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On Multidimensional Approaches to Financial Literacy Measurement

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Abstract
Financial literacy has become an important research topic in recent years. This paper uses data on financial literacy collected in 2012 by Israel's Central Bureau of Statistics. To measure financial literacy it first adopts ideas originally suggested by Lusardi and Mitchell (Am Econ Rev 98(2):413–417, 2008, J Pension Econ Finance 10(4):509–525, 2011). Then it proposes to measure financial literacy by borrowing concepts commonly used in the literature on multi-dimensional poverty measurement. The paper thus introduces three approaches to financial literacy measurement, the so-called "fuzzy" approach, that of Alkire and Foster (J Public Econ 95(7–8):476–487, 2011) and that of Rippin (Distributional justice and efficiency: integrating inequality within and between dimensions in additive poverty indices. Georg-August-Universität Göttingen, Göttingen). The empirical analysis shows that in Israel the overall level of financial sophistication is quite low. Men are generally more financially literate than women, and Jews more than non-Jews. The relationship between age and financial literacy is U-shaped. Financial literacy, and its components, increase with the level of education and are generally higher among married individuals and those who are employed.

Keywords Alkire and Foster multidimensional poverty index · Financial literacy · Fuzzy approach · PISA survey

JEL Classification D14 · G11 · G41

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1 Introduction

In recent decades, more and more financially complex products have appeared in the financial market and many of these have proven to be difficult to handle for financially unsophisticated investors (Brown et al. 2016). Moreover, financial markets around the world have become increasingly accessible to the "small investor", as new products and financial services were introduced. Thus many financial services that once were provided by the government are now offered by the private sector. This trend toward disintermediation is increasingly requiring people to decide themselves how much to save and where to invest and, during retirement, to be in charge of the management of their assets to make sure they will not outlive their assets, while meeting their needs. While these developments have their advantages, they also impose on households a much greater responsibility when borrowing, saving, investing, and de-cumulating their assets, hence the need for individuals to become financially literate.

While there is no internationally accepted definition of financial literacy, the G20 leaders adopted in 2012 (G20, 2012) a definition suggested by Atkinson and Messy (2011, 2012) for whom financial literacy is "a combination of awareness, knowledge, skill, attitude and behavior necessary to make sound financial decisions and ultimately achieve individual financial well-being". Such a definition makes it clear that financial literacy is more than just knowledge; it also includes attitude behavior and skills.

Several studies have indeed shown that there is a strong correlation between financial literacy and financial management skills, and as a consequence with wealth (van Rooij et al. 2012; Jappelli and Padula 2013). For instance, looking at Swedish investors, Calvet et al. (2007, 2009) reported that low income, less educated, and immigrant households were more likely to make financial mistakes. Other studies indicated that the least financially literate were significantly more likely to use high-cost forms of borrowing, incur high transaction costs and pay higher fees (Lusardi and Scheresberg 2013; Lusardi and Tufano 2015; Disney and Gathergood 2013). Mottola (2013) uncovered that costly credit card behavior is more common among those with low financial literacy. In addition, Moore (2003) reported that individuals with the lowest level of financial literacy are more likely to take costly mortgages and the least likely to refinance their mortgages in times of low interest rates (Campbell 2006). Similarly, Klapper et al. (2012) found that those who are less financially literate are also more likely to engage in informal sources of borrowing. Financial literacy is also associated with better retirement planning and greater wealth accumulation during retirement (van Rooij et al. 2012; Lusardi and Mitchell 2007, 2011; Boisclair et al. 2017). That means that more literate individuals plan their retirement more cautiously (Fedorova et al. 2015). Several other studies, both in the United States and in other countries, found that the more financially literate are also more likely to participate in financial markets and invest in stocks (van Rooij et al. 2011; Arrondel et al. 2012; Chu et al. 2017). Furthermore, more sophisticated households invest more efficiently and obtain higher returns on their investment (Calvet et al. 2007, 2009; Chu et al. 2017). Financial literacy has also an impact when economic shocks occur. For instance, in Russia, Klapper et al. (2012) found that the most financially literate were substantially less likely to report having a reduction in their spending capacity and had more available saving. Quite often, financial ignorance comes at a cost. For example, in the Netherlands, van Rooij et al. (2012) estimate that the difference in net worth, between those who are at the 75th rather than at the 25th percentile of the distribution of financial literacy, amounted to €80,000 (i.e., roughly 3.5 times the net disposable income of a median Dutch household). Similarly, Campbell (2006) reported that those

U.S homeowners who had sub-optimally refinanced their mortgage payed a higher interest rate (between 0.5% and 1% higher per year) which amounts to 50 to 100 billion dollars, in aggregate, annually. Strengthening financial skills can hence be beneficial to both the individual and the economy.

More recently, Chu et al. (2017) examined the potential effects of financial literacy on household portfolio choice and investment return, using data from the 2014 Chinese Survey of Consumer Finance. The authors made a distinction between basic and advanced financial literacy. These authors found that households with higher financial literacy, especially those with higher level of advanced financial literacy, tended to delegate at least part of their portfolio to experts and invest in mutual funds, while households who were overconfident about their financial literacy tended to invest by themselves and were more likely to hold only stocks in their portfolios.

Conducting research on financial literacy is a real challenge, because there is no standard definition of such a literacy in the literature (Huston 2010; Lusardi and Mitchell 2014). In 2003 the Financial Services Authority in the United Kingdom launched an initiative to develop and implement a national strategy for financial capability. It commissioned the personal Finance Research Centre of the University of Bristol to identify the components of financial capability, to design a questionnaire as well as a scale against which individuals' financial capability can be measured. This questionnaire looked at how people would deal with an unexpected drop in income, an unexpected expense, anticipated expenses and retirement. The model that emerged identified here key elements of financial capability: knowledge and understanding, skills, and confidence and attitude. Atkinson et al. (2007) made a distinction between four domains of financial capability: managing money, planning ahead, choosing products and staying informed. Several surveys, originally designed by Lusardi and Mitchell (2008, 2011), included three basic questions, each one addressing a different economic concept: compound interest, inflation and stock risk diversification.

The FINRA Investor Education Foundation (2013) focused on four key components of financial capability: making ends meet, planning ahead, managing financial products and financial knowledge and decision-making.

Surveys using the three questions of Lusardi and Mitchell (2008, 2011) found a low percentage of respondents who could answer these three questions successfully. This percentage was about 30% in the United States. The percentages were also relatively low, in countries with well-developed financial markets, like Germany (Bucher-Koenen and Lusardi 2011), the Netherlands (Alessie et al. 2011), Japan (Sekita 2011), Australia (Agnew et al. 2013), Italy (Fornero and Monticone 2011) France (Arrondel et al. 2013) and Canada (Boisclair et al. 2017). Low scores were also reported in countries where financial markets are changing rapidly, like Russia (Klapper and Panos 2011) and Romania (Beckmann 2013). Nicolini et al. (2013) attempted to analyze differences in financial literacy across four countries: Canada, Italy, the UK and the US. They concluded that there are national and cultural differences in what households know and need to know about personal finances. They also stressed the fact that since the Lusardi and Mitchell (2008, 2011) questions include numbers, it is not clear whether they assess financial literacy or numeracy or both.

In a very interesting study of financial behavior before and after the financial crisis, O'Neill and Xiao (2012) concluded that there was evidence of a modest positive difference in the performance of 12 financial practices, including written financial goals, written spending plans, having at least three months' expenses set aside for emergencies, payment of credit card bills in full to avoid interest, calculating net worth and avoidance of impulsive buying and recreational shopping.

Huston (2010) identified three obstacles to creating a standard financial literacy measure. The first is the lack of a common construct; the second is the lack of a comprehensive set of questions to measure all components of financial literacy and the third is the lack of guidance in interpreting the measure created. An interesting attempt to measure financial knowledge, within the younger population, was made by the Programme for International Student Assessment (PISA),[1] of which the OECD is in charge. In 2012, a module of financial literacy was added to the questionnaire on proficiency in mathematics, science, and reading among 15-year-old students. An additional survey[2] conducted by the OECD in 2015, evaluated the financial knowledge of the older population (from age 18–79), in thirty countries. Overall, the OECD surveys confirmed the earlier findings that global financial knowledge is quite poor and should be improved.

Financial ignorance is more common among women, both adults and young. This gender gap remains significant even after keeping constant other characteristics (e.g. Bucher-Koenen and Lusardi 2011; Nejad and O'Connor 2016; Lusardi et al. 2014; Lusardi and Mitchell 2008, 2009, 2011; Lusardi and Tufano 2015; Bucher-Koenen et al. 2016; Agarwal et al. 2015; Boisclair et al. 2017). Another characteristic found to be correlated with financial literacy is education: those without college education are much less likely to be financially literate (Brown and Graf 2013; Agarwal et al. 2015). Servon and Kaestner (2008) found also that income is positively correlated with financial literacy (Lusardi and Tufano 2015; Klapper et al. 2015), lower-paid individuals being less financially literate (Lusardi 2008; Brown and Graf 2013). Moreover, employees and self-employed have higher scores than the unemployed (Lusardi and Mitchell 2011). There is also evidence that scores are lower in rural than in urban areas (Klapper and Panos 2011). Others studies found differences in financial literacy according to religion (Alessie et al. 2011), political opinions (Arrondel et al. 2013) and ethnicity (Nejad and O'Connor 2016).

Other studies looked at the link between financial education and financial satisfaction. Xiao et al. (2014) used data from the 2009 US State-by-State Survey of Financial Capability and found a positive association between perceived financial capability and financial satisfaction. They also concluded that desirable financial behavior increases while risky financial behavior decreases financial satisfaction. Xiao and Porto (2017) used data from the 2012 National Financial Capability Study. Their goal was to find out whether financial education has a direct or indirect potential effect on financial satisfaction, a measure of subjective financial well-being. They concluded that financial education has several positive impacts on financial well-being such as facilitating knowledge acquisition, enhancing confidence in knowledge and ability, and encouraging action taking.

