Could financial education be a universal social policy?

A simulation of potential influences on inequality levels*

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Abstract

This paper aims to identify the potential influence of financial literacy's marginal change on households' income (wealth) inequality levels both at the mean value and along with the distribution. Using data from the Bank of Italy Survey of Households Income and Wealth (SHIW)'s 2016 wave – which includes the Big Three questions, a widely used measure of financial literacy - we show that replacing 10% of respondents reporting no correct answers with respondents reporting two correct answers out of three would increase the mean value of the household equivalized disposable income by 0.8% (160€ per year). Additionally, it would increase by +1.5% (285€ per year) if we replace 10% of respondents reporting no correct answers with those reporting three correct answers. These results are not trivial. A lump sum leading to the same household income increase would cost on average EUR 4.1 to 7.3 billion per year in Italy. Finally, heterogeneous analysis reveals that an increase in financial literacy levels often engenders a greater reduction of inequality levels among the most vulnerable groups. Our preliminary cost analysis supports mandatory financial education in schools.

Keywords: Financial literacy; Financial education; Household finance; Inequality; RIF regressions.

JEL codes: D31; D63; G51; G53.

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1. Introduction

Decreasing inequality has been a long-standing issue for policymakers around the world, both in high-income countries and developing economies. Recent global shocks from the pandemic and the resurgence of inflation have exacerbated the problem and called for more immediate actions to support vulnerable households and reduce income and wealth inequality. Previous literature suggests several options to reduce inequality. Among them, taxes and social policies are just a few but main examples (e.g. Caminada and Goudswaard, 2001; Poterba, 2007; Joumard et al., 2012; Atkinson, 2015; Iosifidi and Mylonidis, 2017; Sabelhaus and Henriques Volz, 2022). A vast previous literature has shown that financial literacy can be a powerful tool against financial fragility, contributing to greater asset accumulation and financial well-being (van Rooij et al., 2011; van Rooij et al., 2012; Lusardi and Mitchell, 2014; Bucciol et al., 2018; Fornero et al., 2019; Collins and Urban, 2020; Klapper and Lusardi, 2020; Almenberg et al., 2021; Bucciol et al., 2021; Kaiser et al., 2022). However, most of this literature focuses on either one specific financial education program or a specific group of the population. Policymakers still lack a comprehensive tool to assess the macro impact of financial literacy on inequality, taking into account the heterogeneity of the population, to conduct a cost-benefit analysis of large-scale financial education initiatives. In this paper, we provide a framework to conduct such analysis via the creation of hypothetical scenarios with minimal data requirements, applicable to a wide variety of countries.

In this paper, specifically, we take on this challenge and propose a replicable framework to compute the influence of financial literacy on income and wealth across a country's full population, quantifying both its average and distributional effects. While causality cannot be fully established, this methodology presents several advantages. First, the data requirements are minimal, as it only needs a micro-level survey of households' income and assets and the "Big Three" questions of financial literacy. Such data is commonly available in many countries, of all income levels, and, as shown by Lusardi & Mitchell (2014), the big three questions can easily be included in future waves of any household-level survey if not already present. Second, the method provides both aggregate-level results -needed for budgeting purposes- as well as a detailed picture of heterogeneity across demographics. The latter is important for targeting at-risk populations/vulnerable groups. Third, the rigorous statistical technique adopted in this work known as the Recentered Influence Functions (RIF) regressions proposed by Firpo et al. (2009) is well-established and easily implementable through standard econometric packages.

To the best of our knowledge, this is the first paper that applies this method to exploit the relationship between financial literacy and equivalized disposable income and wealth inequality. We apply this

method to Italy using the 2016 Bank of Italy's Survey on Household Income and Wealth (SHIW).[1] Italy is an interesting case study due to the lowest levels of financial literacy among OECD countries and the only one with a statistically significant gender gap at an early stage of life (OECD, 2014).[2] Moreover, our work is timely in supporting mandatory financial education in schools, which has been introduced by national law in April 2023 and should be implemented in Italian schools in the next three years (*DDL Capitali*).[3]

Our main results confirm that financial literacy significantly influences values and inequality levels of household income and wealth at the population level. In particular, replacing 10% of respondents reporting no correct answers with respondents reporting two correct answers out of three, keeping constant all the observed characteristics, would increase the mean value of the household equivalized disposable income by 0.8%. In addition, the increase in the mean value would be even higher if we swap respondents reporting no correct answers with those reporting three correct answers (+1.5%). These results are not trivial. Heterogeneous analysis reveals that an increase in financial literacy levels is expected to have different outcomes across the population, engendering often a greater reduction of inequality levels among the most vulnerable groups. Also, we calculate that an income increase equal to the estimated one would be possible only through an extremely expensive lump sum transfer (about 7 billion euros). Our preliminary cost analysis highlights that expected costs (i.e. about 32 million euros) linked to the introduction of mandatory financial education in schools in Italy would be much lower than potential benefits (i.e. about 7 billion euros), making this kind of policy worth implementing.

Lo Prete (2013) finds a preliminary link between income inequality and basic knowledge in economics. Her findings show that income inequality grows less in countries where economic literacy is higher. In addition, Lusardi et al. (2017) suggest that financial knowledge account for 30-40% of wealth inequality in retirement. A recent meta-analysis suggests that financial education works and improves both financial knowledge and behavior (Kaiser et al., 2022). Financial literacy is the skill people need to improve their financial habits, in particular among the most vulnerable groups (OECD, 2017, 2020; Lusardi, 2015).

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[1] SHIW data are available at the following link https://www.bancaditalia.it/statistiche/tematiche/indagini-famiglie-imprese/bilanci-famiglie/distribuzione-microdati/index.html (last visited on September 24, 2022).

[2] The OECD countries' financial literacy ranking is available at the following link https://www.oecd.org/financial/education/oecd-infe-2020-international-survey-of-adult-financial-literacy.pdf (last visited on September 24, 2022).

[3] https://www.ansa.it/sito/notizie/economia/2023/04/11/ddl-capitali-leducazione-finanziaria-entra-nelle-scuole_7b26f856-bc6d-41f4-8a9c-38a9e5ce9617.html.

We contribute to the literature in multiple ways. By analyzing the hypothetical scenarios in which part of the population becomes – *ceteris paribus* – financially literate we evaluate the quantitative importance of financial knowledge and perform informative policy experiments. Our work also helps to assess the economic worthiness of a universal financial education policy at the national level in a 'bias-free' context. For instance, the self-selection bias makes impossible the impact evaluation of several financial education initiatives. Instead, when a rigorous impact evaluation is possible, other studies find a positive effect of financial education on economic outcomes in the short run only due to the lack of follow-up studies (Kaiser et al., 2022).

Exploiting how much financial literacy matters in income and wealth distributions are crucial for three main reasons. First of all, inequality levels are recently reaching the highest levels worldwide with an additional negative impact on the gender gap (Fonseca et al., 2012; Driva et al., 2016). Second, young, women, minorities and the elderly are the most vulnerable groups lacking the ABC of finance and face higher challenges in dealing with their financial management. Third, huge fractions of householders are financially fragile, not being able to come up with an exogenous financial shock of 2000 dollars (Lusardi et al., 2021). All the above reasons are even more exacerbated since 2022 when inflation hit its highest level in four decades.

Relevant policy implications are related to inequality levels, as well as to adequate living conditions among the poorest. Financial distress prevents people to participate in economic and social life. The lowest participation is again among the vulnerable groups both in developing and developed countries. For instance, only 47% of women versus 55% of men have access to an account at a formal financial institution and show lower access to formal credit (World Bank, 2020). Also, it has been found that those experiencing a prolonged status of financial distress tend to present a lower willingness to adopt new technologies, limited investments in education and health, and low levels of life satisfaction and personal control (Farkas et al., 2000; Kraus et al., 2009; Haushofer and Fehr, 2014; Carvalho et al., 2016; Poluektova et al., 2022).

The remainder of the paper is organized as follows. Section 2 describes our sub-sample of SHIW data and the financial literacy measure we use. Section 3 explains our empirical strategy, in particular, the RIF method used to address our hypotheses. Section 4 shows the critical potential influences of financial literacy on households' income and wealth, summarizing the main findings. Section 5 presents a discussion on the economic worthiness of a universal financial education policy. Finally, Section 6 concludes. Robustness checks and additional analyses are included in the Appendix.

2. Data and definition of financial literacy

To investigate the link between financial literacy and inequality we use data from the Bank of Italy's Household Income and Wealth Survey (SHIW). SHIW data ask questions about financial habits and knowledge to one person per household, generally who is in charge of the household's wealth management. Although the Bank of Italy's historical data collection started in the 1960s, financial knowledge questions are included only in four waves and, on top of that, they vary both in numbers and in contents over time. In particular, they include six questions in 2006, nine in 2008, three in 2010, and three in 2016. Any specifications of financial literacy measured on this data confirm findings positive relationship between financial knowledge and behavior (D'Alessio et al., 2021; Di Franceschi et al., 2018).

According to the mainstream literature financially literate respondents correspond to those who answer correctly all the three questions called The Big Three proposed by Lusardi and Mitchell (2014) The basic knowledge required to be considered financially literate is about three simple but essential topics: inflation, compounded interest and diversification.

Although there is evidence that a standardized indicator including questions from previous waves is performing well, we chose to rely on the most rigorous index of financial literacy restricting the sample to the 2016 wave's participants. This choice is mainly motivated by the possible generalization of our results. Using the Big Three questions, we can generalize our findings making them comparable to analogue data collection from other countries. To be noted, the 2016 wave is also the last one made before the Covid-19 pandemic. A 2020 SHIW wave has been indeed released in 2022, but we decided not to use it because of the extra-ordinary economic situation (several studies reported a dramatic negative shock on incomes, such as Gallo and Raitano, 2023) and potential discontinuities in the survey design (Rothbaum et al., 2021; Ward and Edwards, 2021; Meyer et al., 2022).

Our sample of analysis counts 7,421 respondents who are mainly householders. Specifically, the sample is composed of 94% of householders (and 75% are 'breadwinners', thus earning the highest individual income in the family), 5% of spouses, and 1% of other family members. Even if the percentage of the other family members as respondents is small, we consider it a more comprehensive approach to generalize our results. Table 1 reports summary statistics on the variables used in our analysis. We ended up with a total sample composed on average of 57 years old respondents, gender-balanced (49.6% women), highly educated respondents (half of the respondents show at least upper secondary education and 15% graduated parents). The household equivalized disposable income is on average EUR 19,420 instead wealth is on average EUR 133,472.

