to consider multiple pathways to acquire financial literacy—both analytical learning and practical applications of financial and economic concepts—when assessing financial literacy outcomes in VET.

Figure 5: Alternative Model Specifications: Financial Literacy across Clusters



Data: Cross-sectional Online Survey on Financial Literacy in Switzerland, own calculations. Note: Predicted Probabilities with standard errors clustered on cantonal level. Obs.: HC = Health and Care (N=134); HCS = Hospitality, Customer- and Service (N=97); MSA= Manual and Service Assistance (N=74); CMPM = Construction, Manufacturing, Production and Mechanical (N=315); DLM = Digital Layout and Media (N=43); RC=Retail and Costumer (N=99); COM=Commercial (N=553); DCPE = Digitized Construction, Planning, and Engineering (N=228)

5. Further Analysis: Financial Literacy by Type of Education

While upper-secondary academic education[21] may offer more analytically demanding learning environments on average, it typically lacks the practical application of financial or economic concepts. In contrast, VET pathways on average provide more opportunities for applying such financial and economics concepts in everyday occupational tasks but place less emphasis on formal analytical learning. Given these contrasting characteristics, the total effect of each pathway on financial literacy remains theoretically ambiguous. To test whether VET and academic education lead to systematically difference financial literacy levels, we extend our analysis and compare individuals from these two educational pathways in further analysis.

5.1 Data and Variables

In our further analysis, we first estimate the same OLS regression as in (1). To construct our treatment variable '*VET*', we use information on whether a respondent acquired a VET or an academic education degree after compulsory schooling. Our treatment variable '*VET'* is binary, taking the value 1 if respondents, after compulsory education, completed a VET (i.e., a 3- or 4-year apprenticeship[22]), and 0 if they completed academic education (i.e., went to baccalaureate school).

While we control for factors known to correlate with financial literacy, unobservable characteristics or factors may also influence a respondent's choice of upper-secondary education pathway. For example, individuals with high cognitive ability are more likely to enroll in academic education (Bolli, Rageth, and Renold 2019). This selection pattern potentially biases the naïve OLS regressions. To account for this potential endogeneity, we apply an instrumental variables estimation in a second step. As our instrument we use variations in educational traditions across Swiss regions that manifest in distinct differences in VET shares after compulsory education. Using administrative data from the Swiss statistical office (Bundesamt für Statistik 2024), we calculate the municipality-level VET share in the year an individual chooses their upper-secondary education path, typically around age 15, following

[21] Academic education, offered at "baccalaureate" schools called "Gymnasium", typically prepares students for university.

[22] We exclude the shorter two-year programs, because they are mostly aimed at students with difficulties in school and pursued by only a small minority of each cohort. Thus a comparison with highly demanding academic education would be biased.

their completion of lower-secondary education. Since data is unavailable for earlier years, we impute rates for 2005 to 2010 using 2011 data and for years after 2021 using 2021 data.[23]

Following Oswald-Egg and Renold (2021), we construct an instrumental variable leveraging the distinct education traditions across Swiss regions, particularly at the municipality-level.[24] The different upper-secondary educational traditions are reflected in consistent municipality-level differences in the share of individuals enrolling in VET versus academic types of education in each given cohort. These shares, which vary substantially by municipality, indicate strong differences in social norms that may determine adolescents' choosing VET or academic education (Aepli, Kuhn, and Schweri 2021; Bolli, Rageth, and Renold 2019).[25] Therefore, regional education type shares and graduation rates are widely used instruments for educational choices in Switzerland (Zisler, Pregaldini, and Backes-Gellner 2023, Oswald-Egg and Renold 2021, Hänni, Kriesi, and Neumann 2022).

For this further analysis, we retain all respondents aged 18 to 29 who have already completed their VET or academic education degree, resulting in a sample of 1,028 respondents.[26] This restriction ensures that the sample consists of respondents who have recently completed their upper-secondary education and remain in the early stages of their careers. We use these younger respondents because (1) they are at the start of their working lives, thus have had relatively little time to learn financial literacy in the labor market – except in VET training, (2) those individuals soon start making significant financial decisions, such as purchasing a home, buying a car, or investing in a retirement account and (3) research shows that financial literacy starts rising at age 30 (De Bassa Scheresberg 2013). While such a sample restriction was not possible in the main analysis in Section 3 because of sample size constraints, this subsample allows us to estimate the impact of early financial literacy without major concerns about confounding effects from later career or life events. We exclude all respondents from the analysis with missing information on the relevant variables, as well as the 4% of the sample with inconsistent responses.[27] The final sample for our further analysis contains 954 observations.

[23] The validity of our instrument is discussed in Appendix B.
[24] Municipalities are the smallest administrative unit in Switzerland, similar U.S. counties. Switzerland has over 2,000 municipalities, each varying in size and population.
[25] For a detailed description of the methodology and instrument validity see Appendix B.
[26] Swiss students complete upper-secondary school on average at age 19 and tertiary education at age 24.
[27] Individuals dropping out because of inconsistent response, are for example those indicating they had not finished school yet while also listing tertiary education as their highest educational level completed. Excluding individuals with missing information leads to a slight underrepresentation of individuals with VET in our further analysis sample (see Table B1)

5.2 Results

Table 2, Model (1) reports the descriptive comparison of financial literacy levels of academic and VET education. The naïve comparison reveals, on average, higher financial literacy for respondents who completed an academic education degree, compared to those with a VET degree. More specifically, respondents with an academic education background are, on average, 10.1 percentage points more likely to correctly answer the 'Big Three' financial literacy questions, as compared to respondents with a VET background.

To account for potential endogeneity, we then estimate the IV. The first stage regression results, reported in Table 2, Model (2), show a highly significant relation between the municipality-level VET share and respondents' educational choices. A 1 % increase in the municipality-level VET share is associated with an 8.9 % increase in the probability of enrolling in VET, validating the relevance of our instrument.[28]

Table 2: Naïve OLS and Instrumental Variable estimations of the Effect of VET vs. Academic Education on Financial Literacy

	(1) OLS	(2) 1st stage	(3) IV
	Financial Literacy	VET (Dummy)	Financial Literacy
Ref. Academic education			
VET	-0.101**		0.229
	(0.039)		(0.213)
VET share		0.890***	
		(0.148)	
Constant	0.239	-0.959***	0.512*
	(0.209)	(0.114)	(0.289)
Controls	YES	YES	YES
Obs.	954	954	954
F-Stat.		36.38	
p-value		0.000	

Data: Cross-sectional Online Survey on Financial Literacy in Switzerland, own calculations. Notes: The table displays mean regression coefficients in Model (1) and the results of the first stage regression and IV regression in Model (2) and (3). Data are weighted and controls included are tertiary education, gender, Swiss citizenship, age, urban vs. rural residency, mother 's level of education, and language of the questionnaire and canton fixed effects. Standard errors are clustered at cantonal level and are presented in parentheses.
* Significance at the 0.1 level, ** Significance at the 0.05 level, *** Significance at the 0.01 level.