Rather than looking at the consquences of financial literacy and capability, some studies tried to explain financial behavior from a theoretical point of view. Xiao et al. (2011), for example, reviewed three different approaches to understanding consumer financial behavior: the life cycle theory, prospect theory and the theory of consumer socialization.

[1] For more information on the Financial Literacy Framework in PISA, see: http://www.oecd.org/pisa/pisaproducts/46962580.pdf.

[2] The survey included three aspects of finacial literacy: financial knowledge, behavior and attitude. The final score of a country is a combination of a maximum of 7 for knowledge, 9 for behavior and 5 for attitudes. Out of thirty countries participating in the survey, 17 are OECD countries (For more information about the survey: http://www.oecd.org/daf/fin/financial-education/OECD-INFE-International-Survey-of-Adult-FInancial-Literacy-Competencies.pdf).

In this paper, using data collected in 2012 by Israel's Central Bureau of Statistics (CBS), we compare several approaches to measuring financial literacy. We first adopt the suggestions of Lusardi and Mitchell (2008, 2011) who used only three questions to measure financial literacy. Then we propose to borrow techniques from the literature on multidimensional poverty measurement to derive alternative measures of financial literacy. Three different approaches are used. We first measure financial literacy, following the so-called "fuzzy" approach to multidimensional poverty measurement of Cerioli and Zani (1990). Then we borrow ideas from the quite popular approach of Alkire and Foster (2011) to the measurement of multi-dimensional poverty. Finally, we adopt an alternative approach to multi-dimensional poverty measurement that had been proposed by Rippin (2012; 2013) and we adapt it to the measurement of financial literacy.

For each of the four approaches examined we first give some summary statistics and then estimate regressions where we estimate the impact of various demographic and socio-economic variables on financial literacy as well as on some of its components. The paper ends with some concluding comments.

2 Methodology

2.1 The Fuzzy Approach to Multidimensional Financial Literacy Measurement

We follow here previous work by Cerioli and Zani (1990), Cheli et al. (1994) and Cheli and Lemmi (1995) for the case of dichotomous variables.

Let p_{ij} be a binary variable equal to 1 if individual i gave a correct answer to question j, to 0 otherwise.

Assume that there are, as a whole, J questions, and that we give the same weight to each question.[3] The proportion p_i of questions to which individual i gave a correct answer is then

$$p_i = \left(\frac{1}{J}\right) \sum_{j=1}^{J} p_{ij} \tag{1}$$

If there are n individuals, the proportion of individuals who gave a correct answer to question j is then

$$\bar{p}_j = (1/n) \sum_{i=1}^{n} p_{ij} \tag{2}$$

Taking into account the whole questionnaire, it is easy to conclude that on average the individuals gave a correct answer to a proportion $\bar{p}$ of the questions where

$$\bar{p} = \left(\frac{1}{n}\right) \sum_{i=1}^{n} \left[\left(\frac{1}{J}\right) \sum_{j=1}^{J} p_{ij} \right] = \left(\frac{1}{n}\right) \sum_{i=1}^{n} p_i = \left(\frac{1}{J}\right) \sum_{j=1}^{J} \bar{p}_j \tag{3}$$

[3] The case where each question may have a different weight is examined in "Appendix 1".

In "Appendix 1" we also examine the case where each question may have a different weight and that where the questionnaire is divided into K parts.

2.2 The Alkire and Foster Approach

Assume as before that there are J questions and that p_{ij} is equal to 1 if individual i gives a correct answer to question j, and equals 0 otherwise. Implementing Alkire and Foster's (2011) approach to the measurement of financial literacy measurement implies first to select a threshold h, so that an individual will be considered as financially literate if he gives a correct answer to h or more questions. If l_i is a binary variable equal to 1 if individual i is financially literate, we define therefore l_i as

$$l_i = 1 \text{ if } \sum_{j=1}^{J} p_{ij} \geq h, = 0 \text{ otherwise.} \tag{4}$$

Then we define the financial literacy headcount H as

$$H = \left(\frac{1}{n}\right) \sum_{i=1}^{n} l_i \tag{5}$$

Note that when $h = J$, we have the "intersection approach" which implies that an individual will be considered as financially literate only if he gives a correct answer to all the questions.

On the contrary, if $h = 1$, we have the other extreme case, corresponding to a "union approach" in so far as an individual will be considered as financially literate as soon as he gives a correct answer to one question.

Consider now only the financially literate individuals. We define an indicator A as

$$A = \left(\frac{1}{nH}\right)\left(\frac{1}{J}\right)\left[\sum_{i\,with\,l_i=1} \sum_{j=1}^{J} p_{ij}\right] \tag{6}$$

A is therefore equal to the proportion of questions to which the individuals defined as literate gave a correct answer.

Finally, we define an indicator M as

$$M = AH = \left(\frac{1}{nJ}\right)\left[\sum_{i\,with\,l_i=1} \sum_{j=1}^{J} p_{ij}\right] \tag{7}$$

M is therefore equal to the ratio of the number of questions to which the individuals defined as literate gave a correct answer over the maximum (nJ) number of questions to which all the individuals, whether literate or not, could have given a correct answer.

In "Appendix 1" we also examine the case where the questionnaire is divided into K parts and that where a different weight is given to each question. We also show how it is possible to generalize the Alkire and Foster approach.

3 The Empirical Investigation

3.1 Data Sources

Our analysis is based on a survey conducted by Israel's Central Bureau of Statistics (CBS) in 2012. This representative survey covered 1171 individuals at least 20 years old and was a subset of Israel's social survey. Among the 105 questions in the questionnaire, we selected 58 questions that were consistent with the OECD definition of financial literacy ("Appendix 2" lists these 58 questions). The survey questionnaire includes questions on the financial knowledge as well as on the debt, credit card and savings behavior of the respondents. There are also questions on the socioeconomic characteristics of the respondents (e.g., age, gender, education, employment status, household income).

3.2 The Approach of Lusardi and Mitchell (2008, 2011)

To evaluate the extent of financial literacy, Lusardi and Mitchell (2008, 2011) formulated three questions, concerning the notions of compound interest, inflation and risk diversification. Here is the exact wording of these questions:

- Suppose you deposited a one-time amount of 1000 Shekels into a saving account with an interest rate of 5% per year. How much will you accumulate in the account at the end of the second year? (the account is with no indexation, the amount is before taxation): (a) above 1100 Shekels, (b) 1100 Shekels exactly, (c) below 1100 Shekels, (d) insufficient data given to calculate, (e) I don't know.
- In hyperinflation, the cost-of-living grows rapidly: (a) yes (b) no (c) I do not know.
- The risk of an investment portfolio can be reduced by buying a wide range of financial products: (a) yes (b) no (c) I do not know.

Table 1 gives the scores observed in Israel for these three questions, for the whole sample and for various socio-economic characteristics of the population. It appears that the overall financial literacy level in the Israeli population is low, since only about 15% of the adult population succeeded in answering all three questions correctly. This overall score is relatively low when compared to that observed in other countries. Lusardi and Mitchell (2014) indicate, for example, that the score was 53% in Germany, 50% in Switzerland, 31% in France, 30% in the United States, but 4% in Russia. Note that in Israel the score was 28% for the question on compound interest, 65% for that on inflation and 35% for that on risk diversification.

Table 1 shows also that women are more financially illiterate than men. Such a gap exists in many other countries (see, Lusardi and Mitchell 2008; Atkinson and Messy 2011). It also appears that, except for the question about inflation, the non-Jewish subpopulation is substantially less financially literate than the Jewish subpopulation and that, in general, the older population is more financially literate. In particular, older participants are more likely to answer correctly the questions regarding inflation and risk diversification.

The three first columns of Table 2 present results of logit regressions where the dependent variable is the probability of giving a correct answer to the question on compound interest, inflation or risk diversification, while in the fourth column the dependent variable is the probability of correctly answering all three questions.

Table 1 Financial literacy scores in the Israeli population by socioeconomic characteristics, using the three questions designed by Lusardi and Mitchell (2008, 2011)

Characteristic	Compound interest rate		Inflation		Risk diversification							
	Correct	DK	Correct	DK	Correct	DK	All 3 correct	Only 2 correct	Only 1 correct	No correct response	Number of participants	Share of population
Overall sample participants	28.07	44.13	65.03	27.70	35.45	53.97	15.25	22.67	30.01	32.07	1213	100
Gender												
Men	34.90	35.07	68.34	22.90	42.27	45.32	21.43	23.98	26.87	27.72	588	48.47
Women	21.31	53.09	61.86	32.30	28.89	62.28	9.44	21.44	32.96	36.16	625	51.53
Religion and minorities												
Jewish	30.93	41.31	65.10	27.84	39.52	52.92	17.79	23.02	27.83	31.36	955	82.03
Muslim Arabs	13.92	58.23	61.84	29.61	15.03	62.09	2.47	18.52	41.36	37.65	162	13.36
Christian Arabs	25.00	37.50	75.00	18.75	18.75	56.25	6.25	31.25	37.50	25.00	16	1.32
Others	17.95	58.97	71.05	21.05	26.32	44.74	7.69	28.21	33.33	30.77	40	3.29
Employment status												
Employed	30.86	40.12	67.29	25.34	39.02	51.52	17.62	24.05	29.76	28.57	840	69.25
Not a member of the working force	23.47	51.99	59.12	33.94	27.54	60.14	10.37	20.07	30.10	39.46	299	24.65
Unemployed	14.08	59.15	62.12	30.30	25.76	57.58	8.11	17.57	32.43	41.89	74	6.10
Age												
20–24	14.72	60.12	51.27	38.61	17.50	65.62	3.64	16.36	36.97	43.03	165	13.61
25–29	25.00	50.00	59.62	34.62	24.03	61.69	8.81	22.01	35.85	33.33	159	13.12
30–34	29.23	37.69	66.67	25.40	36.51	52.38	15.91	22.73	34.09	27.27	132	10.89
35–39	36.67	43.33	67.80	26.27	41.03	47.86	21.14	23.58	29.26	26.02	123	10.15
40–44	25.44	35.09	67.24	25.00	34.21	54.39	15.32	19.35	33.07	32.26	124	10.23
45–49	26.74	44.19	68.24	22.35	42.86	48.81	15.72	30.34	23.60	30.34	89	7.34
50–54	32.61	35.87	62.22	27.78	33.71	57.30	17.71	20.83	26.04	35.42	96	7.92
55–59	36.67	37.78	75.86	21.84	50.00	43.02	25.53	25.53	23.41	25.53	94	7.76
60–64	35.71	36.90	79.75	16.46	47.50	46.25	24.44	23.33	25.56	26.67	90	7.43