Table 1 – Sample statistics

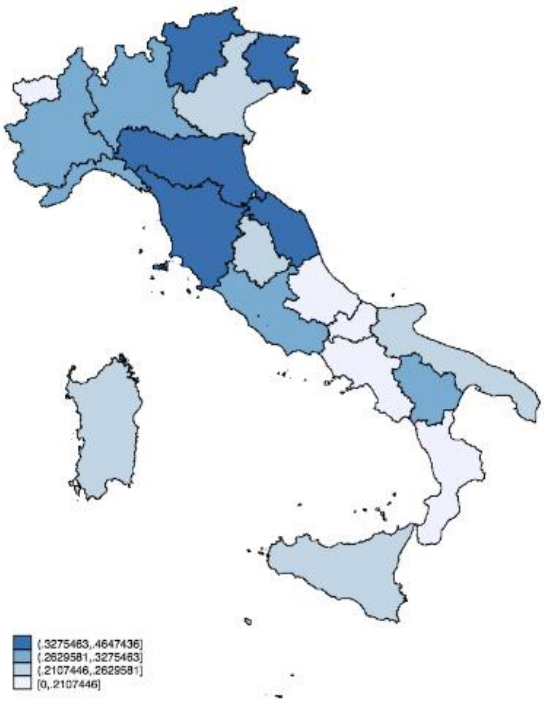
Variable	Total sample		Financially illiterate		Financially literate	
	Mean	Std. dev	Mean	Std. dev	Mean	Std. dev
Household equivalised disposable income	19.420	12.992	17.560	11.066	24.268	16.036
Household equivalised disposable wealth	133.472	216.471	112.819	185.959	187.307	273.659
Correct answers = 0	0,226	0,419	0,313	0,464	0,000	0,000
Correct answers = 1	0,193	0,395	0,267	0,442	0,000	0,000
Correct answers = 2	0,303	0,460	0,420	0,494	0,000	0,000
Correct answers = 3	0,277	0,448	0,000	0,000	1,000	0,000
Female	0,496	0,500	0,526	0,499	0,418	0,493
Foreign	0,064	0,244	0,077	0,267	0,028	0,164
Aged 40 or lower	0,177	0,381	0,171	0,377	0,191	0,393
Aged 41-50	0,212	0,409	0,200	0,400	0,242	0,428
Aged 51-60	0,194	0,395	0,183	0,387	0,221	0,415
Aged 61-70	0,178	0,383	0,173	0,378	0,193	0,394
Aged 71 or more	0,239	0,427	0,272	0,445	0,153	0,360
Primary education or lower	0,214	0,410	0,265	0,442	0,082	0,275
Lower secondary education	0,284	0,451	0,308	0,462	0,221	0,415
Upper secondary education	0,366	0,482	0,330	0,470	0,459	0,498
Tertiary education	0,136	0,342	0,096	0,295	0,239	0,426
Graduated parents	0,150	0,357	0,116	0,321	0,237	0,425
Single	0,195	0,397	0,200	0,400	0,183	0,386
Married	0,535	0,499	0,507	0,500	0,607	0,488
Divorced/separated/widowed	0,270	0,444	0,293	0,455	0,210	0,407
Blue-collar worker	0,183	0,387	0,194	0,395	0,156	0,363
White-collar worker	0,151	0,358	0,130	0,336	0,204	0,403
Teacher/manager/director	0,059	0,236	0,041	0,197	0,109	0,311
Self-employed	0,095	0,293	0,085	0,279	0,121	0,326
Unemployed	0,061	0,239	0,068	0,253	0,041	0,199
Retired from work	0,278	0,448	0,281	0,449	0,272	0,445
Other retired	0,082	0,275	0,103	0,304	0,029	0,167
Other inactivity status	0,090	0,286	0,099	0,298	0,067	0,250
Household size = 1	0,337	0,473	0,368	0,482	0,256	0,436
Household size = 2	0,267	0,442	0,262	0,440	0,281	0,450
Household size = 3	0,176	0,381	0,165	0,371	0,205	0,404
Household size = 4	0,160	0,367	0,144	0,351	0,202	0,402
Household size = 5 or more	0,060	0,238	0,062	0,241	0,056	0,229
Presence of minors	0,238	0,426	0,214	0,410	0,302	0,459
Work intensity < 0.5	0,071	0,257	0,076	0,266	0,058	0,233
Work intensity = 0.5	0,173	0,378	0,177	0,381	0,164	0,370
0.5 < Work intensity < 1	0,102	0,302	0,097	0,296	0,114	0,318
Work intensity = 1	0,654	0,476	0,650	0,477	0,664	0,472
Nort-East	0,279	0,448	0,274	0,446	0,290	0,454
North-West	0,196	0,397	0,181	0,385	0,235	0,424
Middle	0,205	0,404	0,185	0,388	0,258	0,438
South	0,244	0,430	0,284	0,451	0,141	0,348
Islands	0,076	0,265	0,076	0,266	0,076	0,264
Observations	7.421		5.444		1.977	

Notes: Descriptive statistics are computed with household sample weights. The variable description is provided in Appendix (Table A1). Source: Elaborations of the authors on SHIW 2016 data.

2.1. Some sample statistics on financial literacy

Based on the Big Three questions, Figure 1 shows respondents' average financial literacy across Italian regions. However, the clearer the blue color, the lower will be respondents' financial literacy. Looking at the map, it can be clear that financial illiteracy is more spread among lower economically developed regions such as in the South of Italy.

Figure 1 – Financial literacy distribution across Italian regions



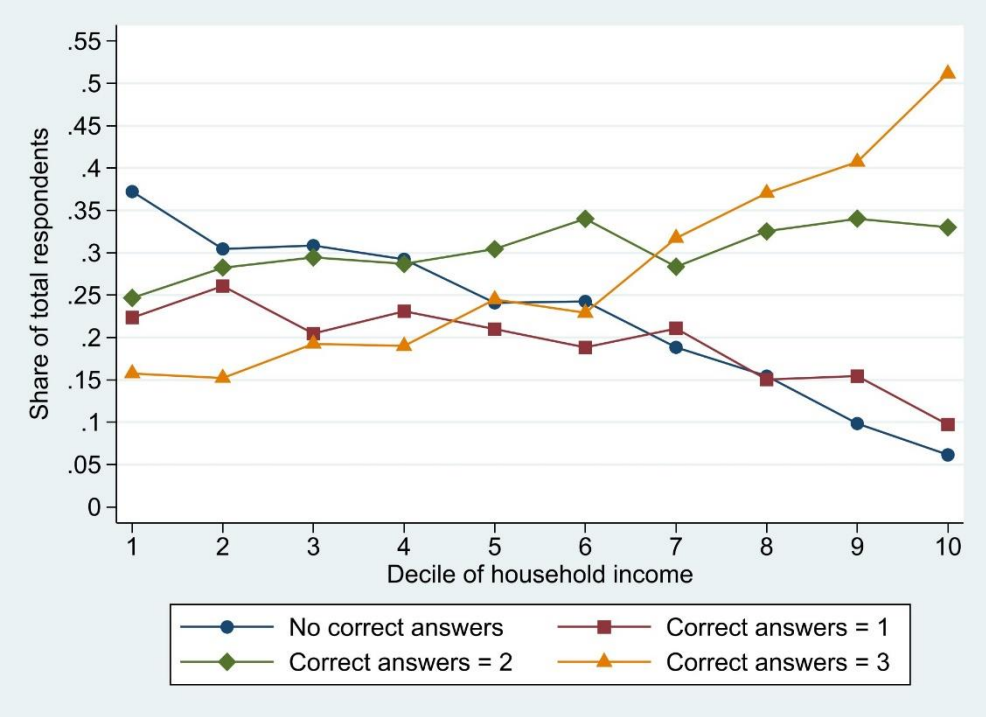
Source: Elaborations of the authors on SHIW 2016 data.

In our sample, financially literate respondents account for only 28%. In line with previous literature, a gender gap emerges in financial literacy with women performing worse than men, even when role play changed (Hsu, 2016). In addition, we confirm the positive relationship between higher education and financial literacy. 48.9% of higher educated respondents (i.e. those with tertiary education) are considered financially literate compared to only 34.4% of those with upper secondary education, 21% of those with lower secondary education and 10% of those with primary education or lower. These characteristics are crucial in the interpretation of our results.

Figures 2 and 3 show the breakdown of financially literate/illiterate respondents by the number of correct answers along the family income or wealth distribution. The figures show the composition of respondents by the number of correct answers within each decile of income/wealth (the values add up to 1 vertically). Those who answer all Big Three incorrectly account for 40% of households in the first decile of household equivalent income. Those who answer all the Big Three correctly represent

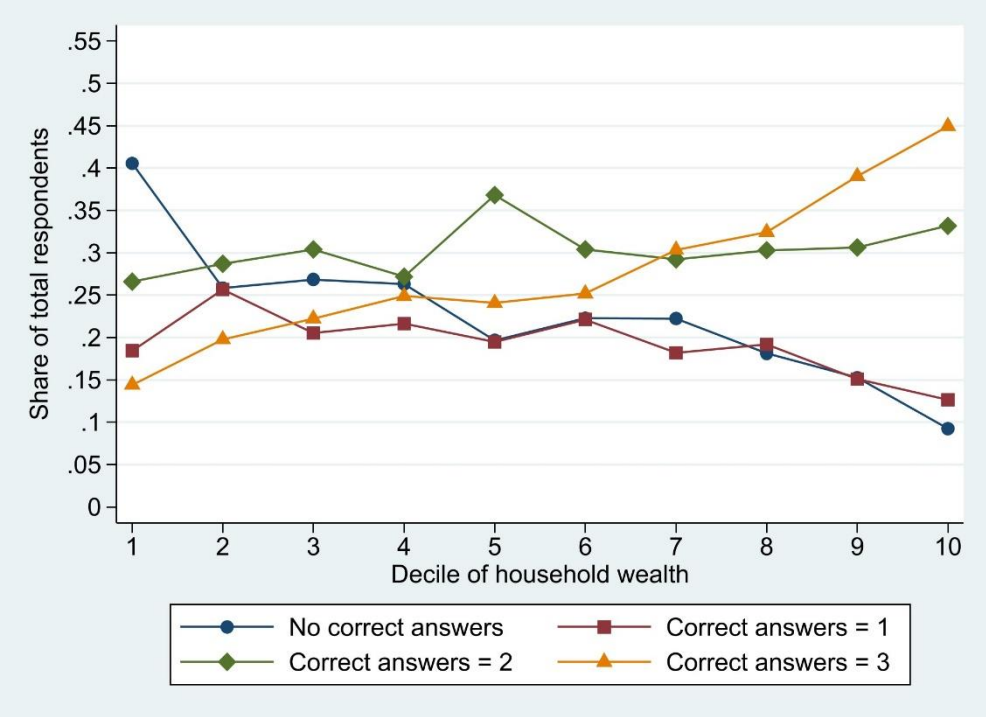
half of the households in the top decile of equivalent household income (and wealth - almost half in this case).

Figure 2 – Financial literacy and household income



Notes: The figure shows the composition of respondents by number of correct answers within each decile of income (the values add up to 1 vertically) Source: Elaborations of the authors on SHIW 2016 data.

Figure 3 – Financial literacy and household wealth



Notes: The figure shows the composition of respondents by number of correct answers within each decile of wealth (the values add up to 1 vertically) Source: Elaborations of the authors on SHIW 2016 data.

Nowadays, policymakers focus their interest on preventing additional financial inequalities to safeguard the whole economic cycle. Investing in financial literacy to improve financial well-being can also reduce inequalities as a consequence. To support our hypothesis, we show a strong correlation graphically (Figures 1-3) to orient future interventions aiming at reducing income and wealth inequalities.

3. Empirical Strategy

Let F be the distribution function of household incomes and $v(F)$ denote a distributional statistic, such as the mean or a quantile. Since we can identify four different types of respondents in Italy according to the number of correct answers to the Big Three questions (i.e. 0 correct answers out of 3, 1 out of 3, 2 out of 3, and 3 out of 3), F can be expressed as

$$F(y) = \sum_{x=1}^{4} s_x F_x(y), \tag{1}$$

where y is the household equivalized disposable income (i.e. the outcome variable),[4] F_x is the household income distribution among respondents belonging to the type x group, and s_x is the proportion of the total population of respondents reporting that number of correct answers.