[28] To test the strength of the instrument, we report the Kleibergen-Paap Wald F statistics (Table 1, Model (2)). This F-statistic for weak instruments is particularly useful in the presence of heteroscedasticity. The F-statistic of 36 (Prob > F = 0.000) underscores the validity of our instrument, as the statistic exceeds the canonical value of 10 (Staiger and Stock 1997).

The results of the second stage IV regression, reported in Model (3), show that the difference between academic and VET observed in descriptive analyses is no longer significant if we account for ability selection. Therefore, there is no evidence to claim that the naïve differences in financial literacy observed in Model (1), are caused by differences in educational pathways, but uncover a more nuanced picture. As the standard errors increase considerably in size and the estimates appear unstable, we cannot conclude that the absence of a significant effect in our IV analysis reveal no difference in financial literacy between VET and academic education.[29] These findings further support the assumption that attributing high financial literacy solely to analytical learning does not capture the full picture. Practically oriented pathways—such as those commonly found in VET—can also support the acquisition of comparable levels of financial literacy.

6. Conclusion

In this paper we examine whether financial literacy differs across VET occupational clusters and, if so, what factors might explain such differences. Using requirement profiles for nearly 200 Swiss VET occupations, we first identify eight occupational clusters with most similar competence profiles and then investigate whether they systematically differ in their financial literacy outcomes. Our analysis indeed reveals clear differences in financial literacy levels across occupational clusters. We find the highest levels in a cluster with high analytical requirements—consistent with research linking cognitive skills to financial literacy (e.g., Callis et al., 2023)—, as well as in clusters characterized by repeated practical applications of financial and economic concepts (e.g. budgeting, managing inventories, or preparing balance sheets), despite having overall low analytical requirements. Conversely, clusters with both low analytical requirements and limited practical applications of financial and economic concepts in everyday occupational tasks show the lowest levels of financial literacy. These findings support our theoretical expectation that financial literacy can be acquired not only through analytical learning, but also through practical application of financial and economic concepts in everyday occupational tasks. While robust, these results may suffer from endogeneity issues and are not necessarily a causal relationship. Thus, further research into this topic is needed.

[29] We also conduct the OLS and IV estimations for each of the "Big Three" separately (Figure A1). This separation reveals that the descriptive results are predominantly driven by the question about interest compounding, which is more analytical than the other questions.

In further analyses, we expand the analysis to investigate whether VET education differs systematically from academic education in its impact on financial literacy. While upper-secondary academic education may offer greater opportunities for analytical learning, it generally lacks practical application of financial or economic concepts. In contrast, VET pathways typically provide more such practical applications but less formal analytical learning, leaving the overall effect unclear.

Overall, our results introduce a more practice-oriented perspective on financial literacy acquisition in educational settings, suggesting that the content of VET programs—when involving practically applied and financially relevant occupational tasks—can be as effective in fostering financial literacy as analytically learning in other educational pathways. Tasks such as systematic inventory planning, budgeting for projects, or cost estimations for services may offer adolescents hands-on opportunities for implicitly understanding and acquiring financial literacy knowledge. Recognizing these diverse learning pathways is crucial for designing inclusive and effective financial education strategies across different educational and occupational contexts.

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Appendix A

Table A1: Questions on Financial Literacy

Question: Inflation ("Big Three")
Five brothers are going to be given a gift of CHF1,000 in total to share between them. Now imagine that the brothers have to wait for one year to get their share of the CHF1,000 and inflation stays at 5% percent. In one year's time will they be able to buy: *a) More with their share of the money than they could today* b) The same amount c) Less than they could buy today d) It depends on the types of things that they want to buy
Question: Interest (OECD)
You lend CHF25 to a friend one evening and he gives you CHF25 back the next day. How much interest has he paid on this loan? *OPEN RESPONSE*
Question: Interest (OECD)
Imagine that someone puts CHF100 into a no fee, tax free savings account with a guaranteed interest rate of 2% per year. They don't make any further payments into this account and they don't withdraw any money. How much would be in the account at the end of the first year, once the interest payment is made? *OPEN RESPONSE*
Question: Interest Compounding ("Big Three")
and how much would be in the account at the end of five years? Would it be: *a) More than CHF110* b) Exactly CHF110 c) Less than CHF110 d) Impossible to tell from the information given I would like to know whether you think the following statements are true or false.
Question: Risk reward (OCED)
An investment with a high return is likely to be high risk *ANSWER:* ***True***, False, Don't know
Question: Inflation (OECD)
High inflation means that the cost of living is increasing rapidly *ANSWER:* ***True***, False, Don't know
Question: Risk diversification ("Big Three")
It is usually possible to reduce the risk of investing in the stock market by buying a wide range of stocks and shares *ANSWER:* ***True***, False, Don't know

Note: Survey respondents were presented with three financial literacy questions, known as the "Big Three" (Lusardi and Mitchell 2011) and additional questions adapted from the OECD framework (OECD 2018).

Table A2: Overall Mean per Requirement Dimension

Variable	Mean	Min	Max
Math: Numbers	46.9053	7	80
Math: Forms	45.96767	2	92
Math: Mass	55.3679	5	88
Math: Functional Relations	42.68516	2	87
Math: Data	35.0267	3	71
Science: Question & Research	49.06169	5.25	78
Science: Information	51.96505	17.5	86.25
Science: Ordering and structuring	50.17091	10	82
Science: Decision-making	52.17461	20	80
Science: Idea development	41.9474	8.25	80
Science: Team	54.61613	22.33	85
Language: Speaking	47.9554	15.5	92.5
Language: Participation	55.46875	18	87.5
Language: Writing	42.64082	12.67	77.5
Language: Listening	50.56672	17.33	82
Language: Reading	49.97878	19	90
Foreign: Listening	19.00309	1	71
Foreign: Reading	18.7716	1	65
Foreign: Participation	17.98904	1	74
Foreign: Speaking	16.20972	1	73
Foreign: Writing	11.26389	1	60