Table 1 (continued)

Characteristic	Compound interest rate		Inflation		Risk diversification							
	Correct	DK	Correct	DK	Correct	DK	All 3 correct	Only 2 correct	Only 1 correct	No correct response	Number of participants	Share of population
65+	28.69	47.54	66.40	25.60	46.34	49.59	15.72	27.14	23.57	33.57	140	11.55
Education (years)											1212	
Up to 12	17.24	57.03	55.62	36.99	21.43	65.11	5.54	19.65	31.23	43.58	397	32.75
13–15	23.28	42.99	62.46	27.93	34.04	55.12	10.77	25.21	30.31	33.71	353	29.13
16+	40.90	34.16	74.66	19.91	48.05	43.94	27.05	23.16	28.79	21.00	462	38.12

DK = respondent indicated "does not know". "All 3 correct" row was computed as follows: each person received the score of 1 if he gave a correct answer to each of the questions separately. Thus, the maximum score of 3 means that he answered all 3 questions correctly and the minimum score of 0 indicates that he answered no question correctly

Table 2 Logit regression estimation of the probability of answering successfully the 3 questions designed by Lusardi and Mitchell (2008, 2011)

		Question about compound interest	Question about inflation	Question about risk diversification	All 3 questions correctly
		(1)	(2)	(3)	(4)
Male		0.833***	0.317**	0.689***	1.117***
		(0.140)	(0.124)	(0.133)	(0.182)
	Age	0.049	0.015	0.001	0.098*
		(0.038)	(0.033)	(0.036)	(0.050)
	Age squared	−0.00047	−0.00006	0.0002	−0.0008
		(0.0004)	(0.0003)	(0.0004)	(0.0005)
Marital status	Married	0.102	0.110	0.311	0.136
		(0.210)	(0.183)	(0.202)	(0.277)
	Divorced or Separated	−0.104	−0.049	0.504*	−0.018
		(0.332)	(0.287)	(0.305)	(0.416)
	Widowed	−0.222	−0.276	−0.373	−0.603
		(0.461)	(0.378)	(0.434)	(0.632)
Population Subgroups	Non-Jewish	−0.412	0.683*	−0.135	−0.576
		(0.445)	(0.368)	(0.396)	(0.648)
	Muslim Arabs	−0.275	−0.484	−0.764*	−1.197
		(0.496)	(0.392)	(0.450516)	(0.822)
	Christian Arabs	0.524	0.247	−0.393	0.090
		(0.733)	(0.687)	(0.754)	(1.224)
Employment status	Employed	0.688*	0.238	0.246	0.442
		(0.366)	(0.256)	(0.308)	(0.473)
	Not a member of the working force	0.600	−0.015	−0.164	0.171
		(0.393)	(0.277)	(0.339)	(0.515)
Education		0.150***	0.117***	0.146***	0.237***
		(0.024)	(0.020)	(0.023)	(0.033)
Constant		−5.412***	−2.174***	−3.908***	−8.814***
		(0.886)	(0.709)	(0.817)	(1.245)
Observations		1211	1211	1211	1211
McFadden Pseudo R^2		0.085	0.04	0.1	0.16

Table 2 (continued)

	Question about compound interest	Question about inflation	Question about risk diversification	All 3 questions correctly
	(1)	(2)	(3)	(4)
Hosmer–Lemeshow statistic	15.25 (0.054)	12.04 (0.15)	6.47 (0.594)	2.99 (0.935)

The variable Male is a binary variable equal to 1 if the applicant is male, to 0 if a female. Age is a continuous variable that describes the age of the participant. Age squared describes the age of the participant in the power of two to test for a Non-linear relationship. Married is defined as 1 if the individual is married and 0 if not. The variable Divorced or Separated receives the binary value of 1 if the respondent is divorced or separated and 0 if not. The dummy variable Widowed is equal to 1 for a widowed participant, to 0 otherwise. The base variable for the marital status category is Single. Non-Jewish is a population subgroup dummy variable that receives the value of 1 if the individual is a Non-Jewish citizen, to 0 for Jews and others. The variable Muslim Arab is a binary variable that is equal to 1 if the participant is a Muslim Arab citizen multiplied by the population subgroup dummy. The variable Christian Arab is a dummy variable that is equal to 1 if the participant is a Christian Arab citizen multiplied by the population subgroup dummy. The base variable for this category is Jewish citizens. The binary variable Employed is equal to 1 if a participant is employed and 0 otherwise. Not a member of the working force is a dummy variable that is equal to 1 if the respondent who is either not in an appropriate working age or not able to work. The base variable for the employment status category is Unemployed. Education is a continuous variable that describes an individual's years of education. $*p<0.1$, $**p<0.05$, $***p<0.01$. Each column represents a logistic estimation for the odds of the representative sample to correctly answer each question as well as all three questions combined. Standard errors are in parentheses. Goodness of fit test p values are presented in parenthesis

We then checked how well the model fits the data, using the Hosmer–Lemeshow goodness of fit test. A low level of Chi square statistic, combined with a high p value, will indicate a good level of fit.

As far as the question on compound interest is concerned, it appears that the odds of giving a correct answer are greater for males than females, and are higher, the higher the educational level.

The results are quite similar for the question on inflation. Note that here non-Jews have higher odds of answering the question correctly.

For the question on risk diversification, we observe a similar impact of gender and education, but, in addition, it appears that divorced individuals have higher odds of giving a correct answer than single individuals. Note also that here the odds for Muslim Arabs to give a correct answer, are lower than those for Jews.

Finally, as far as the probability of giving a correct answer to all three questions is concerned, we see, as was previously the case, that men have significantly better chances than women of answering all three questions correctly. It also appears that age raises the odds of answering all questions correctly, although not by much. Note that, like in all previous regressions, a higher level of education increases the odds of giving a correct answer to all the three questions.

The Hosmer–Lemeshow statistic for the question about compound interest was 15.25 (0.054), just barely significant at 5% confidence level. For the question about inflation it was 12.04 (0.15). For the question about risk diversification the statistic was 6.47 (0.594). And finally, for the model that tested the probability of giving a correct answer to all three questions, the Hosmer–Lemeshow Chi square statistic was 2.99 (0.935). As a whole, these result of the goodness of fit test indicate a good level of fit for each model.

3.3 The "fuzzy" Approach to Financial Literacy Measurement

3.3.1 Giving an Equal Weight to the Different Questions

In Table 3 we present results of a regression where the dependent variable is the financial literacy score obtained on the basis of the "fuzzy" approach, assuming an equal weight is given to all the questions. The explanatory variables are various socio-economic and demographic characteristics of the individual and they explain as much as 23% percent of the variance of financial literacy. The results are quite similar to those obtained previously, using the Lusardi and Mitchell approach. Thus, men score better than women; the score is higher, the higher the educational level of the individual, and there is a U-shaped relationship between financial literacy and age. It also appears that, ceteris paribus, divorced or separated individuals have a lower financial literacy score. This is also true for Muslim-Arabs. Finally, other things constant, the financial literacy score of employed individuals, as well as that of the individuals who do not participate in the labor force, is higher than that of unemployed individuals.

In the following paragraphs, we adopt the approach of the O.E.C.D. that suggested that financial literacy is a combination of awareness, knowledge, skill, attitude and behavior necessary to make sound financial decisions and ultimately achieve individual financial well-being (Atkinson and Messy 2011, 2012). We therefore make a distinction between questions related to financial behavior, knowledge and attitude (see, "Appendix 1"). The scores for financial behavior are close to those obtained previously when looking at the whole questionnaire, since this category of questions includes the largest

Table 3 OLS regression for the relationship between the financial literacy score and socio-economic and demographic characteristics of the individuals, when an equal weight is given to each question ("fuzzy" approach)

		Coefficient	Standard error	t-test	*p* value
Male		3.07	0.69	4.48	0.000
	Age	−0.40	0.18	−2.20	0.028
	Age squared	0.005	0.002	2.46	0.014
Marital status	Married	0.37	1.02	0.37	0.714
	Divorced or Separated	−3.81	1.61	−2.37	0.018
	Widowed	−3.44	2.12	−1.62	0.105
Population Subgroups	Non-Jewish	−1.71	1.91	−0.89	0.371
	Muslim Arabs	−4.23	2.06	−2.05	0.041
	Christian Arabs	0.58	3.46	0.17	0.868
Employment status	Employed	7.73	1.45	5.35	0.000
	Not a member of the working force	3.67	1.57	2.34	0.019
Education		1.35	0.11	11.99	0.000
Constant		17.25	3.95	4.37	0.000
Observations		1211			
Adjusted R^2		0.223			

The dependent dummy variable is equal to 1 if the question was correctly answered, to 0 otherwise

number of questions (50 out of 58 questions). It appears that 35.4% of the individuals are financially literate, a lower average score than that observed for the two other categories of questions. For men, the score is 36.53%, for women 34.33%, and this gender difference is statistically significant.