The method proposed by Firpo et al. (2009) aims to evaluate the impact of marginal changes in the distribution of the explanatory variables on the distributional statistic $v(F)$. Following Choe and Van Kerm (2018), we label this measure the 'unconditional effect' (UE) and we formally define it as

$$\mathrm{UE}(v(F), 4) = \lim_{t \downarrow 0} \frac{v({G_1}^{F,t,4}) - v(F)}{t}, \tag{2}$$

where ${G_1}^{F,t,4}$ is the household income distribution after substituting a proportion t of respondents belonging to the type 1 group (i.e. no correct answers to the Big Three questions) with others belonging to the type 4 group (i.e. three correct answers out of three), that is

$${G_1}^{F,t,4} = (s_4 + t)F_4(y) + (s_1 - t)F_1(y) + \sum_{x=2}^{3} s_x F_x(y). \tag{3}$$

Firpo et al. (2009) demonstrate that $\mathrm{UE}(v(F), 4)$ can also be expressed as

$$\mathrm{UE}(v(F), 4) = \int \mathrm{RIF}(y; v, F) d({G_1}^{F,t,4} - F)(y), \tag{4}$$

where $\mathrm{RIF}(y; v, F) = v(F) + \mathrm{IF}(y; v, F)$ is the recentered influence function of $v(F)$ and

[4] Values of household income and wealth have been equalized using the OECD-modified equivalence scale.

$$\mathrm{IF}(y; v, F) = \lim_{t \downarrow 0} \frac{v\left((1-t)F + t\Delta_y\right) - v(F)}{t} \quad (5)$$

is the influence function introduced by Hampel (1974). In conclusion, as Choe and Van Kerm (2018) show, the $\mathrm{UE}(v(F), k)$, i.e. the effect of replacing a fixed fraction of respondents belonging to a generic type k group with others belonging to the type 1 group, can be expressed as

$$\mathrm{UE}(v(F), k) = (\mathrm{E}[\mathrm{IF}(y; v, F)|X = k) - \mathrm{E}[\mathrm{IF}(y; v, F)|X = 1]) \times t. \quad (6)$$

According to Firpo et al. (2009), the UEs can be correctly calculated using a simple OLS estimation. Once the values of $\mathrm{RIF}(y; v, F)$ are computed for all the observations of the distributional statistic (F), they are regressed using OLS on a vector X of correct answers dummies. With respect to the (conventional) quantile regression method developed by Koenker and Bassett (1978), the unconditional quantile regression method has the merit to estimate the effects on an outcome variable distribution which is not conditioned by the set of covariates included in the model (Fortin et al. 2011). In other words, this methodology also allows for considering socioeconomic characteristics which may diverge across groups of respondents and therefore potentially lead to incorrect UEs on the distributional statistics. To this end, the RIFs must be regressed using OLS on the vector X and a vector Z of relevant covariates including demographic characteristics regarding the respondents (i.e. gender, citizenship, age group, education level, dummy for tertiary education of parents, marital status, and occupational status) and his/her household (i.e. household size, presence of minors, work intensity, and macro-region of residence). More details on variables included in the model are provided in Table A.1. The resulting effect is labelled an 'unconditional partial effect' (UPE) (Firpo et al., 2009; Choe and Van Kerm, 2018) or 'policy effect' (Rothe, 2010; Gallo and Pagliacci, 2020), and is formally defined as

$$\mathrm{UPE}(v(F), k) = \left(\int_{\Omega_z} \mathrm{E}[\mathrm{IF}(y; v, F)|X = k, Z = z) - \mathrm{E}[\mathrm{IF}(y; v, F)|X = 1, Z = z]\, f_Z(z)dz\right) \times t, \quad (7)$$

where Ω_z denotes a set of respondents' types given the covariates vector Z. Similarly to Choe and Van Kerm (2018) and Bonacini et al. (2021), to estimate the UPEs we set the 'financial literacy shift' t to equal 0.1. This means that in the analysis we assume as marginal change a 10% swapping share of respondents from one group (i.e. no correct answers to the Big Three questions) to another one. To be noted, in this 'shares swap' scenario, within-groups household income distributions remain constant. The core idea of this methodology is the following: if the described marginal change engenders significant effects on distributional statistics, then the level of financial literacy in the population influences the household income distribution. In other words, the more the estimated coefficients are bigger and distant from zero the more the number of correct answers to the Big Three

questions (and thus the financial literacy in general) plays an important role in the household income distribution of the analyzed country.

The mechanism described above is, of course, very helpful to understand the econometric method adopted and, in particular, how the hypothetical scenarios coming out from the respondent shares swapping and how our results need to be interpreted. Nonetheless, it may say few as regards the actual channels through which an increase in financial literacy levels should engender an increase in both household income and wealth levels in practice.[5] Based on the existing literature and descriptive evidence illustrated in Section 2.1, we explain the potential outcome of a financial literacy increase through the following three steps. First, we assume the implementation of a universal policy, like the introduction of mandatory financial education courses at secondary schools, which increases levels of financial literacy for many cohorts of students. The opportunity of implementing such a policy in the Italian context is explored further in Section 5. Second, as financial literacy is positively correlated with income levels (Figure 2), we expect that skills and behavior patterns linked to higher levels of financial literacy would allow a share of the population to be better remunerated in the labor and financial markets. Finally, cumulated income gains – as well as a better understanding of financial and credit markets – linked to the increase of financial literacy levels should engender an increase in household wealth values in the medium-long run. If, as expected, all these influences have a greater extent among vulnerable groups of the population, the financial literacy increase is likely to lessen existing inequality levels. All these steps come all at once in the hypothetical scenarios here simulated, but their development in the real world involves several changes in individuals' attitudes and economic behaviors. As the hypothetical scenarios generated by the Firpo et al. (2009)'s method works in the absence of general equilibrium effects, these changes are not explored in this study.

In our analysis, we estimate the unconditional effects of financial literacy on household income distribution by focusing on the following distributional statistics: the mean, the Gini index, and the nine deciles.[6] The formula to calculate the RIFs for the mean is the following: $RIF(y; \mu(F), F) = \mu(F) + (y - \mu(F))$. For the sake of brevity, the formulas to calculate the RIFs for the quantiles and the Gini index are not shown here, but they can be easily found in Choe and Van Kerm (2018). Together with the household income, we also explore the potential influence of an increase in

[5] A similar mechanism is theoretically supported by the model proposed by Lusardi et al. (2017).

[6] Influences of an increase in financial literacy levels on further inequality indexes have been explored. Specifically, we replicated the analysis by looking at two inequality indexes which are more sensitive compared to the Gini index as regards change to the distribution tails: the mean log deviation index and the Atkinson index (with an epsilon parameter equal to 1). Results of this additional analysis, presented in Appendix (Table A3), overall confirm that an increase in financial literacy levels would not engender an increase in inequality levels but a reduction of the latter as for incomes or wealth values.

financial literacy levels on the household equivalized wealth as an additional measure of the well-being of Italian households.

All estimates are provided in relative terms in the main text, while in absolute terms in the Appendix. Relative coefficients are calculated dividing by the point estimation value for the specific distributional statistic (i.e. the mean value, Gini index, nine deciles) in the specific subgroup of respondents.

4. Results

Table 2 reports our main results, thus confirming that financial literacy significantly influences values and inequality levels of household income and wealth at the population level. In particular, column I of Table 2 highlights that replacing 10% of respondents reporting no correct answers with respondents reporting two correct answers out of three would increase the mean value of the household equivalized disposable income by 0.8% (about 160 € per year, see column I of Table A2).[7]

To be noted, coefficients in Table 2 and Table A2 were scaled by 10% accordingly with methodological choices described in Section 3. The increase in the mean value would be even higher if we replace 10% of respondents reporting no correct answers with those reporting three correct answers (+1.5%, thus 285€ per year), while no significant effect will occur in case of replacement with those reporting only one correct answer.

Interestingly, a marginal increase in financial literacy levels would engender almost three times greater effects on the mean values of household wealth (column III of Table 2). This is probably related to the fact that looking at wealth values implicitly means assuming a long-term perspective, where advantages on household incomes related to a higher financial literacy can accumulate one on the other.

As regards the potential influence of financial literacy on inequality levels, columns II and IV of Table 2 shows that the effects on the Gini index of both household income and wealth are negative but barely significant. In other words, in some cases, an increase in the level of financial literacy may overall engender a progressive effect on household income and wealth distributions at the national level.

[7] Just to give an idea of how the coefficients of our variables of interest change according to the share swap scenario adopted, Table A4 in the Appendix shows the variation of estimated influences on the mean value of household income.

Table 2 – Unconditional effects of an increase in the financial literacy levels on the mean and Gini index of household income and wealth

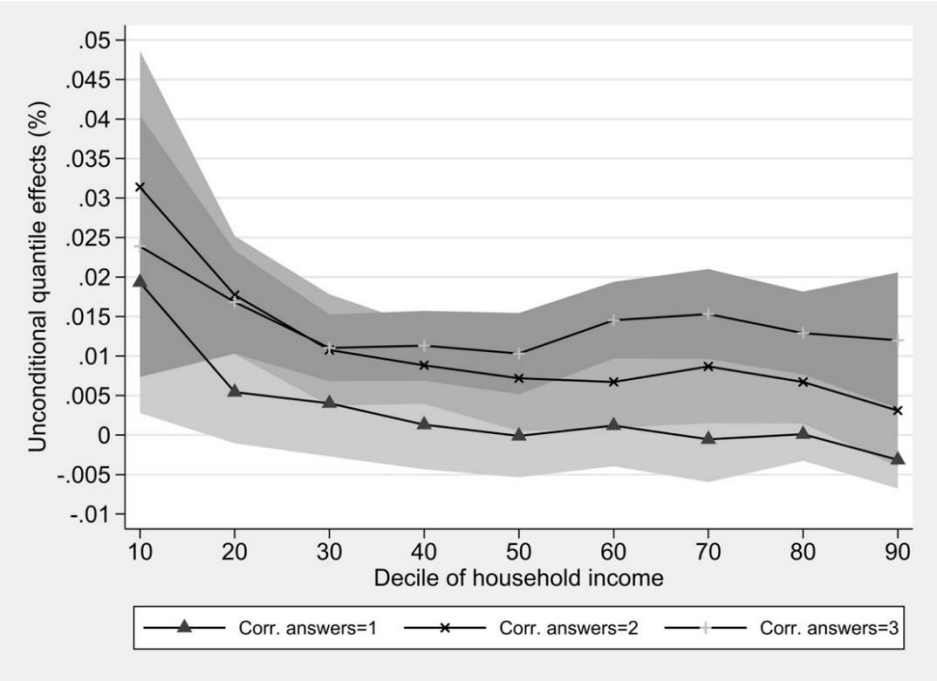
VARIABLES	Household income		Household wealth	
	(I)	(II)	(III)	(IV)
	Mean value	Gini index	Mean value	Gini index
Correct answers = 1	0.001	-0.007*	0.008	-0.004**
Correct answers = 2	0.008**	-0.009***	0.025***	-0.002
Correct answers = 3	0.015***	-0.001	0.039***	-0.002
Female	-0.006**	-0.011***	-0.015*	-0.006***
Foreign	-0.025***	0.035***	-0.043***	0.040***
Aged 41-50	0.014***	0.016***	0.043***	-0.006***
Aged 51-60	0.024***	0.007	0.072***	-0.014**
Aged 61-70	0.031***	0.010	0.095***	-0.010
Aged 71 or more	0.040***	0.010	0.140***	-0.003
Lower secondary education	0.017***	0.000	0.038***	0.000
Upper secondary education	0.033***	-0.005	0.069***	-0.002
Tertiary education	0.064***	0.040**	0.124***	0.015*
Graduated parents	0.020***	0.023**	0.056***	0.014**
Married	0.011***	0.004	0.012	-0.001
Divorced/separated/widowed	0.001	0.008**	-0.004	0.006
White-collar worker	0.009***	-0.021***	-0.003	-0.030***
Teacher/manager/director	0.040***	0.014	0.034	-0.025***
Self-employed	0.026***	0.031***	0.089***	-0.014*
Unemployed	-0.028***	0.080***	0.012*	-0.003
Retired from work	0.004	-0.005	0.020**	-0.024***
Other retired	-0.008**	0.013*	0.002	-0.014**
Other inactivity status	-0.004	0.027***	0.029***	-0.013***
Household size = 2	0.006**	0.002	-0.014*	-0.006*
Household size = 3	0.006	-0.013**	-0.032***	-0.015***
Household size = 4	0.005	-0.014	-0.041**	-0.015*
Household size = 5 or more	-0.001	0.006	-0.041**	-0.009
Presence of minors	-0.016***	0.003	-0.001	0.001
Work intensity = 0.5	0.019***	-0.023***	0.021***	-0.006*
0.5 < Work intensity < 1	0.023***	-0.042***	0.013*	-0.012***
Work intensity = 1	0.041***	-0.046***	0.007	-0.023***
North-West	-0.008**	-0.006	-0.001	0.000
Middle	-0.009*	-0.008	-0.010	-0.009***
South	-0.031***	0.009	-0.039***	0.000
Islands	-0.027***	0.009*	-0.034***	0.002
Constant	-0.082***	0.021	-0.145***	0.046***
Observations	7.421	7.421	7.421	7.421
R-squared	0.427	0.157	0.217	0.073