Table A3: Occupational Clusters by Requirements

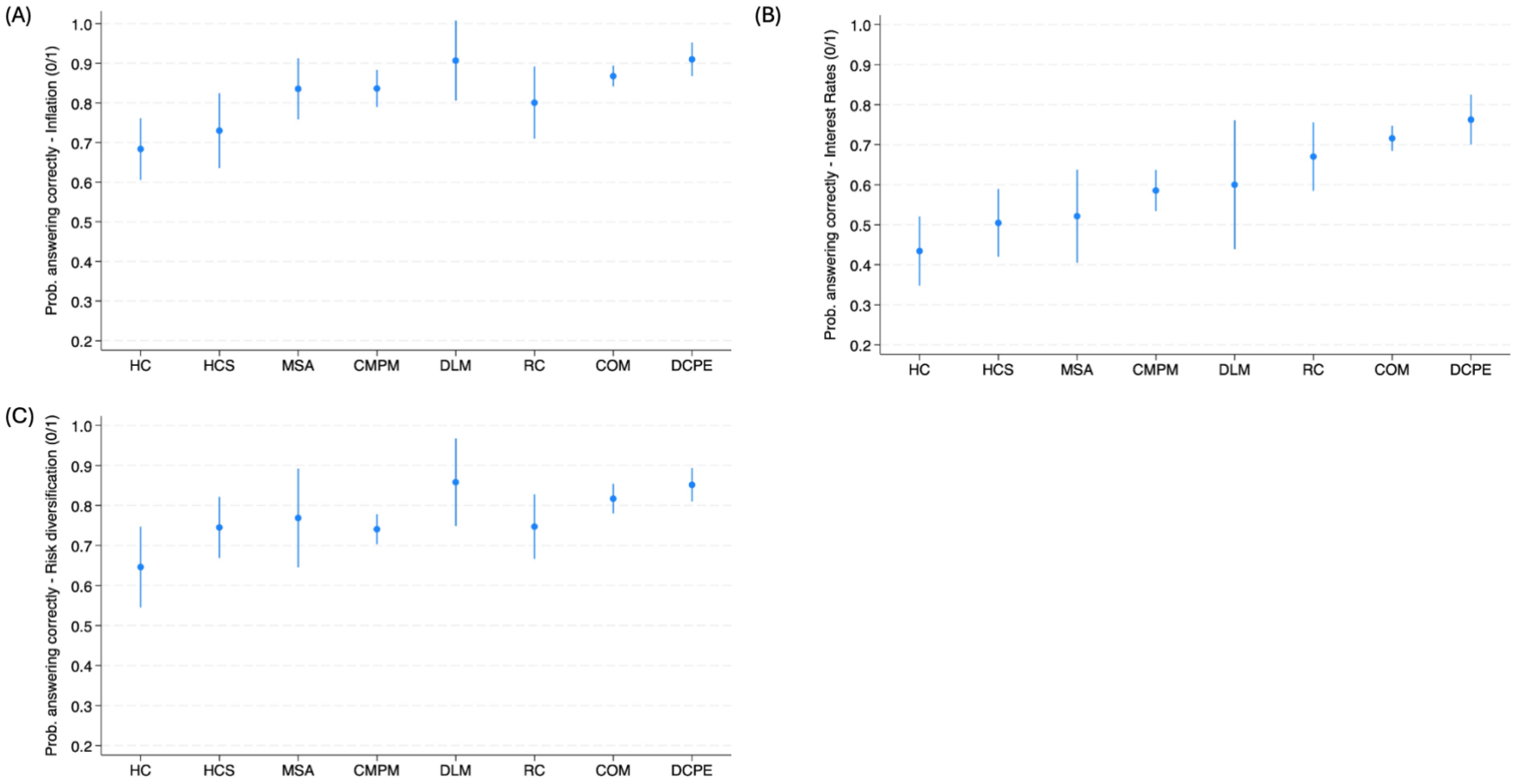
Cluster	Occupations (English)	Occupations (German)
Digital Layout and Media (DLM)	Digital Layout Specialist, Optician, Mediamatics Technician, Photography Expert, Public Transport Agent, Interactive Media Designer	Polygraf/in EFZ, Optiker/in EFZ, Mediamatiker/in EFZ, Fotograf/in EFZ, Fachmann/-frau öffentlicher Verkehr EF, Interactive Media Designer EFZ
Digitized Construction, Planning, and Engineering (DCPE)	Technical Drawer, IT Specialist, Electronics Engineer, Automation Engineer, Laboratory Technician, Design Engineer, Geomatics Expert, Building Services Planner, Metal Construction Engineer, Smart Building Solutions Technician, Physics Laboratory Technician, Electrical Designer	Zeichner/in EFZ, Informatiker/in EFZ, Elektroniker/in EFZ, Automatiker/in EFZ, Laborant/in EFZ, Konstrukteur/in EFZ, Geomatiker/in EFZ, Gebäudetechnikplaner/in Heizung EFZ, Metallbaukonstrukteur/in EFZ, Gebäudeinformatiker/in EFZ, Physiklaborant/in EFZ, Elektroplaner/in EFZ
Manual and Service Assistance (MSA)	Commercial Employee EBA, Logistics Professional, Hairdresser EBA, Baker-Pâtissier-Confectioner EBA, Assistant in Hospitality Services EBA, Print Finisher EBA, Health and Social Care Worker EBA, Logistics Assistant EBA, Gardener EBA, Food Technologist EBA, Automotive Assistant EBA, Bricklayer's assistant EBA, Industrial Flooring and Subflooring Assistant, Restaurant Service Employee EBA	Kaufmann/Kauffrau EBA, Logistiker/in EFZ, Coiffeur/-euse EBA, Bäcker/in-Konditor/in-Confiseur/in EBA, Praktiker/ -in Hotellerie-Hauswirtschaft EBA, Printmedienpraktiker/in EBA, Assistent/in Gesundheit und Soziales E, Logistiker/in EBA, Gärtner/in EBA, Lebensmittelpraktiker/in EBA, Automobil-Assistent/in EBA, Baupraktiker/in EBA, Ind.u. Unterlagsbodenbauerpraktiker/in, Restaurantangestellte/r EBA
Hospitality, Customer- and Service (HCS)	Chef/Cook, Hospitality Services & Hotel Housekeeping, Clothing Designer, Hairdresser, Dental Assistant, Retail Assistant EBA, Driver of Heavyweight Trucks, Restaurant Service Employee	Koch/Köchin EFZ, Fachmann/-frau Hotellerie-Hauswirtschaft EFZ, Bekleidungsgestalter/in EFZ, Coiffeur/-euse EFZ, Dentalassistent/in EFZ, Detailhandelsassistent/in EBA, Strassentransportfachmann/-frau EFZ, Restaurantfachmann/-frau EFZ
Health and Care (HC)	Healthcare Assistant, Certified Social Care Worker, Medical Secretary and Assistant, Pharmacy Specialist, Florist, Animal Caretaker, Druggist, Hearing Aid Professional, Veterinary Assistant	Fachmann/-frau Gesundheit EFZ, Fachmann/-frau Betreuung EFZ, Medizinische/r Praxisassistent/in EFZ, Fachmann/-frau Apotheke EFZ, Florist/in EFZ, Tierpfleger/in EFZ, Drogist/in EFZ, Hörsystemakustiker/in EFZ, Tiermed. Praxisassistent/in EFZ
Construction, Manufacturing, Production and Mechanical (CMPM)	Electrician, Mechanical Engineer, Automotive Mechatronics Technician, Baker-Confectioner, Gardener, Painter, Bricklayer, Licensed Construction Electrician, Cabinetmaker, Automotive Technician, Plumber, Forester, Farmer, Butcher, Vehicle Fitter, Mechanical Technician, Food Technologist, Dairy Technician, Media Technologist, Plant and Equipment Manufacturer, Polydesigner, Chemical and Pharmaceutical Technologist, Metal Worker, Print Media Processor, Agricultural Machinery Mechanic, Powerline Technician, Installer for Heating Systems, Wine Technologist, Interior Designer, Plastics Technologist, Body Painter, Tinsmith, Road Builder, Roofer, Chimney Sweeper, Grape Grower, Home Textile Designer, Home Seamstress EBA, Paper Technologist, Leather and Textile Worker, Industrial Ceramist, Power Tool Mechanic, Panel Beater, Bicycle Mechanic, Small Motorcycle and Bicycle Mechanic, Motorcycle Mechanic, Track Worker, Instrument Maker, Wood Sculptor	Elektroinstallateur/in EFZ, Polymechaniker/in EFZ, Schreiner/in EFZ, Automobil-Mechatroniker/in EFZ, Bäcker/in-Konditor/in-Confiseur/in EFZ, Gärtner/in EFZ, Maler/in EFZ, Maurer/in EFZ, Montage-Elektriker/in EFZ, Zimmermann/Zimmerin EFZ, Automobil-Fachmann/-frau EFZ, Sanitärinstallateur/in EFZ, Forstwart/in EFZ, Landwirt/in EFZ, Fleischfachmann/-frau EFZ, Fahrzeugschlosser/in EFZ, Produktionsmechaniker/in EFZ, Lebensmitteltechnologe/-login EFZ, Milchtechnologe/-login EFZ, Medientechnologe/-login EFZ, Anlagen- und Apparatebauer/in EFZ, Polydesigner/in 3D EFZ, Chemie- und Pharmatechnologe/-login EFZ, Metallbauer/in EFZ, Printmedienverarbeiter/in EFZ, Landmaschinenmechaniker/in EFZ, Netzelektriker/in EFZ, Heizungsinstallateur/in EFZ, Weintechnologe/-login EFZ, Raumausstatter/in EFZ, Kunststofftechnologe/-in EFZ, Carrossier/in Lackiererei EFZ, Spengler/in EFZ, Strassenbauer/in EFZ, Dachdecker/in EFZ, Kaminfeger/in EFZ, Winzer/in EFZ, Wohntextilgestalter/in EFZ, Dekorationsnäher/in EBA, Papiertechnologe/-login EFZ, Fachmann/-frau Leder und Textil EFZ, Industriekeramiker/in EFZ, Motorgerätemechaniker/in EFZ, Carrosseriespengler/in EFZ, Fahrradmechaniker/in EFZ, Kleinmotorrad- u Fahrradmechaniker/in, Motorradmechaniker/in EFZ, Automatikmonteur/in EFZ, Gleisbauer/in EFZ, Blasinstrumentenbauer EFZ, Holzbildhauer/in EFZ
Commercial (COM)	Commercial Employee, Bookseller, Information and Documentation Specialist, Specialist in System Gastronomy, Photo Retailer	Kaufmann/Kauffrau EFZ, Buchhändler/in EFZ, Fachmann/-frau Information u. Dokument EFZ, Systemgastronomiefachmann/-frau EFZ, Fotomedienfachmann/-frau EFZ
Retail and Costumer (RC)	Retail Clerk, Customer Dialogue Specialist, Guest Relations Officer	Detailhandelsfachmann/-frau EFZ, Fachmann/-frau Kundendialog EFZ, Hotel-Kommunikationsfachmann/-frau EFZ