In Table 4 we present the results of regressions estimated separately for each of the three questions mentioned previously. When the dependent variable is the individual score for financial behavior, we find that the demographic and socio-economic characteristics of the individuals explain as much as 22% percent of the variance of the dependent variable, a result similar to that observed in Table 3. This is not surprising, given the great weight of this category of questions in the total number of questions. This explains also why the impact of the explanatory variables is very similar to that observed in Table 3.

For financial knowledge, the average score (39%) is higher than that observed for financial behavior. Here also this average score is higher for men (46%) than for women (33%), and for Jews (42%) than for non-Jews (29%). In the second column of Table 4 we look at the determinants of the score of financial knowledge and it appears that, ceteris paribus, this score is higher among males, married individuals and more educated individuals.

The last category of questions concerns financial attitude and the overall score for this type of questions is almost 48%, higher than that observed for the two previous types of questions. However, given that for financial attitude, there were only two questions, we need to be careful when interpreting the results and comparing them with those observed for the other two parts of the questionnaire. The third column of Table 4 indicates that, ceteris paribus, there is a U-shaped relationship between age and the score for financial attitude. We also observe, other things constant, that the score is higher among married individuals, and among non-Jews.

Table 4 OLS regression results for the relationship between financial literacy scores for each category of questions separately and some socio-economic and demographic characteristics of the individuals, when an equal weight is given to each question ("fuzzy" approach)

		Financial behavior score	Financial knowledge score	Financial attitude score
		(1)	(2)	(3)
Male		2.07***	13.43***	−3.09
		(0.67)	(1.70)	(2.17)
	Age	−0.42**	0.17	−1.63***
		(0.18)	(0.45)	(0.57)
	Age squared	0.005**	−0.0005	0.08***
		(0.002)	(0.005)	(0.006)
Marital status	Married	−0.59	5.86**	8.04**
		(1.00)	(2.54)	(3.24)
	Divorced or Separated	−4.81***	3.63	−1.14
		(1.57)	(3.98)	(5.09)
	Widowed	−3.76*	−2.56	1.97
		(2.07)	(5.25)	(6.71)
Population Subgroups	Non-Jewish	−2.50	−0.05	13.04**
		(1.87)	(4.74)	(6.06)
	Muslim Arabs	−3.58*	−8.30	−8.28
		(2.02)	(5.12)	(6.54)
	Christian Arabs	1.10	−3.47	−0.52
		(3.38)	(8.57)	(10.94)
Employment status	Employed	8.56***	4.62	−3.70
		(1.41)	(3.58)	(4.58)
	Not a member of the working force	4.47***	−0.83	−2.66
		(1.53)	(3.88)	(4.96)
Education		1.25***	2.48***	0.38
		(0.11)	(0.28)	(0.35)
Constant		18.92***	−15.07	73.33***
		(3.86)	(9.79)	(12.50)
Observations		1211	1211	1211
Adjusted R^2		0.215	0.158	0.013

The dependent dummy variable is equal to 1 if the question was correctly answered, to 0 otherwise

3.3.2 Looking at the Whole Questionnaire and Giving a Different Weight to Each Question

In this section, following Cerioli and Zani (1990), we give a different weight to each question. As was explained previously, the intuitive idea is that the less successfully answered questions should receive a higher weight, while the questions to which most individuals gave a correct answer should have a lower weight. It then appears that the scores are lower than those observed when giving an equal eight to each question. Thus the overall level of financial literacy turns out to be quite low (18.2%) for the population as a whole, but we still observe that males have a higher score than women, Jews than non-Jews, employed individuals than those who are unemployed or do not belong to the

Table 5 OLS regression results for the relationship between the financial literacy score and some socio-economic and demographic characteristics of the individuals, when a different weight is given to the various questions ("fuzzy" approach)

		Coefficient	Standard error	t-test	*p* value
Male		2.64	0.51	5.17	0.000
	Age	−0.20	0.13	−1.48	0.138
	Age squared	0.003	0.001	1.82	0.069
Marital status	Married	0.17	0.76	0.22	0.823
	Divorced or Separated	−2.53	1.20	−2.12	0.035
	Widowed	−2.45	1.58	−1.55	0.120
Population Subgroups	Non-Jewish	−0.15	1.43	−0.10	0.918
	Muslim Arabs	−3.03	1.54	−1.97	0.049
	Christian Arabs	0.73	2.57	0.28	0.777
Employment status	Employed	4.15	1.08	3.85	0.000
	Not a member of the working force	1.17	1.17	1.00	0.315
Education		0.98	0.08	11.70	0.000
Constant		3.33	2.94	1.13	0.258
Observations		1211			
Adjusted R^2		0.20			

The dependent dummy variable is equal to 1 if the question was correctly answered, to 0 otherwise

labor force. We also observe that the score is higher, the more educated the individual is.

In Table 5 we examine the link between some socio-economic and demographic characteristics and the individual financial literacy scores, when the questions have different weights. These characteristics explain as much as 20% of the variance of the financial literacy scores. Here again we observe that, ceteris paribus, financial literacy scores are higher among males and increase with age, that divorced or separated individuals have lower scores, this being also true, ceteris paribus, for Muslim Arabs, non-employed individuals and those with a lower level of education.

In a second stage, we divided the questionnaire into the three categories of questions previously mentioned, assuming again that the questions have different weights. To derive an aggregated score, we first applied the Cerioli and Zani procedure, separately for each category of questions, using (7). Then we aggregated the three financial scores obtained, using the weighting procedure described in (14).

The overall aggregated financial literacy score turns then out to be equal to 28%. Note that when we use equal weights for each of the three parts, the aggregated score is 32.5%. However, the aggregated financial literacy score significantly declines (19.4%) when we use a weighting system based on the share of questions within each part. As before, men have a higher score than women, Jews than non-Jews, employed individuals than unemployed, more educated than less educated, this being true whatever the weighting system we select.

In Table 6 we first examine the relationship between some socio-economic and demographic characteristics and the score obtained for each of the three components of financial literacy, assuming again that the weights of the different questions are those proposed by Cerioli and Zani (1990). For financial behavior, we observe that, ceteris paribus, the score is higher for males, more educated and employed individuals, but lower for divorced or

Table 6 Relationship between some socio-economic and demographic characteristics and the individual financial literacy subcategory and aggregated scores, when the questions have different weights ("fuzzy" approach)

		Financial behavior score	Financial knowledge score	Financial attitude score	Cerioli and Zani weighting system	By share of questions	Equal weight for each part
		(1)	(2)	(3)	(4)	(5)	(6)
Male		1.93***	13.90***	−4.20*	3.99***	2.96***	3.88***
		(0.49)	(1.67)	(2.21)	(0.83)	(0.53)	(1.03)
	Age	−0.21	0.29	−1.6***	−0.38*	−0.21	−0.52*
		(0.13)	(0.44)	(0.59)	(0.22)	(0.14)	(0.27)
	Age squared	0.003*	−0.002	0.02***	0.005**	.003*	0.006**
		(0.001)	(0.005)	(0.006)	(0.002)	(0.001)	(0.003)
Marital status	Married	−0.38	5.84**	6.95**	2.98**	0.51	4.14***
		(0.73)	(2.49)	(3.31)	(1.24)	(0.80)	(1.54)
	Divorced or Separated	−3***	3.85	−1.56	−0.76	−2.27*	−0.25
		(1.14)	(3.91)	(5.18)	(1.94)	(1.25)	(2.42)
	Widowed	−2.48	−2.43	−1.36	−2.22	−2.44	−2.09
		(1.51)	(5.16)	(6.84)	(2.57)	(1.65)	(3.19)
Population Subgroups	Non-Jewish	−0.31	−1.42	12.87**	2.24	0.03	3.71
		(1.36)	(4.66)	(6.18)	(2.32)	(1.49)	(2.88)
	Muslim Arabs	−2.69*	−7.46	−3.82	−4.29*	−3.22**	−4.65
		(1.47)	(5.03)	(6.66)	(2.50)	(1.61)	(3.11)
	Christian Arabs	0.99	−3.16	2.06	0.05	0.60	−0.04
		(2.46)	(8.41)	(11.15)	(4.18)	(2.69)	(5.20)
Employment status	Employed	4.19***	5.29	−2.04	3.15*	4.09***	2.48
		(1.03)	(3.52)	(4.67)	(1.75)	(1.12)	(2.18)
	Not a member of the working force	1.35	−0.20	−2.42	0.09	1.06	−0.43
		(1.11)	(3.81)	(5.05)	(1.90)	(1.22)	(2.36)
Education		0.89***	2.30***	0.44	1.19***	1.02***	1.21***
		(0.08)	(0.27)	(0.36)	(0.14)	(0.09)	(0.17)
Constant		3.74	−19.22**	69.38***	11.49**	3.63	17.97***
		(2.81)	(9.61)	(12.74)	(4.78)	(3.07)	(5.95)

Table 6 (continued)

	Financial behavior score	Financial knowledge score	Financial attitude score	Cerioli and Zani weighting system	By share of questions	Equal weight for each part
	(1)	(2)	(3)	(4)	(5)	(6)
Observations	1211	1211	1211	1211	1211	1211
Adjusted R^2	0.18	0.16	0.01	0.12	0.20	0.08

The dependent dummy variable is equal to 1 if the question was correctly answered, to 0 otherwise

separated people and for Muslim Arabs. For financial knowledge it appears that, ceteris paribus, the score is higher for males, married and more educated individuals. However, for financial attitude, we observe that males have a lower and non-Jews a higher score.