*Notes: Standard errors are clustered by NUTS-2 region and estimates are computed with household sample weights; *** p<0.01, ** p<0.05, * p<0.1. Regression results reporting absolute variations of household income and wealth values at the national level related to a positive shift in financial literacy are provided in the Appendix (Table A2).*

Figure 4 shows the influence a marginal increase in the financial literacy levels would engender along the household income distribution. In line with results in Table 2, the effects of swapping populations reporting no correct answers with others with one or more correct answers do not vary significantly along the distribution, and thus without triggering a reduction in inequalities (but not even an increase in them). The only exception regards the swapping to respondents with two correct answers, where the estimated effect at the first decile is significantly higher than the one at the last decile (the latter is also the only insignificant one in this case).

Replacing respondents with no correct answers with others with one correct answer out of three would not engender any significant influence on deciles of household income along the whole distribution. Instead, swapping 10% of respondents reporting no correct answers with respondents reporting two correct answers out of three would increase deciles by about 0.5−1% (1−1.5% in the case of respondents reporting three correct answers). From the median onwards, the effect of replacing respondents reporting no correct answers with respondents reporting three correct answers is also significantly higher than the one related to swapping respondents reporting only one correct answer to the Big Three questions.

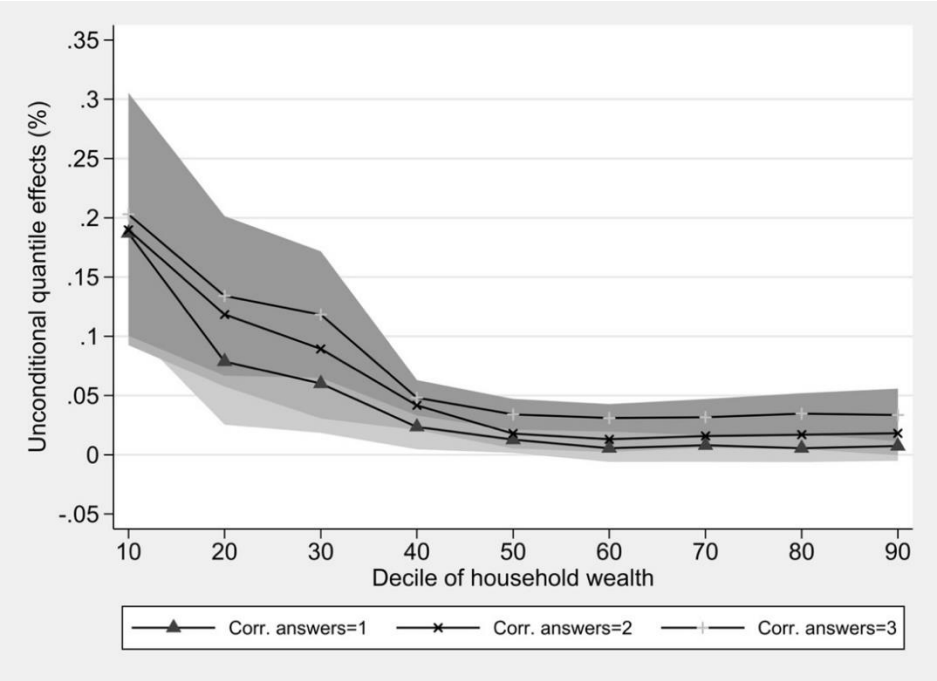
Figure 4 – Unconditional effects of an increase in the financial literacy levels along the household income distribution (coefficients scaled by 10%)



Notes: Standard errors are clustered by NUTS-2 region and estimates are computed with household sample weights. The shadowed area reports confidence intervals at a 90% level. The figures present coefficients of variables of interest only, but the estimation model includes all other covariates shown in Table 2. Regression results reporting absolute variations are provided in the Appendix (Figure A1).

Figure 5 shows that, also in the case of unconditional effects on household wealth, the estimated coefficients are often significantly different from 0. Interestingly, in this case, increasing the number of correct answers from zero to one would have a significant effect at least in the first three deciles. A further difference in results in Figure 4 consists of the fact that in all cases of swapping effects in the first part of household wealth distribution are significantly greater than those estimated in the right part of the distribution.

Figure 5 – Unconditional effects of an increase in the financial literacy levels along the household wealth distribution (coefficients scaled by 10%)



Notes: Standard errors are clustered by NUTS-2 region and estimates are computed with household sample weights. The shadowed area reports confidence intervals at a 90% level. The figures present coefficients of variables of interest only, but the estimation model includes all other covariates shown in Table 2. Regression results reporting absolute variations are provided in the Appendix (Figure A2).

It is however important recalling that very close effects on households along income/wealth distribution reported in Figures 4 and 5 do mean that an increase in financial literacy would affect the population similarly but only from a relative perspective. Figure A1 and Figure A2, for household income and wealth respectively, highlight indeed that the potential influence of an increase in financial literacy would benefit (in absolute terms) most households with higher levels of well-being.

4.1. Additional analysis on single questions

Although to be considered financially literate people should correctly answer all the Big Three questions, it can be informative to analyze each question separately. For instance, numeracy knowledge (e.g., knowledge of compound interest), is critically important to make financial decisions when they involve return assessment. In other words, in this subsection, we investigate how correctly (or wrongly) answering any single question can unconditionally affect income or wealth levels, compared to does who do not provide any correct or wrong options.

To do so, we consider the respondents choosing the "Do-not-know" when replying to one of the Big Three questions as a base group.[8] Previous literature identifies a huge source of information in the "Do-not-know" option. It is mostly chosen by females and it explains one-third of the gender gap meaning that it may due to a lack of confidence (Bucher-Koenen et al., 2021). In this paper, we want to further investigate any source of information offered by the Big Three questions to exploit unconditional effects on respondents' financial outcomes of interest.

Table 3 reports the unconditional effects due to a gain in (or a lack of) knowledge related to each question of the Big Three questions on both income (columns I and II) and wealth (columns III and IV) compared to those who chose the "Do-not-know" option, respectively.

Table 3 – The Big Three questions' unconditional effects on household income and wealth (base group: Do-not-know option)

VARIABLES	Household income		Household wealth	
	(I) Mean value	(II) Gini index	(III) Mean value	(IV) Gini index
Numeracy				
Wrong answer	0.005*	-0.001**	0.015*	-0.003
Correct answer	0.011***	-0.005**	0.023**	-0.004
R-squared	0.424	0.157	0.213	0.073
Inflation				
Wrong answer	0.003	-0.006	-0.001	-0.003
Correct answer	0.006**	-0.006**	0.018**	-0.001
R-squared	0.422	0.157	0.213	0.073
Risk Diversification				
Wrong answer	0.007***	-0.006	0.015**	-0.003
Correct answer	0.013***	-0.001	0.033***	-0.000
R-squared	0.427	0.156	0.218	0.073

*Notes: Standard errors are clustered by NUTS-2 region and estimates are computed with household sample weights; *** p<0.01, ** p<0.05, * p<0.1. The table presents coefficients of variables of interest only, but the estimation models include all other covariates shown in Table 2. Full estimation results are available upon request.*

On the one hand, the results reported in Table 3 overall confirm what is shown in Table 2 but, on the other hand, this analysis highlights some interesting new evidence. In particular, respondents who chose the "Do-not-know" option are those who show – *ceteris paribus* – the worst levels of disposable income and wealth. This is true for two questions out of three (numeracy and risk diversification), while the difference between the base group and those who wrongly answered the inflation question is insignificant. As expected looking at its correlation with higher levels of household income and wealth (Figures A3-A5), risk diversification appears to be the most useful knowledge to improve to

[8] Since very few respondents choose "Refuse-to-answer" to each one of the Big Three questions, we included them in the base group of the "Do-not-know" respondents.

engender greater increases in the mean values of income and (especially) wealth at the national level. However, it is also the only one reporting no statistically significant effects on the Gini index. This is probably due to the fact that we do not observe any significant difference in the financial literacy influence along the distribution across groups (Figures A10 and A11). On the opposite, Table 3 sheds light on the fact that the overall decreasing effect of a financial literacy increase on income inequality levels is mainly possible when numeracy or inflation knowledge is improved. A better understanding of this evidence is provided by Figures A6 and A7 in Appendix, while Figures A8 and A9 clearly illustrate why the effect on the Gini index is instead insignificant when we focus on household wealth values.

4.2. Heterogeneity analysis

To better identify the effects and the implications of our analysis on the different subgroups of the population, we conduct a heterogeneity analysis across gender, age groups, educational levels, and regions of residence.

The influence related to a marginal increase in financial literacy levels appears quite heterogenous within the analyzed population of respondents (Tables 4 and 5). In particular, Table 4 reveals that both male and female respondents' disposable income would benefit from becoming financially literate (three correct answers out of three). To be noted, the gain in financial knowledge does not however lead to any significant change in the relative gender gap, while it slightly reduces the within-inequality among men as for income (Table 4) and mainly among women as for wealth (Table 5). When age groups are considered, those who would benefit the most in terms of income are middle age respondents (aged 41-50). In that case, a partial gain in knowledge (two questions correctly answered out of three) seems to reduce inequality within that particular age group. Interesting results arise for different educational levels. Those with the highest level of education would benefit the most in terms of higher disposable income and wealth. However, in that case, the Gini index is positive and statistically significant meaning that acquiring basic financial knowledge leads to different disposable income levels among the most educated ones. This result highlights that there could be hidden mechanisms leading part of the population to differently allocate their additional human capital. Previous literature suggests that better-educated people are more likely to participate in the stock market and save more. Based on this theory, we can argue that part of them may start investing better in their savings or starting to spend differently to avoid waste of money. Our results are in line with Lo Prete (2013) who suggests that the ability to benefit from investment opportunities depends on economic literacy which is not captured by more generic measures of school attainment.