Table A4: Description of Requirement Profiles

COMPETENCE	COMPETENCE DESCRIPTION (GERMAN)	COMPETENCE DESCRIPTION (ENGLISH)
MATH: NUMBERS	Algebra, Gleichungen mit Unbekannten (z.B. Berechnung der Drehgeschwindigkeit, Berechnung der Glasdaten für eine Brille).	Algebra, equations with unknowns (e.g., calculating rotational speed, calculating lens data for glasses).
MATH: FORMS	Dinge räumlich vorstellen, Pläne lesen oder zeichnen, räumliche Formen herstellen.	Visualizing things spatially, reading or drawing plans, creating spatial shapes.
MATH: MASS	Messen, Einheiten umrechnen, berechnen (z.B. Fläche, benötigte Menge).	Measuring, converting units, calculating (e.g., area, required quantity).
MATH: FUNCTIONAL RELATIONS	Bei Berechnungen mit Wertetabellen und Grafiken arbeiten (z.B. Lärmbelastung in Abhängigkeit des Abstandes von der Lärmquelle)	Working with calculations using data tables and graphs (e.g., noise pollution depending on distance from the noise source).
MATH: DATA	Wahrscheinlichkeiten von Ereignissen bestimmen, Diagramme erstellen, z.B. Anzahl Gäste in der kommenden Woche, Verkaufszahlen analysieren entsprechend	Determining probabilities of events, creating diagrams, e.g., number of guests in the coming week, analyzing sales figures accordingly.
SCIENCE: QUESTION & RESEARCH	Erkunden, messen, Geräte hierfür einsetzen, Ergebnisse darstellen. Z.B. Fehler suchen, Ursachen abklären.	Exploring, measuring, using devices for this purpose, presenting results. E.g., finding errors, clarifying causes.
SCIENCE: INFORMATION	In Fachbüchern, Handbüchern oder im Internet Informationen suchen und verwenden	Searching for and using information in specialized books, manuals, or the internet.
SCIENCE: ORDERING AND STRUCTURING	Beobachtungen kombinieren und daraus Schlüsse ziehen z.B. Gründe für Hautrötung, Stottern des Motors	Combining observations and drawing conclusions, e.g., reasons for skin redness, engine stuttering.
SCIENCE: DESICION-MAKING	Entscheidungen treffen z.B. „diese Lösung ist besser, weil…“ oder „ich muss achten auf… denn sonst…“	Making decisions, e.g., “this solution is better because…” or “I need to pay attention to… because otherwise…”.
SCIENCE: IDEA DEVELOPMENT	Ideen umsetzen, sich an Projekten beteiligen	Implementing ideas, participating in projects.
SCIENCE: TEAM	Im Team oder gegenüber Kundschaft ein Projekt präsentieren, Fachbegriffe verwenden	Presenting a project in a team or to customers, using technical terms.
LANGUAGE: SPEAKING	z.B. kleiner Vortrag, Präsentation eines Produktes an Kundschaft, auch auf Hochdeutsch	E.g., a short lecture, presentation of a product to customers, also in High German.
LANGUAGE: PARTICIPATION	Sich an Gesprächen beteiligen, aber auch Rücksicht auf andere im Gespräch nehmen, z.B. Gespräch mit Kundschaft, im Team, auch auf Hochdeutsch	Participating in conversations while also being considerate of others in the conversation, e.g., discussions with customers, in a team, also in High German.
LANGUAGE: WRITING	Fehlerfreie, verständliche Texte schreiben, z.B. Brief, Speisekarte, Protokoll, Anleitung	Writing error-free, comprehensible texts, e.g., letters, menus, protocols, instructions.
LANGUAGE: LISTENING	Verstehen, z.B. Nachrichtensprecherin, telefonische Anfrage eines Kunden	Understanding, e.g., news anchor, telephone inquiry from a customer.
LANGUAGE: READING	Verstehen, z.B. Fachbücher, Briefe, Anleitungen, Rezepte lesen	Understanding, e.g., reading specialized books, letters, instructions, recipes.
FOREIGN: LISTENING	z.B. Nachrichtensprecherin, telefonische Anfrage der Kundschaft verstehen	E.g., understanding a news anchor, telephone inquiries from customers.
FOREIGN: READING	z.B. Zeitung, Fachartikel, Handbuch eines Gerätes auf Englisch.	E.g., reading a newspaper, specialized articles, device manuals in English.
FOREIGN: PARTICIPATION	z.B. Gespräch mit Kundschaft, in der Fremdsprache	E.g., conversations with customers in a foreign language.
FOREIGN: SPEAKING	z.B. kleiner Vortrag, Präsentation eines Produktes an Kundschaft in der Fremdsprache	E.g., a short lecture, presentation of a product to customers in a foreign language.
FOREIGN: WRITING	z.B. Brief oder Email in der Fremdsprache, Texte bei einer PowerPoint Präsentation	E.g., letters or emails in a foreign language, texts in a PowerPoint presentation.