In regressions (4)–(6) in Table 6 we analyze the impact of the different demographic and socio-economic variables on the aggregated financial literacy score assuming each time a different weighting system for the three categories of questions distinguished. Regression (4) presents the results obtained when for each of the three categories of questions we use the Cerioli and Zani weighting system. In regression (5) the weight of each of the three categories of questions is related to the share of each category in the total number of questions. Finally, in regression (6) each of the three categories of questions has the same weight. It then appears, ceteris paribus, that the overall financial literacy score is higher among males, married (though not in regression (6)) and more educated individuals and among employed individuals (though not in (6)) and that the relationship between age and this aggregated score is U shaped. We also observe, other things constant, that Muslim Arabs have a lower score, although the coefficient is not significant in regression (6).

3.4 The Alkire and Foster (2011) Approach

Here we first need to define the thresholds h. When looking at the overall financial literacy score we will assume that $h=34$. In other words, an individual will be assumed to be financially literate, if he/she gave a correct answer to 55% of the questions. When a distinction is made between the three categories of questions, we will assume that for financial behavior $h = 28$, for financial knowledge $h=4$ and for financial attitude, where there are only two questions, $h=1$.

It then appears that the overall financial literacy head-count (H) in Israel is 23% and that those who are financially literate gave a correct answer to 73% of the questions ($A=0.73$). Combining H and A, we obtain an overall measure M of financial literacy of 0.17.

In Table 7 we present regression results derived from the Alkire and Foster approach. The dependent variables are respectively the scores obtained for financial behavior, knowledge and attitude as well as the overall financial literacy score. In the latter case, we assumed that, to be financially literate (regression 4), an individual needed to be financially literate in at least two categories of questions.

It then appears that, ceteris paribus, men have a higher probability of being financially literate when we look at financial behavior or knowledge, but not when we consider financial attitude. We also observe that age has a positive impact on the probability of being financially literate, except in the case of financial attitude, and that being married increases the probability of being financially literate, but only as far as financial knowledge and financial attitude are concerned. The results also show that Muslim Arabs have, ceteris paribus, a lower probability of being financially literate, except in the case of financial attitude. Finally, other things constant, education increases the probability of being financially literate, except in the case of financial attitude.

3.5 Generalizing the Alkire and Foster Approach: The Rippin (2012) Approach

In what follows, we first assumed that the inputs to financial literacy (the different questions) are substitutes. It then appears that, whatever the value of the parameter α, the overall level of financial literacy is below 30%. The highest score is obtained when $\alpha=0.25$ and, as expected, the score decreases when α increases. As was the case previously, we

Table 7 Probability of being financially literate, both separately for each category of questions and when no distinction is made between the different categories, using Alkire and Foster's approach

		Financial behavior score	Financial knowledge score	Financial attitude score	Overall score with no distinction between the categories
		(1)	(2)	(3)	(4)
Male		0.608**	1.09***	−0.13	1.00***
		(0.26)	(0.14)	(0.13)	(0.15)
	Age	0.02*	0.01***	−0.002	0.013**
		(0.01)	(0.01)	(0.005)	(0.01)
Marital status	Married	0.06	0.45**	0.41**	0.34
		(0.39)	(0.20)	(0.17)	(0.21)
	Divorced or Separated	−0.37	0.35	−0.15	−0.01
		(0.65)	(0.31)	(0.28)	(0.35)
	Widowed	−1.15	−0.09	0.61	−0.02
		(1.12)	(0.46)	(0.43)	(0.47)
Population Subgroups	Non-Jewish	0.73	−0.30	0.74*	−0.03
		(0.65)	(0.41)	(0.43)	(0.43)
	Muslim Arabs	−1.92**	−0.79*	−0.57	−1.06**
		(0.96)	(0.48)	(0.45)	(0.51)
	Christian Arabs	0	−0.11	−0.09	−0.47
		(0)	(0.77)	(0.77)	(0.87)
Employment status	Employed	0.11	0.25	−0.02	0.38
		(0.63)	(0.32)	(0.27)	(0.37)
	Not a member of the working force	−0.28	−0.21	0.27	0.20
		(0.70)	(0.35)	(0.29)	(0.40)
Education		0.28***	0.15***	0.02	0.162***
		(0.06)	(0.02)	(0.02)	(0.03)
Constant		−8.37***	−4.55***	0.36	−5.19***
		(1.17)	(0.53)	(0.44)	(0.59)
Observations		1195	1211	1211	1211
Pseudo R^2		0.115	0.127	0.015	0.113

Table 7 (continued)

	Financial behavior score	Financial knowledge score	Financial attitude score	Overall score with no distinction between the categories
	(1)	(2)	(3)	(4)
Hosmer–Lemeshow statistic	8.08 (0.425)	7.91 (0.442)	2.18 (0.975)	10.10 (0.26)

The dependent dummy variable is equal to 1 if the question was correctly answered, to 0 otherwise. Goodness of fit test P-values are presented in parenthesis

observe that men outscore women, when no distinction is made between the categories, as well as in each category separately, except for financial behavior. The scores are generally higher among Jews, employed and better educated individuals.

The results for the case of complementarity between the inputs (the questions) are very similar to those obtained when assuming substitution. Here also the score decreases with α, the highest score (a bit lower than 12%) being observed when $\alpha = 1.25$. As before, we observe that men, Jews, better educated and employed individuals have a higher score.

Since the impacts of the demographic and socio-economic characteristics are quite similar, whatever the value of α, we only present regression results for the case where $\alpha = 0.5$ (see, Table 8). For financial behavior (regression (1)), we observe that, ceteris paribus, males, Jews, employed and better educated individuals have a higher score, while divorced or separated have a lower score than single individuals. It also appears that the relationship between age and the financial behavior score is U shaped.

For financial knowledge (regression (2)) we observe that, ceteris paribus, the score is higher for men married people and individuals with a higher level of education.

For financial attitude (regression (3)) it appears that, ceteris paribus the relationship between age and the financial attitude score is U-shaped, that married individuals score higher than single individuals and that non-Jews have a significantly higher score than Jews.

The results for the overall financial literacy score are presented in regression (4), no distinction being made here between the various categories of questions. It then appears, other things constant, that the overall financial literacy score is higher among males, divorced or separated individuals, people that have an employment and a higher level of education, while Muslim Arabs have a lower score. Note also that the relationship between age and the aggregated score is U shaped.

As far as the Hosmer–Lemeshow test is concerned, the Chi square statistic for the model concerning financial behavior was 8.08 (0.425). For the model predicting financial knowledge it was 7.91 (0.442) and it was 2.18 (0.975) regarding the model for financial attitude. Lastly, for the model that tested the probability of being overall financially literate, no distinction being made between the questions, the Hosmer–Lemeshow Chi square statistic was 10.10 (0.26). These Hosmer–Lemeshow statistics show therefore a good level of fit for each model.

4 Concluding Comments

Financial literacy has become an important topic in recent years, mainly because the management of wealth requires more sophisticated knowledge than it did two or three decades ago.

Lusardi and Mitchell (2008, 2011) were the first to attempt to measure financial literacy, and they did so on the basis of answers to three questions concerning respectively the notions of compound interest, inflation and risk diversification. The OECD (2011; 2012) also proposed a definition of financial literacy, one that considered three aspects: financial knowledge, behavior and attitude

In this paper, using data on financial literacy collected in 2012 by Israel's Central Bureau of Statistics, we first measured financial literacy on the basis of the ideas suggested by Lusardi and Mitchell (2008, 2011). Then we estimated financial literacy by borrowing concepts commonly used in the literature on multi-dimensional poverty measurement.

Table 8 OLS estimation for the relationship between some socio-economic and demographic characteristics and the individual financial literacy for each category of questions separately, as well as when no distinction is made between the various categories of questions, using Rippin's approach for the case where $\alpha = 0.50$

		Financial behavior score	Financial knowledge score	Financial attitude score	Overall score
		(1)	(2)	(3)	(4)
Male		2.02***	13.68***	− 3.19	3.06***
		(0.60)	(1.64)	(2.19)	(0.63)
	Age	− 0.34**	0.34	− 1.69***	− 0.32*
		(0.16)	(0.43)	(0.58)	(0.17)
	Age squared	0.004**	− 0.002	0.019***	0.004**
		(0.0017)	(0.005)	(0.006)	(0.002)
Marital status	Married	− 0.36	5.27**	6.96**	0.49
		(0.90)	(2.45)	(3.28)	(0.94)
	Divorced or Separated	− 3.84***	3.70	− 1.40	− 2.99**
		(1.41)	(3.84)	(5.14)	(1.47)
	Widowed	− 3.30*	− 1.53	− 1.19	− 3.10
		(1.85)	(5.06)	(6.78)	(1.94)
Population Subgroups	Non-Jewish	− 1.75	− 1.80	12.74**	− 1.17
		(1.67)	(4.57)	(6.12)	(1.75)
	Muslim Arabs	− 3.22*	− 7.30	− 7.75	− 3.84**
		(1.81)	(4.93)	(6.60)	(1.89)
	Christian Arabs	0.59	− 2.44	− 0.03	0.09
		(3.02)	(8.26)	(11.05)	(3.16)
Employment status	Employed	6.76***	3.25	− 4.81	6.25***
		(1.26)	(3.45)	(4.62)	(1.32)
	Not a member of the working force	3.26**	− 1.30	− 4.53	2.78*
		(1.37)	(3.74)	(5.01)	(1.43)
Education		1.08***	2.33***	0.34	1.20***
		(0.10)	(0.27)	(0.36)	(0.10)
Constant		7.43**	− 23.86**	70.19***	5.40
		(3.46)	(9.44)	(12.63)	(3.62)
Observations		1211	1211	1211	1211

Table 8 (continued)

	Financial behavior score	Financial knowledge score	Financial attitude score	Overall score
	(1)	(2)	(3)	(4)
Adjusted R^2	0.198	0.162	0.012	0.209

Each column represents an OLS estimation. the dependent variable is the individual fuzzy financial literacy identification for each category of questions as-well as when no distinction is made between the various categories. Standard deviations in parenthesis

More precisely, we adapted three approaches to multi-dimensional poverty measurement. The first one is the so-called "fuzzy" approach. The second one is the by now quite famous approach of Alkire and Foster (2011). The third one adopts ideas originally proposed by Rippin (2012).