Table 4 - Unconditional effects on the mean and Gini index of household income by type of respondent

Type of respondent	Mean value			Gini index		
	Correct answers = 1	Correct answers = 2	Correct answers = 3	Correct answers = 1	Correct answers = 2	Correct answers = 3
Total sample	0.001	0.008**	0.015***	-0.007*	-0.009***	-0.001
Male	0.003	0.010**	0.018***	-0.009*	-0.010*	-0.002
Female	-0.000	0.009***	0.011**	-0.006	-0.005	-0.001
Aged 40 or lower	0.012***	0.016***	0.017***	-0.022	-0.018	-0.015
Aged 41-50	0.001	0.008	0.024***	-0.004	-0.019***	0.005
Aged 51-60	0.001	0.005	0.001	-0.003	-0.008	-0.008
Aged 61-70	0.007**	0.010***	0.010***	-0.007	-0.001	-0.005
Aged 71 or more	-0.003	0.007	0.018***	-0.005	-0.005	0.009
Primary education or lower	-0.001	0.004	0.015*	0.001	-0.001	0.004
Lower secondary education	0.003	0.005*	0.009***	-0.010**	-0.018***	-0.010***
Upper secondary education	0.003	0.015**	0.020***	-0.006	-0.004	-0.004
Tertiary education	0.032**	0.047***	0.052***	-0.005	0.022	0.046**
Nort-East	0.002	0.012	0.020*	-0.008	-0.010**	0.005
North-West	0.003	0.008	0.024**	-0.003*	-0.007	0.011
Middle	0.005	0.015*	0.012**	-0.009	-0.001	-0.004
South	0.000	0.008*	0.007***	-0.004	-0.014**	-0.018**
Islands	-0.005	0.001	0.009	-0.004	-0.006	-0.005

*Notes: Standard errors are clustered by NUTS-2 region and estimates are computed with household sample weights; *** p<0.01, ** p<0.05, * p<0.1. The table presents coefficients of variables of interest only, but the estimation models include all other covariates shown in Table 2. Full estimation results are available upon request.*

Table 5 - Unconditional effects on the mean and Gini index of household wealth by type of respondent

Type of respondent	Mean value			Gini index		
	Correct answers = 1	Correct answers = 2	Correct answers = 3	Correct answers = 1	Correct answers = 2	Correct answers = 3
Total sample	0.008	0.025***	0.039***	-0.004**	-0.002	-0.002
Male	0.014	0.027***	0.051***	-0.005*	-0.002	0.002
Female	0.004	0.026***	0.024**	-0.005**	-0.001	-0.001**
Aged 40 or lower	0.007	0.018**	0.017	-0.007	-0.003	-0.002
Aged 41-50	-0.000	0.021	0.026**	0.003	0.002	-0.001*
Aged 51-60	0.005	0.014	0.027**	-0.003	-0.001	-0.006
Aged 61-70	0.015	0.021***	0.037**	-0.013**	-0.007	-0.011
Aged 71 or more	0.008	0.033*	0.081***	-0.004	-0.004	0.014*
Primary education or lower	0.008	0.026**	0.052**	-0.003	0.001	-0.002
Lower secondary education	0.012*	0.010	0.028***	-0.004	-0.008*	-0.004
Upper secondary education	0.003	0.030**	0.031***	-0.008*	-0.002	-0.007
Tertiary education	0.081***	0.120***	0.145***	-0.001	0.018	0.026**
Nort-East	0.001	0.024	0.048	-0.003	-0.007	0.003
North-West	0.023	0.042	0.069*	0.001	0.008	-0.003
Middle	0.022***	0.036**	0.041*	-0.002	0.002	0.002
South	0.009	0.021*	0.015*	-0.007*	-0.000	-0.007
Islands	-0.022	-0.011	-0.010	0.003	0.001	0.004

*Notes: Standard errors are clustered by NUTS-2 region and estimates are computed with household sample weights; *** p<0.01, ** p<0.05, * p<0.1. The table presents coefficients of variables of interest only, but the estimation models include all other covariates shown in Table 2. Full estimation results are available upon request.*

A noteworthy result is that inequality decreases among the most vulnerable groups such as respondents with lower secondary education. Interestingly, in those low-educated groups also a small gain in knowledge (one correct answer out of three, or more) is enough to reduce inequality intra-group. Finally, the geographical analysis suggests that being able to correctly answer three questions out of three leads to a statistically significant decrease in inequality in the South of Italy, which is known to be the area with the highest levels of poverty and income inequality at national level (Gallo and Pagliacci, 2020). This is a powerful result that speaks about the critical importance of financial literacy not only as a necessary skill to increase overall financial well-being but also as an additional tool to reduce inequality where most needed.

Hence, the heterogeneous analysis above reveals that an increase in financial literacy levels is expected to have different outcomes across the population, engendering often a greater reduction of inequality levels among the most vulnerable groups.

5. Discussion of costs and benefits for policy implications in Italy

While understanding the potential influences of financial literacy on income and wealth inequality, the discussion is incomplete without providing indications of the estimated costs.

Our approach is twofold. First of all, we describe a hypothetical scenario based on population register statistics to simulate a 10% swap in Italy. Then, we discuss the estimated cost analyses conducted in previous studies in Italy. Finally, we provide a list of the costs to be considered to implement mandatory financial education in Italy, taking into account the requirements introduced by the "*DDL Capitali"* law.

In our dataset, 23% of respondents fail to provide any correct answers to the Big Three, so about 5.8 million Italian householders are financially illiterate. If 10% of them become financially literate, on average the mean value of the households' equivalized disposable income would increase by 285 EUR. Considering 25.5 million Italian households (ISTAT, 2021), a policy intervention mirroring the same income increase through a lump sum transfer would be extremely expensive (EUR 7.3 billion). Based on the ISTAT 2023 data, approximately 400,000 children are born in Italy every year. To make our 10%-swap hypothesis realistic, assuming that financial education has long-lasting effects on individuals' life, this means that compulsory financial education should be introduced in school for at least two consecutive years. According to Italian law, all children (6 to 16 years old at least) have the right to study and must comply with compulsory schooling. Both public and private schools are managed by the state and, therefore, are similar in their organization throughout Italy.

Being schooling defined as an 'essential service' by the national law, offices of the Italian Ministry of Education guarantee the same qualitative standard across schools located in the whole country. This result leads to a straightforward policy implication: scalable financial education initiatives might be a reasonable cost-effective solution to reduce inequality. The magnitude of our results should be considered in the Italian context. In other words, the same analysis conducted in other countries may lead to effects with different magnitude and economic importance compared to those presented in this study.

Although there is limited evidence of cost analysis in previous literature, there is still evidence both in Italy and in other countries suggesting that financial education works and is cost-effective (Kaiser et al., 2022).

In the Italian context, Sconti (2022) tested the effectiveness of traditional (with a financial advisor) vs digitized financial education courses, both are only 8 hours. She concludes that each euro spent in the traditional program translates into a 2% of probability that students get all the Big Three[9] questions right. The cost-effectiveness ratio for the traditional treatment was reported as 0.02 (0.28/11.04) if the financial advisors were paid for their time.

In other countries, Frisancho (2020) reports a cost per pupil of USD 4.80. As noted by Kaiser et al. (2022), this cost applies to a financial education within a year-long class and average and median interventions in the sample are only 12 and 7 h, respectively, which means that the average effect across studies may correspond to lower costs. In addition, Frisancho (2020) provides estimates of limiting opportunity costs and translating into performance gain: a $1 increase in spending on the program yields a 3.3-point improvement in the PISA financial literacy assessment. Both Frisancho (2020) and Bruhn et al. (2016) document positive effects and positive externalities beyond the target group (such as teachers' and parents' outcomes).

To calculate the potential cost related to the introduction of mandatory financial education in Italian schools since 2023, let's assume for Italy the same cost per pupil reported by Frisancho (2020) roughly converted to Euro, thus EUR 5.00. As written above, the mandatory financial education course should involve all school levels and then 13 different cohorts of children, aged from 6 to 18

[9] To measure financial literacy, Lusardi and Mitchell (2007) created three simple and basic questions to capture the fundamentals of personal finance. These questions are known worldwide as the Big Three and investigate how people deal with inflation, compound interest, and risk diversification concepts necessary for financial decisions. These questions revealed that knowledge is poor throughout the world (with only 2.1 per cent of countries qualifying as top performers), particularly among the young, women and the elderly (OECD, 2014). The Big Three questions are mainly used to assess financial literacy among adults. Due to higher comparability with several national and international surveys and our target group's age, we follow Lusardi and Mitchell's (2007) approach.

years old. Based on the ISTAT 2023 data, about 480,000 children aged 6 years old and about 585,000 individuals aged 18 years old live in Italy. Assuming a linear progression in the decrease of births across the cohorts considered, this means that each cohort counts about 532,500 children, for a total number of 6,390,000 children interested in the new policy. Given a cost per pupil of EUR 5.00, mandatory financial education should then cost about 32 million euros per year. Moreover, given the large number of children involved in mandatory financial education every year, to optimistically achieve the same effect on household income and wealth levels estimated in Section 4, it would be enough that the expected increase of financial literacy is long-lasting for at least one-eleventh of the target population.

Our discussion on the costs and benefits of mandatory financial education estimate is still preliminary and should also take into account, beyond the actual cost of learning materials and teaching training hours, the cost opportunity of introducing financial education in another subject (i.e. civic education), as the Italian law is aiming to do. However, we highlight that expected costs (i.e. about 32 million euros) linked to the introduction of mandatory financial education in schools in Italy would be much lower than potential benefits (i.e. about 7 billion euros), making this kind of policy worth implementing.

6. Conclusions

Financial literacy has been recognized as an essential basic knowledge to prevent financial fragility and mispractices.

We contribute to the literature by showing hypothetical scenarios looking for the effects between financial literacy and inequality levels on households' income and wealth.

To the best of our knowledge, this is the first paper investigating the potential influence of financial literacy on wealth and income households' inequality using the rigorous unconditional quantile regression method proposed by Firpo et al. (2009). We find that a marginal increment in the financially literate population significantly reduces households' income and wealth inequality. Our results are robust to different wealth measures, both in relative and absolute terms. If 10% of them become financially literate, on average the mean value of the households' equivalized disposable income would increase by 285 EUR. Since in Italy, the number of households is equal to 25.5 million (ISTAT, 2021), a lump sum leading to the same household income increase would cost EUR 7.3 billion per year. Based on the ISTAT 2021 data, approximately 400,000 children are born in Italy every year. To make our 10%-swap hypothesis realistic, this means that compulsory financial education should be introduced in schools for at least two consecutive years. Our preliminary cost

analysis highlights that expected costs (i.e. about 32 million euros) linked to the introduction of mandatory financial education in schools in Italy would be much lower than potential benefits (i.e. about 7 billion euros), making this kind of policy worth implementing.

Our results from a heterogeneity analysis suggest that those who benefit more from higher levels of financial literacy are the most vulnerable ones.

To sum up, our results highlight that financially literate people may reach higher wealth and income levels. This is a crucial point in supporting empirical evidence in favor of financial literacy effects. The presented evidence appears of particular importance also because based on a national context, thus the Italian one, where levels of financial literacy are extremely low. To be noted, only one-quarter of the analysed sample of respondents fail to provide any correct answers to the Big Three questions, which means that about 5.8 million Italian householders out of 25.5 are completely illiterate in terms of financial literacy. Also, given our sample of respondents is mainly composed of householders and breadwinners, strongly assuming they have the highest level of financial literacy within the household, we believe that our results may represent an actual lower bound of the effect of a financial literacy increase on household income and wealth values.