Source: https://www.anforderungsprofile.ch, Note: Competencies translated using DeepL.com.

Figure A1: "Big Three" Financial Literacy by Question across Clusters



Data: Cross-sectional Online Survey on Financial Literacy in Switzerland, own calculations. Note: Panel A shows the probability of answering correctly the question on inflation. Panel B shows the probability of answering correctly the question on Interest Rates. Panel C shows the probability of answering correctly the question on Risk diversification. Each dot represents the estimated coefficient of one of the eight occupational clusters. Error bars denote 95% confidence intervals. All cluster variables are unweighted and standardized. Cluster labels: HC = Health and Care (N=134); HCS = Hospitality, Customer- and Service (N=97); MSA = Manual and Service Assistance (N=74); CMPM = Construction, Manufacturing, Production and Mechanical (N=315); DLM = Digital Layout and Media (N=43); RC = Retail and Customer (N=99); COM = Commercial (N=553); DCPE = Digitized Construction, Planning, and Engineering (N=228).

Figure A2: WSS, log(WSS), η2, and PRE for all K cluster solutions

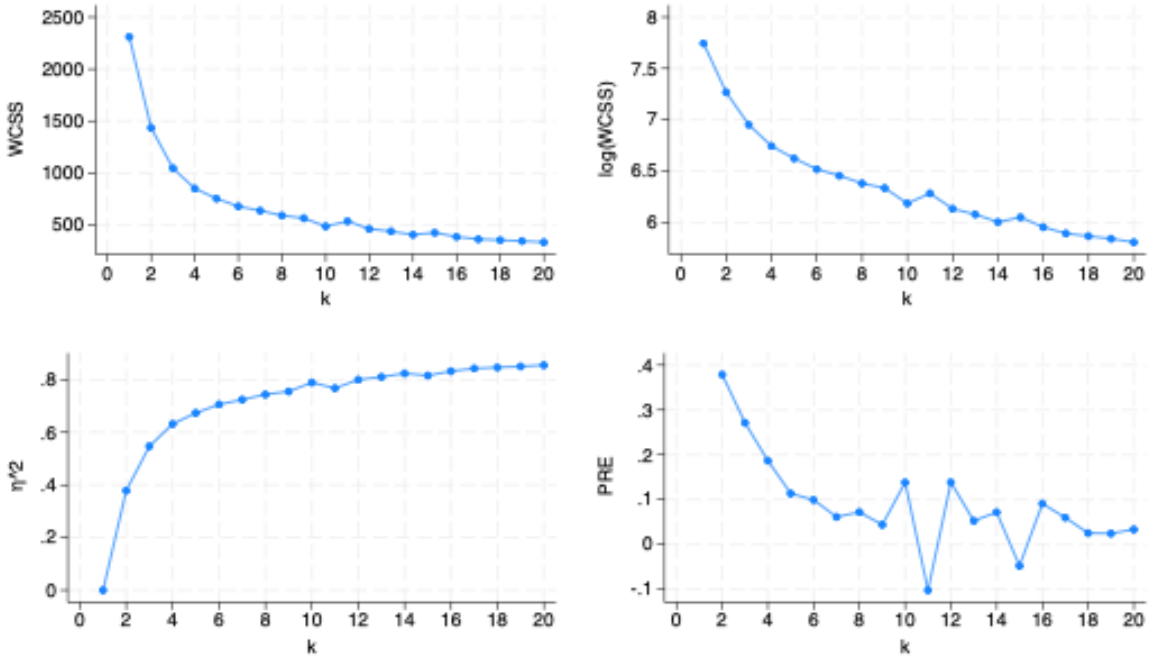


Figure A3: Thirty interations WSS, log(WSS), η2, and PRE curves for K = 20

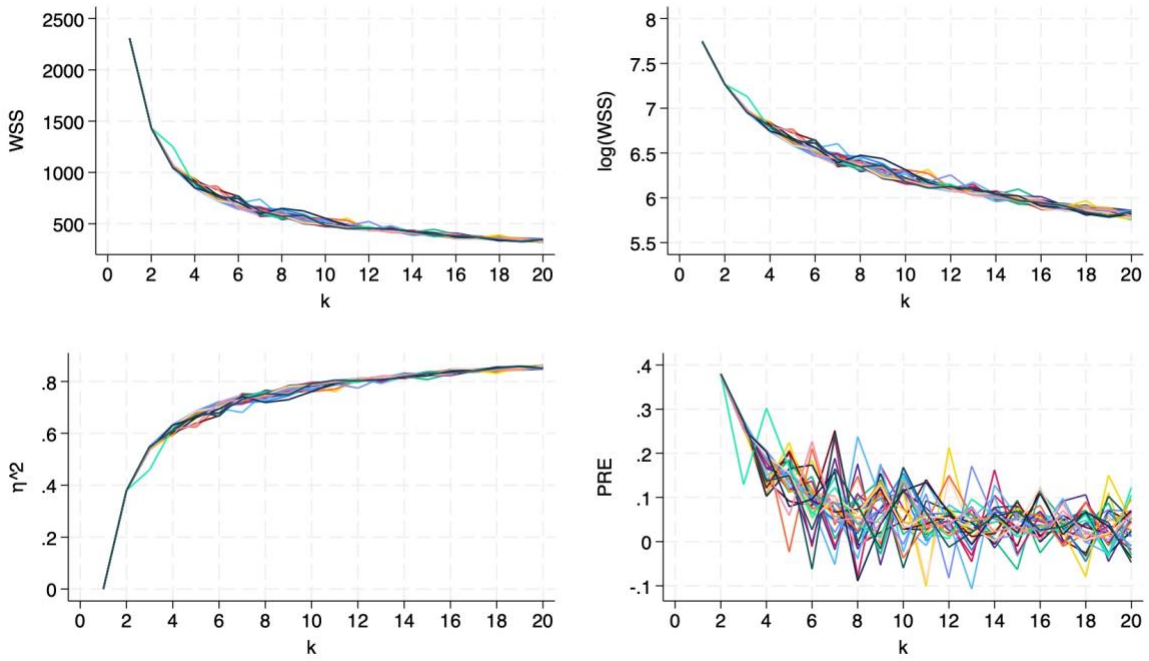


Figure A4: Hierarchical Clustering with twenty-one requirements (Wards Linkage): Dendrogram

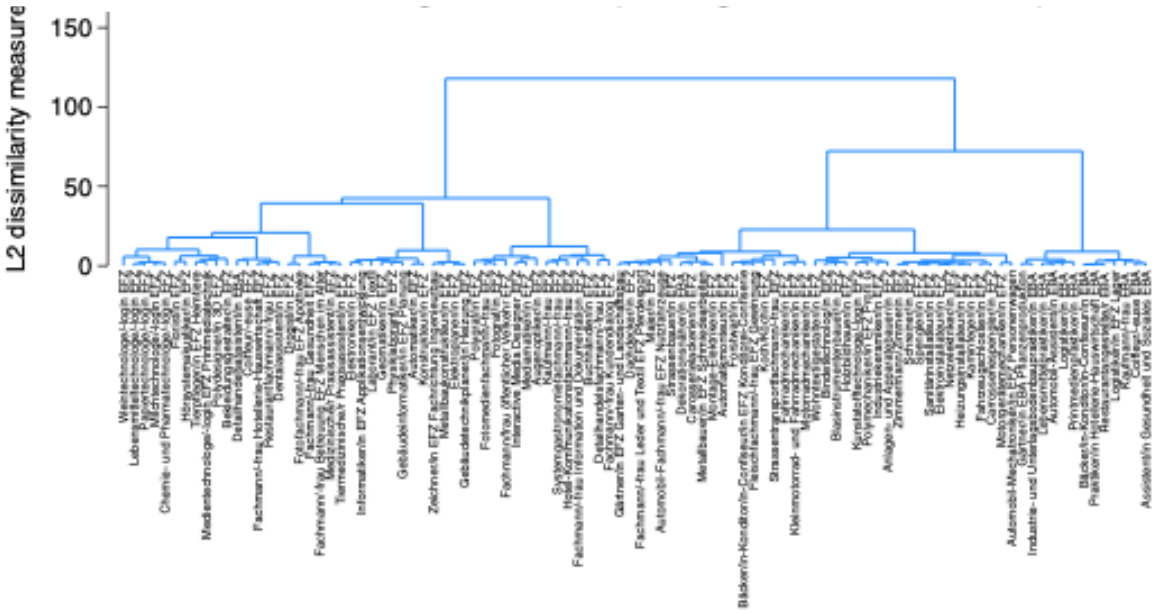


Table A5: Duda/Hart stopping rule

Number of clusters	Duda/Hart Je(2)/Je(1)	Duda/Hart pseudo T-squared
1	0.6685	52.55
2	0.4748	61.96
3	0.7352	17.29
4	0.6365	19.41
5	0.7145	16.79
6	0.6999	9.43
7	0.606	10.4
8	0.6833	5.56
9	0.6502	5.92
10	0.5861	7.06
11	0.586	8.48
12	0.7856	5.46
13	0.7779	5.71
14	0.65	6.46
15	0.5457	9.16
16	0.6559	2.62
17	0.593	2.74
18	0.5942	4.1
19	0.3082	8.98
20	0.4974	3.03

Appendix B

B1. Methodological approach

In a simple ordinary least square (OLS) setting, we regress the probability of answering correctly the "Big Three" on our explanatory variable '*VET*'. We estimate the following model:

$$LIT_{ic} = \beta_0 + \beta_1 VET_{ic} + \theta X_{ic} + \delta_c + \varepsilon_{ic} \quad (1)$$