Our empirical analysis showed that in Israel, like in many other countries, the overall level of financial sophistication is quite low. The results for overall financial literacy range between 36% for the fuzzy approach, when equal weights are given to all the questions, to about 18% when the weighting procedure of Cerioli and Zani (1990) is adopted. An even lower score (16%) is obtained when using the approach of Alkire and Foster (2011).

As a whole, our analysis reinforces the findings of other studies of financial literacy. More precisely, we concluded that men are generally more financially literate than are women, this being also true for Jews when compared to non-Jews. In most cases, the relationship between age and financial literacy is U-shaped. Financial literacy, and its components were also shown to increase with the level of education and to be generally higher among married individuals and among those who have an employment.

Such findings have clearly policy implications. It should nevertheless be clear that we did not explore the impact of other characteristics such as impulsiveness, behavioral biases, unusual preferences or external circumstances, since information on these aspects was not available in the survey we used.

Appendix 1: A Detailed Presentation of the Fuzzy Approach, The Alkire and Foster Approach and Its Generalization

The Fuzzy Approach to Multidimensional Financial Literacy Measurement

We follow here previous work by Cerioli and Zani (1990), Cheli et al. (1994) and Cheli and Lemmi (1995) for the case of dichotomous variables.

Let p_{ij} be a binary variable equal to 1 if individual i gave a correct answer to question j, to 0 otherwise.

Giving the Same Weight to all the Questions

Considering the Whole Set of Questions Assuming there are, as a whole, J questions, the proportion of questions to which individual i gave a correct answer is

$$p_i = \left(\frac{1}{J}\right) \sum_{j=1}^{J} p_{ij} \tag{8}$$

Assuming there are n individuals, the proportion of individuals who gave a correct answer to question j is then

$$\bar{p}_j = (1/n) \sum_{i=1}^{n} p_{ij} \tag{9}$$

Taking into account the whole questionnaire, we conclude that on average the individuals gave a correct answer to a proportion $\bar{p}$ of the questions where

$$\bar{p} = \left(\frac{1}{n}\right)\left(\frac{1}{J}\right)\sum_{i=1}^{n}\sum_{j=1}^{J} p_{ij} = \left(\frac{1}{J}\right)\sum_{j=1}^{J}\left[\left(\frac{1}{n}\right)\sum_{i=1}^{n} p_{ij}\right] = \left(\frac{1}{J}\right)\sum_{j=1}^{J}\bar{p}_j$$
$$= \left(\frac{1}{n}\right)\sum_{i=1}^{n}\left[\left(\frac{1}{J}\right)\sum_{j=1}^{J} p_{ij}\right] = \left(\frac{1}{n}\right)\sum_{i=1}^{n} p_i \tag{10}$$

Dividing the Questionnaire into K Parts Let us now assume that we divide the questionnaire into K parts.

Let p_{ij}^k be a binary variable equal to 1 if individual i gave a correct answer to question j which belongs to part k of the questionnaire, to 0 otherwise.

The proportion of individuals who gave a correct answer to question j in part k of the questionnaire is

$$\bar{p}_j^k = \left(\frac{1}{n}\right)\sum_{i=1}^{n} p_{ij}^k \tag{11}$$

It then follows that on average the individuals gave a correct answer to a proportion $\bar{p}^k$ of the questions that belong to part k of the questionnaire, where

$$\bar{p}^k = \left(\frac{1}{n}\right)\left(\frac{1}{J^k}\right)\sum_{i=1}^{n}\sum_{j=1}^{J^k} p_{ij}^k \tag{12}$$

and where J^k is the total number of questions in part k of the questionnaire.

Note then that $\bar{p}$ in (10) may be also defined as

$$\bar{p} = \left(\frac{1}{n}\right)\sum_{i=1}^{n}\sum_{k=1}^{K}\left(\frac{J^k}{J}\right)\left(\frac{1}{J^k}\right)\sum_{j=1}^{J^k} p_{ij}^k = \sum_{k=1}^{K}\left(\frac{J^k}{J}\right)\left[\left(\frac{1}{n}\right)\left(\frac{1}{J^k}\right)\sum_{i=1}^{n}\sum_{j=1}^{J^k} p_{ij}^k\right] = \sum_{k=1}^{K}\left(\frac{J^k}{J}\right)\bar{p}^k \tag{13}$$

Giving a Different Weight to Each Question

Working with the Whole Questionnaire Using (9), and following Cerioli and Zani (199), Cheli et al. (1994) and Cheli and Lemmi (1995), the weight of question j will be

$$w_j = \frac{\left(1/ln\bar{p}_j\right)}{\sum_{j=1}^{J}\left(1/ln\bar{p}_j\right)} \tag{14}$$

from which we derive that the (weighted) average proportion of questions to which individual i gave a correct answer is

$$\mu(i) = \sum_{j=1}^{J} w_j p_{ij} \tag{15}$$

so that the (weighted) average proportion of questions to which individuals in the population gave a correct answer is

$$\bar{\mu} = \left(\frac{1}{n}\right) \sum_{i=1}^{n} \mu(i) \tag{16}$$

Considering Only Part k of the Questionnaire Similarly, using (10), the weight of question j in part k of the questionnaire will be

$$w_j^k = \frac{\left(1/ln\bar{p}_j^k\right)}{\sum_{j=1}^{J^k}\left(1/ln\bar{p}_j^k\right)} \tag{17}$$

from which we derive that the (weighted) average proportion of questions to which individual i gave a correct answer in part k of the questionnaire is

$$\mu^k(i) = \sum_{j=1}^{J^k} w_j^k p_{ij} \tag{18}$$

so that the (weighted) average proportion of questions to which individuals in the population gave a correct answer in part k of the questionnaire is

$$\bar{\mu}^k = \left(\frac{1}{n}\right) \sum_{i=1}^{n} \mu^k(i) \tag{19}$$

Note that there is no clear relationship between $\bar{\mu}^k$ and $\bar{\mu}$.

Aggregating All *k* Parts

We will proceed here in two stages. We first compute $\mu^k(i)$, as it was defined in (19). Then we compute an alternative measure $\mu_A(i)$ of the proportion of questions to which individual i gave a correct answer in the questionnaire as a whole and write that

$$\mu_A(i) = \sum_{k=1}^{K} s_k \mu(i)^k \tag{20}$$

where s_k is the weight given to part k. This weight s_k could be defined, in a way similar to that in which we defined in (17) the weight of a given question, in which case we would write that

$$s_k = w_k = \frac{\left(1/ln\bar{\mu}^k\right)}{\sum_{k=1}^{K}\left(1/ln\bar{\mu}^k\right)} \tag{21}$$

But this weight s_k. could also be assumed to be equal to the share of the number of questions in part k in the total number of questions in the whole questionnaire. We could even decide to give the same weight to each part k, no matter how many questions it includes, in which case we would define s_k as being equal to $(1/K)$.

No matter which weight we select, an alternative measure of the proportion of questions to which individuals in the population gave on average a correct answer will be defined, when we proceed in two stages, as

$$\bar{\mu}_A = \left(\frac{1}{n}\right) \sum_{i=1}^{n} \mu_A(i) \tag{22}$$

The Alkire and Foster Approach

Considering the Whole Set of Questions

Assume as before that there are J questions and that p_{ij} is equal to 1 if individual i gives a correct answer to question j, and equals 0 otherwise. Implementing Alkire and Foster's (2011) approach to the measurement of financial literacy measurement implies first to select a threshold h, so that an individual will be considered as financially literate if he gives a correct answer to h or more questions. If l_i is a binary variable equal to 1 if individual i is financially literate, we define therefore l_i as

$$l_i = 1 \text{ if } \sum_{j=1}^{J} p_{ij} \geq h, = 0 \text{ otherwise.} \tag{23}$$

Then we define the financial literacy headcount H as

$$H = \left(\frac{1}{n}\right) \sum_{i=1}^{n} l_i \tag{24}$$

Note that when $h = J$, we have the "intersection approach" which implies that an individual will be considered as financially literate only if he gives a correct answer to all the questions.

On the contrary, if $h = 1$, we have the other extreme case, corresponding to a "union approach" in so far as an individual will be considered as financially literate as soon as he gives a correct answer to one question.

Consider now only the financially literate individuals. We define an indicator A as

$$A = \left(\frac{1}{nH}\right)\left(\frac{1}{J}\right)\left[\sum_{i\,with\,l_i=1} \sum_{j=1}^{J} p_{ij}\right] \tag{25}$$

A is therefore equal to the proportion of questions to which the individuals defined as literate gave a correct answer.

Finally, we define an indicator M as

$$M = AH = \left(\frac{1}{nJ}\right)\left[\sum_{i\,with\,l_i=1} \sum_{j=1}^{J} p_{ij}\right] \tag{26}$$

M is therefore equal to the ratio of the number of questions to which the individuals defined as literate gave a correct answer over the maximum (nJ) number of questions to which all the individuals, whether literate or not, could have given a correct answer.