The results presented in this paper are leading to three straightforward policy implications. First, scalable financial education initiatives might be a reasonable cost-effective additional tool to reduce inequality. Second, offering financial education in schools allows reaching the most vulnerable groups, granting them access to it starting on the same opportunity levels. Third, offering financial education may have positive externalities such as reducing financial anxiety and financial fragility. Our findings are of interest to researchers, academics and policymakers interested in designing financial education programs and deeply understanding their potential beneficial effects on inequality.

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Appendix

Table A1 – Variable description

Variable	Description
Household equivalized disposable income	Continuous variable representing the annual household equivalized disposable income. OECD modified equivalence scale was applied. All RIFs on income distributional statistics are based on this variable.
Household equivalized disposable wealth	Continuous variable representing the annual household equivalized disposable wealth. OECD modified equivalence scale was applied. All RIFs on wealth distributional statistics are based on this variable.
Correct answers = 1 Correct answers = 2 Correct answers = 3	Binary variables representing the number of correct answers made replying to the Big Three questions (i.e. those to assess the financial literacy level). The reference category is composed of those reporting 0 correct answers.
Female	Binary variable taking value 1 for female, 0 for male.
Foreign	Binary variable taking value 1 for foreign citizens, 0 for Italian ones.
Aged 41-50 Aged 51-60 Aged 61-70 Aged 71 or more	Binary variables representing the age group of respondents. The reference category is Aged 40 or lower.
Lower secondary education Upper secondary education Tertiary education	Binary variables representing the highest education level achieved by respondent. The reference category is composed of Primary education or lower (i.e. no education).
Graduated parents	Binary variable taking value 1 for those reporting at least one parent with a University degree, and 0 otherwise.
Married Divorced/separated/widowed	Binary variables representing the respondent's marital status. The reference category is composed of Single.
White-collar worker Teacher/manager/director Self-employed Unemployed Retired from work Other retired Other inactivity status	Binary variables representing the respondent's occupational status. The reference category is composed of Blue-collar worker.
Household size = 2 Household size = 3 Household size = 4 Household size = 5 or more	Binary variables representing the household size. The reference category is Single person (or Household size = 1).
Presence of minors	Binary variable taking value 1 for people living in households with at least one minor child, and 0 otherwise.
Work intensity = 0.5 0.5 < Work intensity < 1 Work intensity = 1	Binary variables representing the household work intensity status. The work intensity is calculated as the ratio between the number of earners and the number of employable (aged 16 or more) household members. The reference category is Work intensity < 0.5.
North-West Middle South Islands	Binary variables representing the macro-region of residence. The reference category is North-East.

Table A2 – Unconditional effects of an increase in the financial literacy levels on the mean and Gini index of household income and wealth (absolute terms)

VARIABLES	Household income		Household wealth	
	(I)	(II)	(III)	(IV)
	Mean value	Gini index	Mean value	Gini index
Correct answers = 1	19,5	-0,002*	1081,7	-0,003**
Correct answers = 2	160,7**	-0,003***	3323,7***	-0,001
Correct answers = 3	285,3***	0.000	5205,4***	-0,001
Female	-120,1**	-0,004***	-1963,5*	-0,004***
Foreign	-484,5***	0,011***	-5738,5***	0,025***
Aged 41-50	274,2***	0,005***	5702,9***	-0,003***
Aged 51-60	461,4***	0,002	9550.0***	-0,009**
Aged 61-70	594,4***	0,003	12723,7***	-0,006
Aged 71 or more	780,8***	0,003	18676,4***	-0,002
Lower secondary education	327,4***	0.000	5118.0***	0.000
Upper secondary education	645,5***	-0,002	9168,5***	-0,001
Tertiary education	1238.0***	0,013**	16567,6***	0,009*
Graduated parents	378,7***	0,007**	7474,7***	0,009**
Married	209,5***	0,001	1605	-0,001
Divorced/separated/widowed	11,8	0,003**	-508,7	0,003
White-collar worker	168,2***	-0,007***	-423,3	-0,019***
Teacher/manager/director	775,7***	0,005	4511,5	-0,015***
Self-employed	505,7***	0.010***	11845,5***	-0,008*
Unemployed	-550,7***	0,026***	1535,8*	-0,002
Retired from work	71,3	-0,002	2609,1**	-0,015***
Other retired	-155,2**	0,004*	260,3	-0,008**
Other inactivity status	-78,4	0,009***	3864,8***	-0,008***
Household size = 2	116.0**	0,001	-1860,5*	-0,004*
Household size = 3	121,1	-0,004**	-4326,7***	-0,009***
Household size = 4	98,4	-0,004	-5502,9**	-0,009*
Household size = 5 or more	-22,4	0,002	-5501.0**	-0,005
Presence of minors	-309,5***	0,001	-166,4	0,001
Work intensity = 0.5	365,6***	-0,007***	2747,8***	-0,004*
0.5 < Work intensity < 1	439,5***	-0,013***	1725.0*	-0,007***
Work intensity = 1	788,7***	-0,015***	905,6	-0,014***
North-West	-158,8**	-0,002	-191,7	0.000
Middle	-172.0*	-0,003	-1392,2	-0,005***
South	-606,9***	0,003	-5132,1***	0.000
Islands	-517,6***	0,003*	-4483,9***	0,001
Constant	342,8***	0,039***	-5998,3***	0.090***
Observations	7.421	7.421	7.421	7.421
R-squared	0,427	0,157	0,217	0,073

*Notes: Standard errors are clustered by NUTS-2 region and estimates are computed with household sample weights; *** p<0.01, ** p<0.05, * p<0.1.*

Table A3 – Unconditional effects of an increase in the financial literacy levels on the mean log deviation and the Atkinson index of household income and wealth

VARIABLES	Household income			Household wealth		
	Gini index	Mean log deviation	Atkinson index (e=1)	Gini index	Mean log deviation	Atkinson index (e=1)
Effects in absolute terms						
Correct answers = 1	-0.023*	-0.093	-0.071	-0.027**	-0.584***	-0.117***
Correct answers = 2	-0.028***	-0.116	-0.088	-0.010	-0.514***	-0.103***
Correct answers = 3	-0.003	-0.056	-0.043	-0.014	-0.515***	-0.103***
Effects in relative terms						
Correct answers = 1	-0.071*	-0.338	-0.293	-0.044**	-0.362***	-0.146***
Correct answers = 2	-0.087***	-0.418	-0.363	-0.016	-0.319***	-0.128***
Correct answers = 3	-0.011	-0.204	-0.177	-0.022	-0.320***	-0.129***
Observations	7421	7421	7421	7421	7421	7421
R-squared	0.157	0.157	0.157	0.073	0.152	0.152
Sample distributional statistic	0.320	0.277	0.242	0.616	1.610	0.800

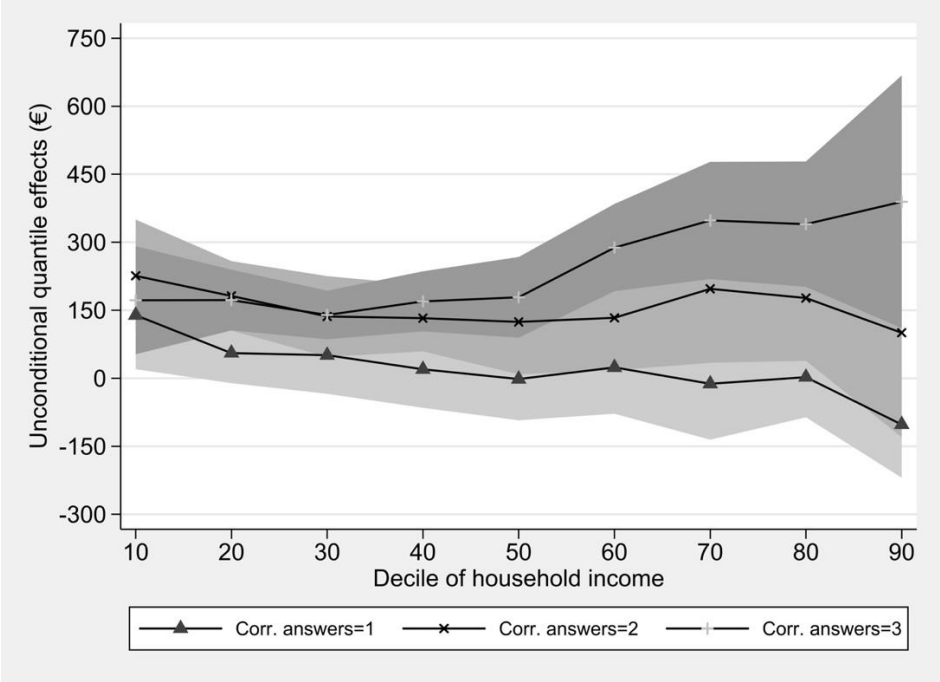
*Notes: Standard errors are clustered by NUTS-2 region and estimates are computed with household sample weights; *** p<0.01, ** p<0.05, * p<0.1. The table presents coefficients of variables of interest only, but the estimation models include all other covariates showed in Table 2. Full estimation results are available upon request.*

Table A4 – Unconditional effects of an increase in the financial literacy levels on the mean value of household income by respondents share swap

Share swap	Correct answers = 1	Correct answers = 2	Correct answers = 3
10%	0.001	0.008**	0.015***
20%	0.002	0.016**	0.030***
30%	0.003	0.024**	0.045***
40%	0.004	0.032**	0.060***
50%	0.005	0.040**	0.075***
60%	0.006	0.048**	0.090***
70%	0.007	0.056**	0.105***
80%	0.008	0.064**	0.120***
90%	0.009	0.072**	0.135***
100%	0.010	0.080**	0.150***

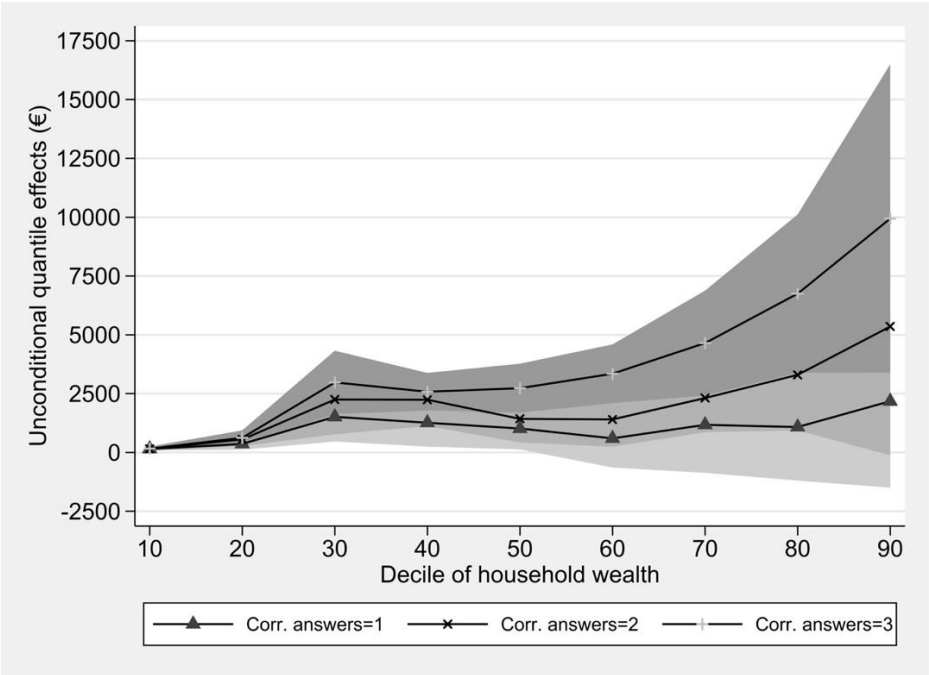
*Notes: Standard errors are clustered by NUTS-2 region and estimates are computed with household sample weights; *** p<0.01, ** p<0.05, * p<0.1. The table presents coefficients of variables of interest only, but the estimation models include all other covariates showed in Table 2. Full estimation results are available upon request.*