where the binary outcome, LIT_{ic} denotes our financial literacy measure for individual i living in canton c.[30] VET_{ic}, is a dummy variable for individuals who completed vocational education as opposed to academic education. The vector X_{ic} includes individual-specific characteristics, such as tertiary education, gender, Swiss citizenship, age, urban versus rural residency, mother's level of education, and language in which the questionnaire was answered (German, French and Italian). Table B1 contain a description of all variables included in the estimations. To capture unobserved regional heterogeneities, such as workforce composition or economic activities, we introduce cantonal fixed effects, represented by δ_c, into our regression model, while ε_{it} displays the error term. Standard errors are clustered at the cantonal level. Using an OLS regression allows us to compare the average financial literacy of individuals who completed vocational education versus individuals who completed academic education.

Although, we control for individual characteristics that might correlate with financial literacy, the results of this estimation are purely descriptive, and a naïve comparison overlooks the sorting of individuals with different abilities into various educational pathways. Due to these endogeneity problems the OLS estimates cannot serve as causal evidence on the effect of different educational pathways. To address this endogeneity problem, we introduce an Instrumental Variables (IV) approach, a canonical solution to the problems of OLS.

The first stage of our IV estimation involves regressing the municipality-level vocational education share, $SHARE_c$, as an instrument on educational choice, VET_{ic}. At the same time, we control for the same set of variables as in equation (1), a vector of individual-level variables X_{ic}, and cantonal fixed effects, Δ_c. We estimate the first stage as follows:

[30] Because logistic regression (logit) or probit regression are often preferred over OLS regression for binary dependent variables, we also plan to conduct estimations using logit and probit models. For interpretability reasons, OLS model are often preferred.

$$VET_{ic} = \gamma_0 + \gamma_1 SHARE_c + \rho X_{ic} + \Delta_c + \eta_{ic} \quad (1)$$

where $SHARE_c$ denotes the municipality-level vocational education share in the year of individuals upper-secondary school choice in their current municipality.