Dividing the Questionnaire into K Parts

Assume that in part k there are J^k questions and that, as before, p_{ij} is equal to 1 if individual i gives a correct answer to question j, and equals 0 otherwise. If the threshold for part k is defined as being equal to h^k, an individual will be financially literate for part k, which we write as $l_i^k = 1$, if he gives a correct answer to h^k or more questions. We therefore write that

$$l_i^k = 1 \text{ if } \sum_{j=1}^{J^k} p_{ij} \geq h^k, = 0 \text{ otherwise.} \tag{27}$$

Then we define the financial literacy headcount for part k as H^k with

$$H^k = \left(\frac{1}{n}\right) \sum_{i=1}^{n} l_i^k \tag{28}$$

Consider now only those individuals who are financially literate for part k. We then define an indicator A^k as

$$A^k = \left(\frac{1}{nH^k}\right)\left(\frac{1}{J^k}\right)\left[\sum_{i\,with\,l_i^k=1} \sum_{j=1}^{J^k} p_{ij}\right] \tag{29}$$

A^k is therefore equal to the proportion of questions in part k to which the individuals defined as literate in part k gave a correct answer.

Finally, we define an indicator M^k as

$$M^k = A^k H^k = \left(\frac{1}{nJ^k}\right)\left[\sum_{i\,with\,l_i^k=1} \sum_{j=1}^{J^k} p_{ij}\right] \tag{30}$$

Aggregating the Information by Giving Each Part *k* the Same Weight

Let us now aggregate the information obtained at the level of each part k and proceed in two stages, computing first M^k for each part k, then aggregating these indicators M^k, each part k being given the same weight $(1/K)$.

The aggregated financial literacy score M_{A1} will then be defined as

$$M_{A1} = \left[\sum_{k=1}^{K} (1/K) M^k\right] \tag{31}$$

It should be clear that in general M, as given in (26) and M_{A1} will take different values.

Aggregating the information by giving each part *k* a weight equal to its share $\left(J^k/J\right)$ in the total number of questions

In such a case the aggregated financial literacy score M_{A2} will be defined as

$$M_{A2} = \left[\sum_{k=1}^{K} (J^k/J)M^k\right] = \sum_{k=1}^{K} (J^k/J)\left(\frac{1}{nJ^k}\right)\left[\sum_{i\,with\,l_i^k=1}\sum_{j=1}^{J^k} p_{ij}\right] = \left(\frac{1}{nJ}\right)\sum_{k=1}^{K}\left[\sum_{i\,with\,l_i^k=1}\sum_{j=1}^{J^k} p_{ij}\right] \tag{32}$$

Here also we may observe that M, as given in (26) and M_{A2} will take different values.

Giving a Different Weight to Each Question

Considering the Whole Set of Questions Assume as before that there are J questions, that p_{ij} is equal to 1 if individual i gives a correct answer to question j, to 0 otherwise, that we select, as before, a threshold h and that a weight w_j is given to question j, these weights w_j being, for example, equal to those given in (14).

Implementing Alkire and Foster's (2011) approach to the measurement of financial literacy measurement implies now that an individual will be considered as financially literate ($l_i = 1$) only if $\sum_{j=1}^{J} w_j p_{ij} \geq h$.

The financial literacy headcount H will then be defined as in (25) but with the definition of individual literacy l_i that has just been given.

We can similarly define an indicator A as in (26) and a measure of financial literacy M as in (27), using again the definition of individual literacy l_i which gives a different weight to each question.

Dividing the Questionnaire in *K* Parts Assume, as before, that in part k there are J^k questions, that p_{ij} is equal to 1 if individual i gives a correct answer to question j, to 0 otherwise and that the threshold for part k is equal to h^k.

An individual will be considered as financially literate for part k ($l_i^k = 1$) if

$$\sum_{j=1}^{J^k} \frac{w_j p_{ij}}{\sum_{j=1}^{J^k} w_j} \geq h^k.$$

The indicators H^k, A^k and M^k will then be identical to the formulations given previously in (28), (29) and (30), but using the weighted definition of l_i^k.

Aggregating the Information Let us now aggregate the information obtained at the level of each part k and proceed in two stages. We first compute M^k for each part k. Then we aggregate these indicators M^k, each part k being given a weight s_k.

These weights s_k could be identical and all equal to $(1/K)$. Another possibility is that each part k gets a weight identical to its share in the total number of questions on financial literacy in the survey. Finally, one could think of adopting the kind of weighting procedure given in (7) and define s_k as

$$s_k = \frac{\left(1/ln\bar{\mu}^k\right)}{\sum_k \left(1/ln\bar{\mu}^k\right)} \tag{33}$$

where $\bar{\mu}^k$ is given in (19).

The aggregated financial literacy score M_B will then be defined as

$$M_B = \left[\sum_{k=1}^{K} s_k M^k\right] \tag{34}$$

Here also it should be clear that in general M, as given in (26), will be different from $M_{B.}$

Financial Literacy at the Individual Level

To define financial literacy at the individual level, we proceed in two stages. We start with the definition of the financial literacy rate l_i^k for each part k which was defined in (27). We then aggregate this information and conclude that an alternative measure $\mu_{AF}^A(i)$ of the overall degree of financial literacy for individual i will be written as

$$\mu_{AF}^A(i) = \sum_{k=1}^{K} s_k l_i^k \tag{35}$$

where s_k is, as before, the weight given to part k, a weight which can be defined in a way similar to that in which we defined in (21). This weight could also, as was mentioned previously, be equal to share of the number of questions in part k in the total number of questions in the whole questionnaire or even be simply equal to $(1/K)$.

No matter which weight we select, an alternative measure of the proportion of questions to which individuals in the population gave on average a correct answer will be defined, when we proceed in two stages, as

$$\bar{\mu}_{AF}^A = \left(\frac{1}{n}\right) \sum_{i=1}^{n} \mu_{AF}^A(i) \tag{36}$$

Generalizing the Alkire and Foster Approach

It is possible to generalize the Alkire and Foster approach as follows, as suggested by Yalonetzky (2012), and Silber and Yalonetzky (2013).

First let c_i refer to what will be called the "financial literacy counting function" of individual i where

$$c_i = \sum_{j=1}^{J} p_{ij}\omega_j \tag{37}$$

where as before, $p_{ij} = 1$ if individual i gave a correct answer to question j, to 0 otherwise, whereas ω_j is the weight given to question j.[4]

Second let us define the concept of "financial literacy identification function" ψ_i for an individual i, where $\psi_i = 1$ if c_i, the "financial literacy counting function" is higher than or equal to h, the threshold defined previously, ψ_i being equal to 0 otherwise.

Third let us define the "degree of literacy function" of individual i as

[4] The weights ω_j may be computed as were computed the weights in the so-called fuzzy approach, or they may be the same for all questions, in which case $\omega_j = \left(\frac{1}{J}\right) \forall j$.

$$r_i = g(c_i) = g\left(\sum_{j=1}^{J} p_{ij}\omega_j\right) \tag{38}$$

Alkire and Foster (2011) assumed that $g(c_i) = c_i$.

We can now define the "extent of financial literacy" EFL_i for individual i as

$$EFL_i = \psi_i r_i = \psi_i g(c_i) = \psi_i c_i = \psi_i\left(\sum_{j=1}^{J} p_{ij}\omega_j\right) \tag{39}$$

The extent EFL of financial literacy in the population as a whole will then be expressed as

$$EFL = \left(\frac{1}{n}\right)\sum_{i=1}^{n}\psi_i\left(\sum_{j=1}^{J} p_{ij}\omega_j\right) \tag{40}$$

It is possible to generalize the Alkire and Foster approach as follows.

Let c_i refer to what will be called the "financial literacy counting function" of individual i where

$$c_i = \sum_{j=1}^{J} p_{ij}\omega_j \tag{41}$$

where, as before, $p_{ij} = 1$ if individual i gave a correct answer to question j, to 0 otherwise, whereas ω_j is the weight given to question j.[5]

We will now define the "overall literacy rate" of individual i as

$$r_i = g(c_i) = g\left(\sum_{j=1}^{J} p_{ij}\omega_j\right) \tag{42}$$

The extent r of financial literacy in the population as a whole will then be expressed as

$$r = \left(\frac{1}{n}\right)\sum_{i=1}^{n} g(c_i) = \left(\frac{1}{n}\right)\sum_{i=1}^{n} g\left(\sum_{j=1}^{J} p_{ij}\omega_j\right) \tag{43}$$

Expressions (42) and (43) may be slightly modified to include as a special case the approach of Alkire and Foster (2011), as suggested by Yalonetzky (2012), and Silber and Yalonetzky (2013). The individual corrected degree of financial literacy FL_i for an individual i, will then be defined as

$$FL_i = \psi_i r_i = \psi_i g(c_i) = \psi_i g\left(\sum_{j=1}^{J} p_{ij}\omega_j\right) \tag{44}$$

where ψ_i refers to the "financial literacy identification function" for individual i. In other words $\psi_i = 1$ if c_i, the degree of "financial literacy" (that is, the weighted number of questions to which individual i gave a correct answer), is higher than or equal to h, the threshold defined previously, ψ_i being equal to 0 otherwise.

[5] See footnote 4.