Figure A1 – Unconditional effects of an increase in the financial literacy levels along the household income distribution (absolute terms - coefficients scaled by 10%)



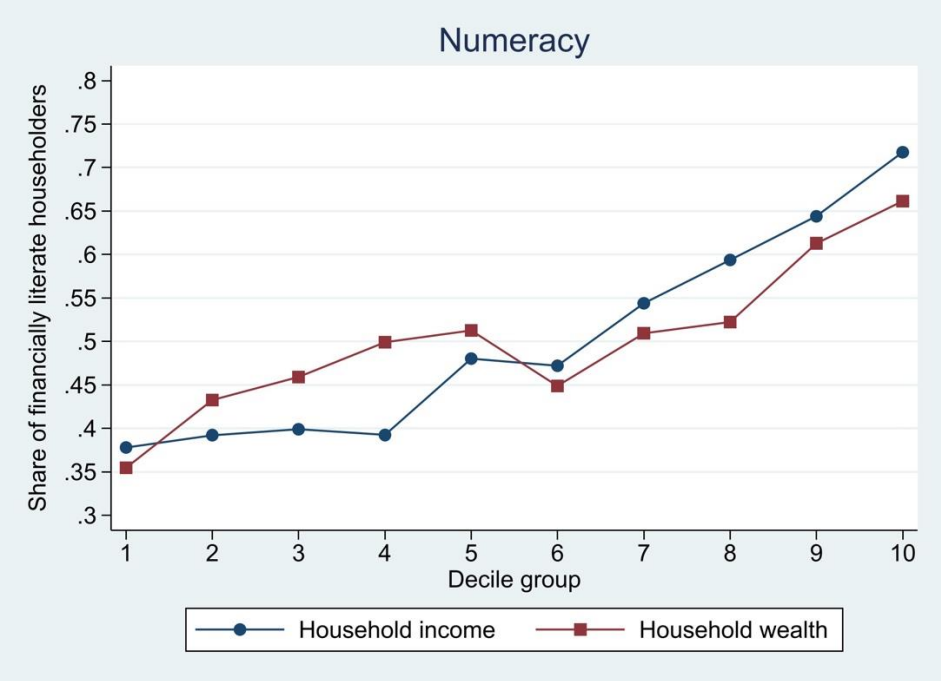
Notes: Standard errors are clustered by NUTS-2 region and estimates are computed with household sample weights. The shadowed area reports confidence intervals at a 90% level. The figures present coefficients of variables of interest only, but the estimation model includes all other covariates showed in Table 2.

Figure A2 – Unconditional effects of an increase in the financial literacy levels along the household wealth distribution (absolute terms - coefficients scaled by 10%)



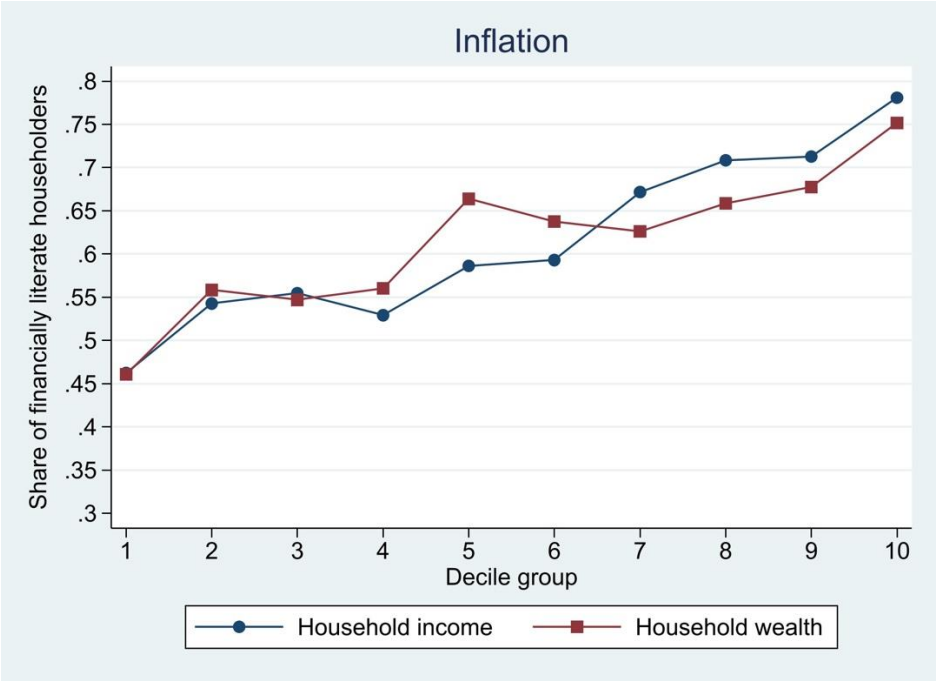
Notes: Standard errors are clustered by NUTS-2 region and estimates are computed with household sample weights. The shadowed area reports confidence intervals at a 90% level. The figures present coefficients of variables of interest only, but the estimation model includes all other covariates showed in Table 2.

Figure A3 – Numeracy knowledge and income (and wealth) distribution



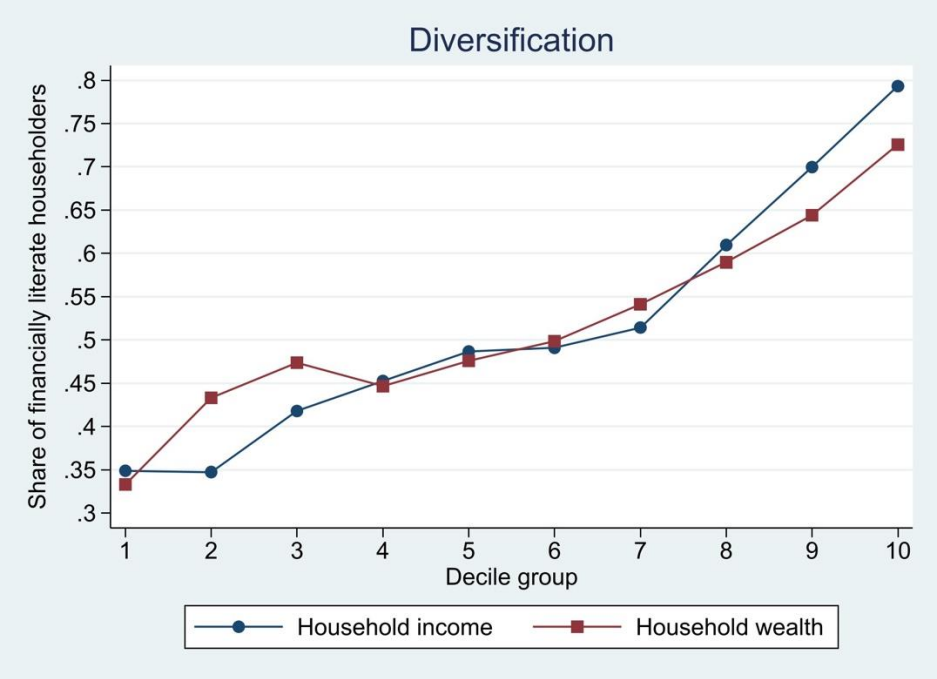
Notes: The figure shows the composition of respondents by numeracy knowledge within each decile of income or wealth (the values add up to 1 vertically) Source: Elaborations of the authors on SHIW 2016 data.

Figure A4 – Inflation knowledge and income (and wealth) distribution



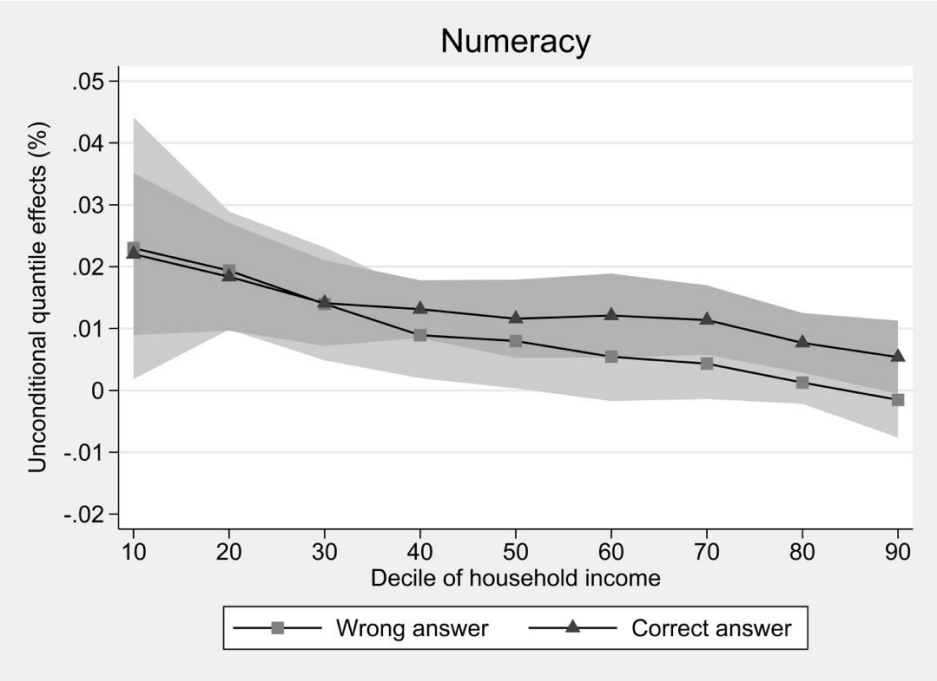
Notes: The figure shows the composition of respondents by inflation knowledge within each decile of income or wealth (the values add up to 1 vertically) Source: Elaborations of the authors on SHIW 2016 data.

Figure A5 – Inflation knowledge and income (and wealth) distribution



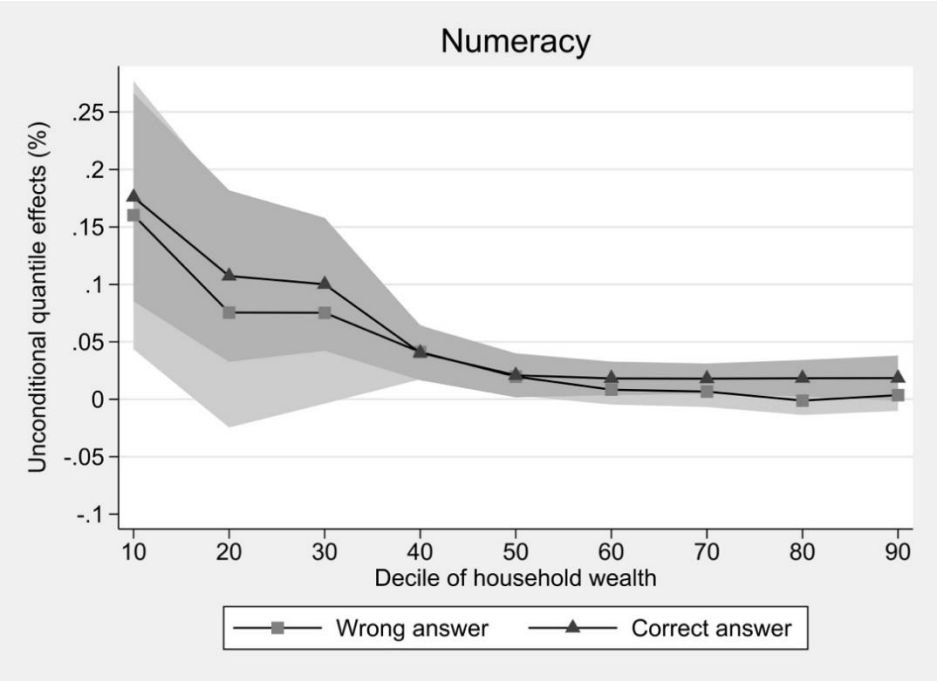
Notes: The figure shows the composition of respondents by diversification knowledge within each decile of income or wealth (the values add up to 1 vertically) Source: Elaborations of the authors on SHIW 2016 data.