The second stage of the IV estimation resembles the OLS model in equation (1), with the difference that the vocational education variable is derived from the estimated value of educational choice from our first stage regression. We estimate the second stage IV regression as follows:

$$LIT_{ic} = \beta_0 + \beta_1 \widehat{VET}_{\text{ic}} + \theta X_{ic} + \delta_c + \varepsilon_{ic} \quad (2)$$

Given a valid instrument, IV eliminates omitted variables bias, allowing for estimation of causal returns of vocational education on financial literacy. The IV estimation identifies the local average treatment effect (LATE) of type of education on financial literacy for those individuals whose educational decision was influenced by cultural norms in their home region, and who would have decided differently in other parts of Switzerland.

B2. Instrument validity

Instrument validity is crucial for our analysis. First, our instrument must be correlated with the binary treatment variable VET_i, i.e., cov ($SHARE_c$, VET_i) $\neq$ 0. We test this assumption by testing the joint significance of our instruments' coefficients via an F-test (Stock, Wright, and Yogo 2002). The F-statistic of 36 (Prob > F = 0.000) exceeds the canonical value of 10.

Second, the instrument must not be associated with the second stage error term, meaning that the municipality-level vocational education share, reflecting regional educational traditions, must not correlate with other characteristics related to financial literacy. This assumption may be violated if for example, family background, or other socio-economic variables that affect both educational decisions and financial literacy are linked with the municipality-level share of vocational enrolment and are not directly measured in the analysis. This association would occur, for example, if individuals intentionally move to different cantons, or to different municipalities to receive better financial education. Given the, generally, very low mobility of school-age individuals across cantons in Switzerland (Muehlemann, Ryan, and Wolter 2013; Pfister, Tuor Sartore, and Backes-Gellner 2017), this intentional relocation is quite unlikely. Moreover, empirical studies suggest that young Swiss who choose vocational education at the age 15 strongly prefer programs available within their home region (Oswald

and Backes-Gellner 2014), hence, this preference -if anything- restricts their opportunities to pursue academic education (Eggenberger, Rinawi, and Backes-Gellner 2018), as some regions lack baccalaureate schools.

Finally, the violation of the exclusion restriction is a further concern if for example, different school curricula change across regions, leading to different skill levels across Switzerland. While changes to educational curricula are not uncommon in Switzerland (Schweri, Aepli, and Kuhn, Andreas 2021; Bühler, Lehnert, and Backes-Gellner 2024), school curricula (at least for vocational education programs) are standardized at the state and the cantonal level, such that the exclusion restriction is likely not violated.

In general, the independence of municipality-level vocational education share when respondents were 15-years old from financial literacy is a reasonable assumption, supported by the time difference between individuals' graduation year and the collection of our survey, and thus fulfils the crucial requirement for an IV.

B3. Robustness checks

To ensure the robustness of our results, we conduct four additional analyses examining potential concerns related to 1) the measurement of financial literacy, 2) structural regional differences, 3) peer effects, and 4) model specification.

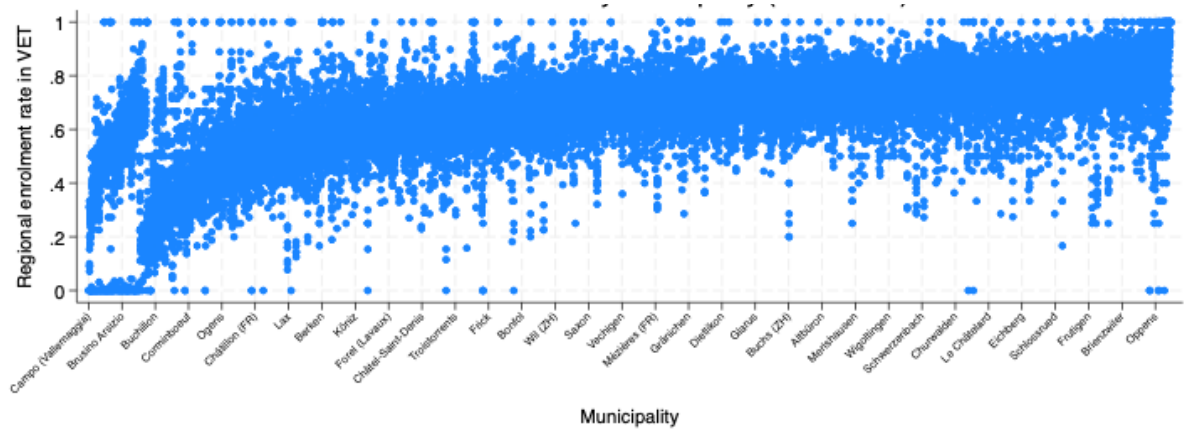
First, to ensure the robustness of our findings and account for potential concerns regarding the specific definition of financial literacy, we construct three alternative outcome variables as introduced by (Atkinson and Messy 2011; 2012)[31]: 1) we use the full OECD financial literacy module (seven questions) to create a count variable ranging from 0 to 7, representing the number of correct answers; 2) we transform the OECD count variable into a dummy that equals 1 if respondents correctly answered at least five of the seven questions: 3) we construct a count variable ranging from 0 to 3 for the number of correct answers among the "Big Three" questions. Our results remain consistent across these specifications.

Second, while our main specification includes cantonal fixed effects to capture time-invariant differences, it may not account for time-varying factors, such as shifts in local economic conditions, that could influence both financial literacy and educational pathways. To address this concern, we incorporate macroeconomic indicators of the local economy by time and canton (Table B4) and confirm our main results.

[31] For an overview of all measures see Appendix Table B3.

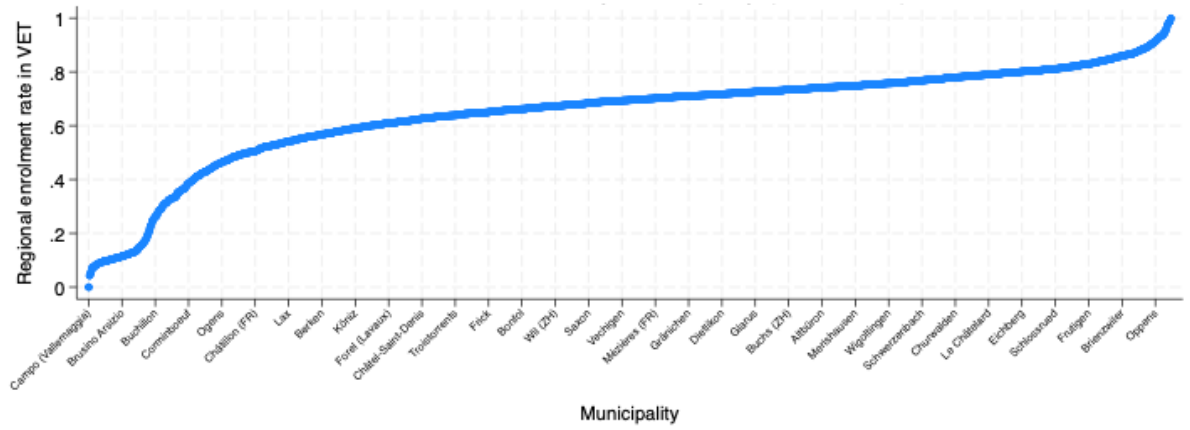
Third, a final concern might be the presence of a specification error, meaning that the structure of the model does not accurately capture the underlying relationship between the variables being analyzed. Specifically, the choice of a linear model to estimate the relationship between school type and financial literacy may oversimplify this relationship. To test the robustness of our results, we additionally plan to employ two alternative specifications: logit and probit models. Both methods are designed for binary outcomes, such as correctly answering the "Big Three" financial literacy questions and transform the predicted probabilities to fall within a [0,1] range. While the logit model uses a logistic function, the probit model applies a normal distribution function.