Table 9 Counting measures of financial literacy derived from the literature on multidimensional poverty with ordinal variables

Source	ψ_i	$r_i = g(c_i)$	FI
Alkire and Foster (2011)	$=1$ if $c_i \geq h$ $=0$ otherwise	c_i	$FL \equiv \frac{1}{n}\sum_{i=1}^{n} \psi_i c_i$
Bossert et al. (2013)	1	$[c_i]^r$	$FL \equiv \left[\frac{1}{n}\sum_{i=1}^{n}[c_i]^r\right]^{\frac{1}{r}}$
Chakravarty and D'Ambrosio (2006)	1	$g(c_i) = f(c_i)$ with $f(0) = 0$; $f' > 0; f'' \geq 0$.	$FL \equiv \frac{1}{n}\sum_{i=1}^{n} f(c_i)$
Rippin (2012)	1	$[c_i]^\gamma c_i$	$FL \equiv \frac{1}{n}\sum_{i=1}^{n} c_i^{\gamma+1}$

This Table is based on Yalonetzky (2012)

Table 9 mentions (in columns 2 and 3) various functions ψ_i and r_i that have appeared in the literature on multi-dimensional poverty. The extent of financial literacy FL in the whole population is then derived in column 4 of Table 9, which is borrowed from Silber and Yalonetzky (2013). Note that, in the formulation of Bossert et al. (2013), FI is a "generalized mean": it represents the average financial literacy that would be observed in the population, if everyone had the same financial literacy count.

It is also important to stress, that the measures proposed by Bossert et al. (2013), Chakravarty and D'Ambrosio (2006) and Rippin (2012), take into account the degree of inequality, between the individuals (households) classified as financially literate, in the number of correct answers. Such a property does not hold for the index developed by Alkire and Foster (2011).

Appendix 2

See Table 10.

Table 10 List of questions

Financial behavior questions		
1	Do you have a bank account (separate or joint account with a family member)	1. **Yes** 2. No
2	Have you checked your bank account during the last 12 months and if so, in what frequency	1. I haven't **2. Yes, once a week or more** **3. Yes, several times a month** **4. Yes, once a month to once in three months** **5. Yes, onsce in every three months or less**
	Have you used any of the following sources to follow your bank account	
3	Messages from the bank	**1. Yes** 2. No
4	Bank's website	**1. Yes** 2. No
5	Phone calls	**1. Yes** 2. No
6	Automatic bank services (ATM)	**1. Yes** 2. No
7	Meetings at the bank that you initiated	**1. Yes** 2. No
8	Others Please specify_____	**1. Yes** 2. No
9	Is there someone else that follows your bank account	1. Yes **2. No** 3. Don't know
	Presented below are various events that involve your bank account, please specify in what frequency it happened to you in the last 12 months	
10	Had an overdraft in your bank account	**1. Never** 2. Once 3. 2–3 times 4. times and more 5. This is what happens in general

Table 10 (continued)

Financial behavior questions		
11	The bank teller addressed you about exceeding your credit limit	**1. Never** 2. Once 3. 2–3 times 4. 4 times and more 5. This is what happens in general
12	Your bank account has been blocked	**1. Never** 2. Once 3. 2–3 times 4. 4 times and more 5. This is what happens in general
13	Who is usually responsible for following current bills, like electricity and property tax, within your household	**1. You** 2. Your spouse 3. A parent 4. Someone else among the household members 5. No one in particular is responsible 6. Someone outside the household 7. No one is responsible 8. I don't know
14	How many credit cards do you own, including cards that was not issued by the bank	**1. I don't own a credit card** **2. One credit card** 3. Two credit cards 4. Three credit cards 5. Four credit cards
	During the last 12 months, have you used your credit cards to make the following actions	
15	Postpone a payment	1. Yes **2. No** 3. I don't know
16	Buy in installments with no interest	1. Yes **2. No** 3. I don't know

Table 10 (continued)

Financial behavior questions		
17	Buy in a "credit transaction" with interest	1. Yes **2. No** 3. I don't know
18	Receiving a loan from the credit card company	1. Yes **2. No** 3. I don't know
19	Has your credit card been blocked in the last 12 months	1. Yes **2. No** 3. I don't know
20	Do you have a loan from one of the following, not including mortgages	1. Yes **2. No** 3. I don't know
	Bank	
	Credit card company	
	Insurance company	
	Other financial institute that manages provident funds, pensions etc.	
	Employer	
	Business/other organization	
	Private person	
	Another source Please specify_____	
21	Have you had any financial debt/charges, from the following, that you were unable to pay on time in the last year	1. Yes **2. No** 3. I don't know
	Tax authorities	
	Collection system authority	
	Municipal authority	
	Utility services company	

Table 10 (continued)

Financial behavior questions		
	Other business or organization	
	Private person	
	Others Please specify_____	
	Do you have any of the following financial investments	
22	Savings plan or/and banking savings account	**1. Yes** 2. No 3. I don't know
23	Advanced study fund	**1. Yes** 2. No 3. I don't know
24	Provident fund	**1. Yes** 2. No 3. I don't know
25	Pension plan	**1. Yes** 2. No 3. I don't know
26	Trust fund or Exchange-traded note	**1. Yes** 2. No 3. I don't know
27	Bonds or stocks	**1. Yes** 2. No 3. I don't know
28	Other financial investment Please specify_____	**1. Yes** 2. No 3. I don't know

Table 10 (continued)

Financial behavior questions		
29	Who usually decides within your household about investment plans and in what financial companies to invest	**1. You** 2. Your spouse 3. A parent 4. Someone else among the household members 5. No one in particular is responsible 6. Someone outside the household 7. No one 8. I don't know
	Have you used any financial consulting services in the last year (like pension advisor, tax consultant, accountant and insurance broker) for the following	
30	Managing your household budget	**1. Yes** 2. No 3. I don't know
31	Insurance	**1. Yes** 2. No 3. I don't know
32	Loan and mortgages	**1. Yes** 2. No 3. I don't know
33	Savings plans	**1. Yes** 2. No 3. I don't know
34	Provident fund or pension plan	**1. Yes** 2. No 3. I don't know
35	Managing investment portfolio	**1. Yes** 2. No 3. I don't know

Table 10 (continued)

Financial behavior questions		
36	Do you know the exact interest rate in your banking savings account	1. I don't have banking savings account **2. I know the exact interest rates** 3. I know the interest rates, but not exactly 4. I don't know
	What is the frequency at which you seek financial and economic information from the following sources	
37	News articles (printed or online)	1. Never 2. Less than once every month **3. 1–3 times every month** **4. Once in every week** **5. Several time every week**
38	Radio or T.V shows	1. Never 2. Less than once every month **3. 1–3 times every month** **4. Once in every week** **5. Several time every week**
39	Private individuals that you find specialized in the field of finance	1. Never 2. Less than once every month **3. 1–3 times every month** **4. Once in every week** **5. Several time every week**
40	Discussion groups/online forums	1. Never 2. Less than once every month **3. 1–3 times every month** **4. Once in every week** **5. Several time every week**
41	Governmental authorities like the ministry of finance or the central bank	1. Never 2. Less than once every month **3. 1–3 times every month** **4. Once in every week** **5. Several time every week**

Table 10 (continued)

Financial behavior questions		
42	Financial companies	1. Never 2. Less than once every month **3. 1–3 times every month** **4. Once in every week** **5. Several time every week**
43	Non-profit association or organizations	1. Never 2. Less than once every month **3. 1–3 times every month** **4. Once in every week** **5. Several time every week**
44	Other source of information Please specify_____	1. Never 2. Less than once every month **3. 1–3 times every month** **4. Once in every week** **5. Several time every week**
	Written below, are several statements addressing some financial issues. Please mark to what extent you agree with the following statements	
45	I follow my financial expenses regularly	**1. Completely agree** **2. Agree** 3. Do not really agree 4. Completely disagree 5. Not relevant
46	In most months I find myself struggling to pay my monthly expenses	1. Completely agree 2. Agree 3. Do not really agree **4. Completely disagree** 5. Not relevant

Table 10 (continued)

Financial behavior questions		
47	I usually pay my bills on time	**1. Completely agree** **2. Agree** 3. Do not really agree 4. Completely disagree 5. Not relevant
48	I buy things even if have no money to spare	1. Completely agree 2. Agree 3. Do not really agree **4. Completely disagree** 5. Not relevant
49	I compare between product prices before I purchase them	**1. Completely agree** **2. Agree** 3. Do not really agree 4. Completely disagree 5. Not relevant
50	I compare between investment plans and/or financial companies when I choose a financial investment channel	**1. Completely agree** **2. Agree** 3. Do not really agree 4. Completely disagree 5. Not relevant
Financial knowledge questions		
51	The prime interest rate is higher than the interest rate determined by the central bank of Israel	**1. Yes** 2. No 3. I don't know
52	When there is hyper-inflation, the cost-of-living grows rapidly	**1. Yes** 2. No 3. I don't know
53	The risk of an investment portfolio can be reduced by buying a wide range of financial products	**1. Yes** 2. No 3. I don't know

Table 10 (continued)

Financial behavior questions		
54	Investment with a higher return rate is usually an investment with a higher risk	**1. Yes** 2. No 3. I don't know
55	Suppose you deposited a one-time amount of 1000 Shekels into a saving account with an interest rate of 2% per year. How much will you accumulate in the account at the end of the first year?	**1. Write the amount** 2. I don't know
56	Suppose you deposited a one-time amount of 1000 Shekels into a saving account with an interest rate of 5% per year. How much will you accumulate in the account at the end of the second year?	**1. Above 1100 Shekels** 2. 1100 Shekels exactly 3. below 1100 Shekels 4. insufficient data given to calculate 5. I don't know.
Financial attitude questions		
57		**1. Completely agree** **2. Agree** 3. Do not really agree 4. Completely disagree 5. Not relevant
58	I prefer to spend money today than to save it for the long term	1. Completely agree 2. Agree 3. Do not really agree **4. Completely disagree** 5. Not relevant

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