Figure A6 – Unconditional effects of an increase in numeracy knowledge along the household income distribution (absolute terms - coefficients scaled by 10%)



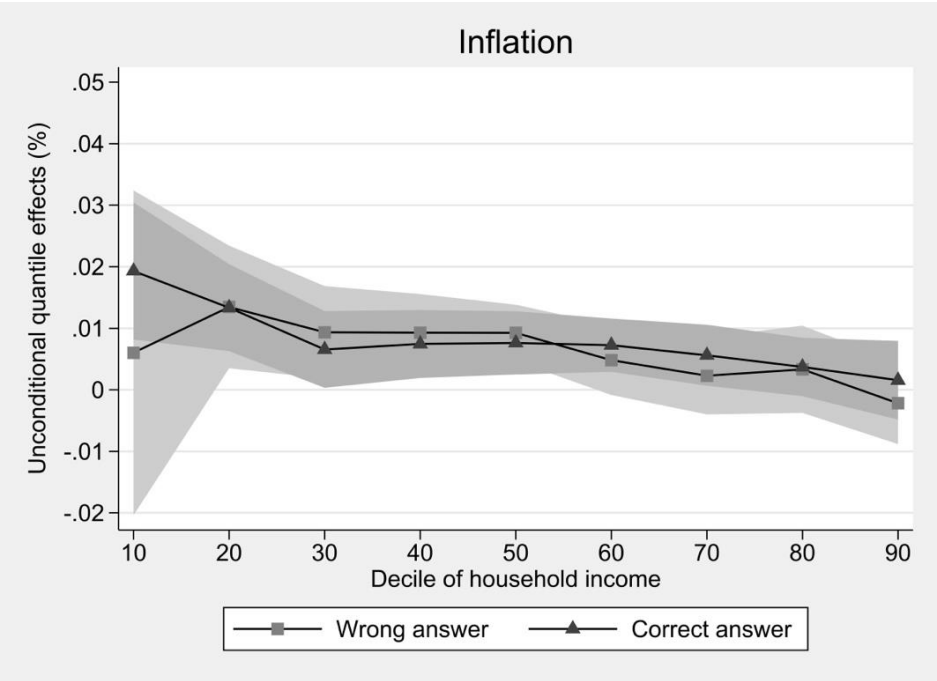
Notes: Standard errors are clustered by NUTS-2 region and estimates are computed with household sample weights. The shadowed area reports confidence intervals at a 90% level. The figures present coefficients of variables of interest only, but the estimation model includes all other covariates showed in Table 2.

Figure A7 – Unconditional effects of an increase in numeracy knowledge along the household wealth distribution (absolute terms - coefficients scaled by 10%)



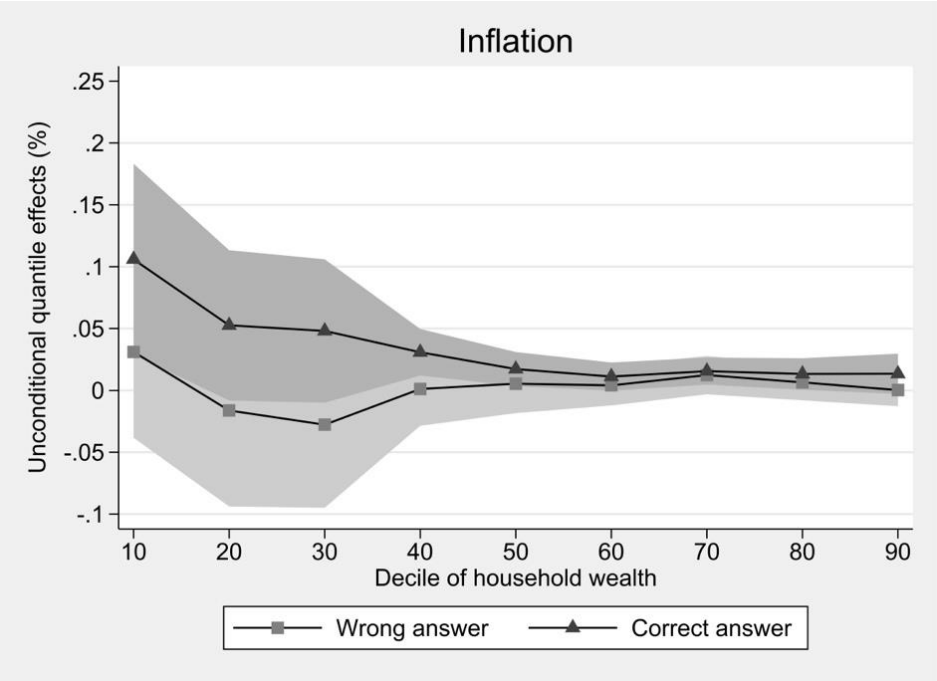
Notes: Standard errors are clustered by NUTS-2 region and estimates are computed with household sample weights. The shadowed area reports confidence intervals at a 90% level. The figures present coefficients of variables of interest only, but the estimation model includes all other covariates showed in Table 2.

Figure A8 – Unconditional effects of an increase in inflation knowledge along the household income distribution (absolute terms - coefficients scaled by 10%)



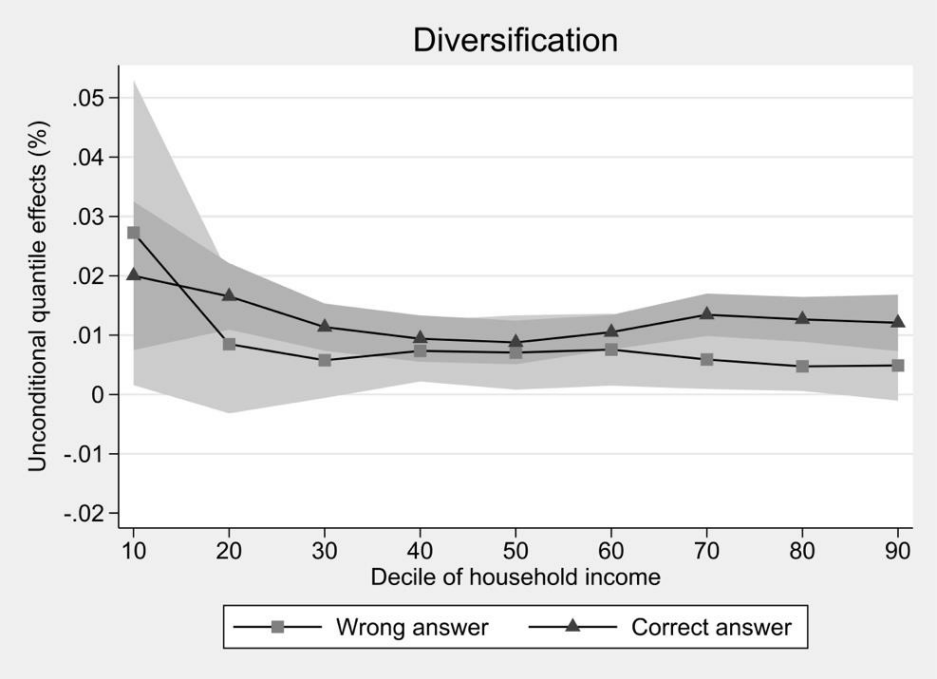
Notes: Standard errors are clustered by NUTS-2 region and estimates are computed with household sample weights. The shadowed area reports confidence intervals at a 90% level. The figures present coefficients of variables of interest only, but the estimation model includes all other covariates showed in Table 2.

Figure A9 – Unconditional effects of an increase in inflation knowledge along the household wealth distribution (absolute terms - coefficients scaled by 10%)



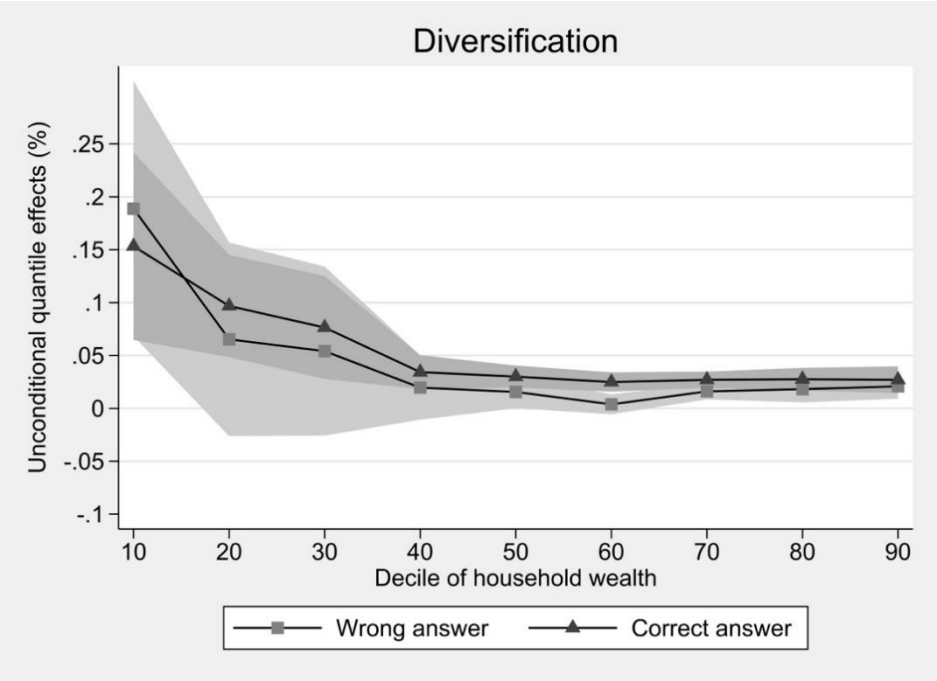
Notes: Standard errors are clustered by NUTS-2 region and estimates are computed with household sample weights. The shadowed area reports confidence intervals at a 90% level. The figures present coefficients of variables of interest only, but the estimation model includes all other covariates showed in Table 2.

Figure A10 - Unconditional effects of an increase in the risk diversification knowledge along the household wealth distribution (absolute terms - coefficients scaled by 10%)



Notes: Standard errors are clustered by NUTS-2 region and estimates are computed with household sample weights. The shadowed area reports confidence intervals at a 90% level. The figures present coefficients of variables of interest only, but the estimation model includes all other covariates showed in Table 2.

Figure A11 – Unconditional effects of an increase in the risk diversification knowledge along the household wealth distribution (absolute terms - coefficients scaled by 10%)



Notes: Standard errors are clustered by NUTS-2 region and estimates are computed with household sample weights. The shadowed area reports confidence intervals at a 90% level. The figures present coefficients of variables of interest only, but the estimation model includes all other covariates showed in Table 2.