Figure B1: Variation of Vocational Education Share by Region and within Region for Different Cohorts (2011-2021)



Note: The figure illustrates variations in vocational education shares across and within regions, with regional shares fluctuating annually. The graph is organized by the overall mean share for each region during the period 2011–2021. Every 66th municipality is labelled for clarity.

Figure B2: Average Vocational Education Share by Region (2011-2021)



Note: The figure illustrates overall mean vocational share for each region during the period 2011–2021. Every 66th municipality is labelled for clarity.

Table B1: Descriptive Statistics of the Sample

	(1) All	(2) Vocational Education	(3) Academic Education	(4) Difference (p-value)
Financial literacy	0.55	0.51	0.58	0.07**
	(0.50)	(0.50)	(0.49)	(0.030)
Completed tertiary education	0.40	0.32	0.46	0.15***
	(0.49)	(0.47)	(0.50)	(0.000)
Female	0.47	0.42	0.52	0.10***
	(0.50)	(0.49)	(0.50)	(0.003)
Married	0.04	0.05	0.03	-0.03**
	(0.19)	(0.23)	(0.16)	(0.027)
Swiss citizen	0.92	0.95	0.89	-0.05***
	(0.28)	(0.23)	(0.31)	(0.003)
Age	25.02	25.63	24.58	-1.05***
	(3.27)	(3.12)	(3.31)	(0.000)
Rural residency area	0.32	0.37	0.28	-0.09***
	(0.47)	(0.48)	(0.45)	(0.003)
German speaking	0.70	0.77	0.64	-0.14***
	(0.46)	(0.42)	(0.48)	(0.000)
French speaking	0.26	0.19	0.32	0.13***
	(0.44)	(0.39)	(0.47)	(0.000)
Italian speaking	0.04	0.03	0.04	0.01
	(0.19)	(0.18)	(0.20)	(0.485)
Mother with tertiary education	0.29	0.19	0.36	0.17***
	(0.45)	(0.40)	(0.48)	(0.000)
In employment	0.50	0.73	0.34	-0.39***
	(0.50)	(0.44)	(0.47)	(0.000)
Obs.	954	403	551	954

Data: Cross-sectional Online Survey on Financial Literacy in Switzerland, own calculations. Notes: Data are weighted.

Table B2: Big Three Financial Literacy Questions Separately

	(1)	(2)	(3)	(4)	(5)	(6)
	Inflation		Interest Compounding		Risk Diversification	
	OLS	IV	OLS	IV	OLS	IV
Ref. Academic education						
Vocational	-0.033	0.109	-0.110***	0.057	-0.035	0.188
education	(0.027)	(0.169)	(0.026)	(0.190)	(0.037)	(0.219)
Constant	1.079***	1.196***	0.477	0.616*	0.862***	1.045***
	(0.201)	(0.183)	(0.317)	(0.327)	(0.193)	(0.207)
Controls	YES	YES	YES	YES	YES	YES
Canton FE	YES	YES	YES	YES	YES	YES
Obs.	954	954	954	954	954	954

Data: Cross-sectional Online Survey on Financial Literacy in Switzerland, own calculations. Notes: Data are weighted and controls included are tertiary education, gender, Swiss citizenship, age, urban vs. rural residency, mother 's level of education, and language of the questionnaire and canton fixed effects. Standard errors are clustered at cantonal level and are presented in parentheses. * Significance at the 0.1 level, ** Significance at the 0.05 level, *** Significance at the 0.01 level.

Table B3: Different Specifications of Financial Literacy

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OECD (Count)		OECD (Dummy)		Big Three (Count)		Big Three	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Ref. Academic education								
Vocational	-0.236**	0.202	-0.024	0.113	-0.178**	0.354	-0.101**	0.229
education	(0.108)	(0.542)	(0.043)	(0.170)	(0.071)	(0.397)	(0.039)	(0.213)
Constant	5.082***	5.444***	0.463	0.576*	2.418***	2.856***	0.239	0.512*
	(0.647)	(0.666)	(0.359)	(0.346)	(0.585)	(0.535)	(0.209)	(0.289)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Obs.	954	954	954	954	954	954	954	954

Data: Cross-sectional Online Survey on Financial Literacy in Switzerland, own calculations. Notes: Data are weighted and controls included are tertiary education, gender, Swiss citizenship, age, urban vs. rural residency, mother 's level of education, and language of the questionnaire and canton fixed effects. Standard errors are clustered at cantonal level and are presented in parentheses. * Significance at the 0.1 level, ** Significance at the 0.05 level, *** Significance at the 0.01 level.

Table B4: Estimation with Macro Indicators

	(1)	(2)
	OLS	
	Financial Literacy	Financial Literacy
Ref. Academic education		
Vocational Education	-0.101**	-0.096**
	(0.039)	(0.034)
Avg. vocational education share		
Constant	0.239	0.526***
	(0.209)	(0.122)
Controls	YES	YES
Macro	NO	YES
Obs.	954	965

Data: Cross-sectional Online Survey on Financial Literacy in Switzerland, own calculations. Notes: Data are weighted and additional controls included are tertiary education, gender, Swiss citizenship, age, urban vs. rural residency, mother 's level of education, and language of the questionnaire and canton fixed effects. Model (2) additionally includes cantonal unemployment rate, cantonal Gross Domestic Product (GDP) per capita, cantonal bankruptcy rate per capita, percent of firms and employees per capita. Model (3) displays the first stage results of the analysis with municipality-level average vocational education share between 2005 and 2011. Model (4) are the second stage results of the IV estimation with municipality-level average vocational education share. Standard errors are clustered at cantonal level and are presented in parentheses. * Significance at the 0.1 level, ** Significance at the 0.05 level, *** Significance at the 0.01 level.

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