Is financial literacy an economic good?

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ABSTRACT

Financial literacy (FL) is generally regarded as an economic good which individuals choose whether or not to consume depending on how much of a contribution they expect it to make to the quality of their financial decision-making. This construct has not, however, been tested empirically. In this study we analyse variations in FL on the part of individuals who experience major life-cycle events that show up in the data and that can be assumed to have repercussions on their personal finances. The analysis of a panel made up of approximately 12,000 people indicates that there is a correlation between 13 of the 17 selected life events and financial decisions, but only one of those events (job training) is associated with a change in FL. This evidence casts doubt upon the conceptualization of FL as an economic good and is in line with a series of other studies that, for one reason or another, have questioned the soundness of the current conceptual approach to FL.

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I

Introduction

Financial markets are becoming increasingly complex and are becoming accessible to more and more people. Because of this, individuals' ability to optimize their finances is presumed to have a substantive influence on their well-being (see, for example, Hilgert, Hogarth and Beverly, 2003, and Campbell and others, 2011). This is the origin of the concept of "financial literacy" (FL) as a characteristic that has a decisive influence on an individual's ability to optimize his or her financial standing position.

While the different empirical approaches used to measure people's FL have come in for criticism, it can be argued that the levels of FL found in the general population are substantially lower than they should be (Hogarth and Hilgerth, 2002; Miles, 2004; Christelis, Jappelli and Padula, 2005; Lusardi and Mitchell, 2007a and 2007b; Lusardi, Mitchell and Curto, 2010; Landerretche and Martínez, 2011; Van Rooij, Lusardi and Alessie, 2011; Stone and Neumann, 2012, among others). This has consistently been found to be the case in all the countries for which data are available, and FL levels are particularly low among the poorer segments of the population and among women. It has been observed that this FL deficit not only has a detrimental impact on individuals but has also played a harmful role in markets and in recent global financial crises (Gerardi, Goette and Meier, 2010). Many countries have therefore begun to implement programmes designed to boost the population's FL levels in the belief that the social benefits of this type of initiative will far outweigh its costs.

Analyses of such programmes' impact on financial behaviour have not yielded straightforward results, however (see, for example, Lyons and others, 2006; Hathaway and Khatiwada, 2008; Servon and Kaestnert, 2008; Willis, 2009; Mandell and Klein, 2009). A number of authors attribute this to the FL literature's lack of a sound conceptual framework (Mason and Wilson, 2000; Willis, 2008; Remund, 2010, and Huston, 2010).

In order to develop better policies and impact assessments in this area, a fuller understanding of the process of FL accumulation and decumulation (FLAD)

is needed. Thus far, only a very few in-depth studies (Delavande, Rohwedder and Willis, 2008, and Agarwal and others, 2009) have focused on how FL levels may change over people's life cycles or over time or how they may be altered by changes in the surrounding environment.

There is no consensus in the literature regarding the conceptualization of FL (Huston, 2010). Mason and Wilson (2000) have looked into the meaning of "financial literacy", while Remund (2010) says that experts and consumer advocates use the term "to describe the knowledge, skills, confidence and motivation necessary to effectively manage money." Clearly, there are a number of different definitions of FL (based on such factors as numeracy, financial behaviour, knowledge and others) but very little clarity about the decision-making process and what role FL plays in that it.[1]

The approach most commonly taken in the literature is to treat FL as an economic good whose accumulation is optimized on the basis of its expected contribution to an individual's decision-making process. This amounts to an implicit adoption of the model of FL as an "information good" (Bates, 1990), although some authors use a human capital model instead (see, for example, Delavande, Rohwedder and Willis, 2008). In both cases, the underlying idea is that FL is an economic good about which individuals arrive at optimization-based consumption decisions. FLAD patterns will therefore presumably be influenced by the expected benefit and expected cost of FL acquisition. If the expected benefit increases or the cost decreases, a person can be expected to acquire more FL. This is the origin of the idea that it is desirable to educate people about the importance of FL and to reduce the cost and effort involved in acquiring it. Here, this view will be referred to as the "economic model of FL."

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[1] Van Rooij, Lusardi and Alessie (2011), for example, pose questions that allow them to measure numeracy and basic knowledge related to the working of inflation and interest rates, as well as questions designed to measure more advanced financial knowledge related to financial market instruments (stocks, bonds, and mutual funds). Lusardi and Mitchel (2006) and Stone and Neumann (2012) use a measurement of preparedness for retirement. Lusardi (2008) uses a measurement of knowledge about basic financial concepts, while Fajnzylber, Plaza and Reyes (2009) and Hastings and Tejeda-Ashton (2008) focus on variations in the amount of financial information provided to individuals or the format in which it is supplied.

Yet, despite the fact that this approach is so widely used, no empirical assessments have been made of how well the fit between the economic model of FL and FLAD patterns is.

The main objective of this study is to arrive at just such an assessment. In the economic model of FL, the occurrence of an event that has long-term financial implications for a given person will raise the expected value of FL, since the incorporation of new information (the event) may make it necessary to take certain financial decisions. If the occurrence is exogenous to FL, then FL will be expected to increase in response to the event. The impact of events having financially significant implications on individuals' FL was estimated using a representative sample of the Chilean population for the period 2004-2009. The sample corresponds to that used in four rounds (2002, 2004, 2006 and 2009) of a panel survey (the Social Protection Survey); a fifth round was conducted in 2012, but the data from that round are not yet available. These longitudinal data include a module on financial knowledge and skills.

The results of this analysis indicate that there is no significant, consistent variation in FL when an event having substantial financial implications occurs. The study therefore concludes that FL does not behave like an economic good.

The following section covers the data, the selected events, the FL indicators and the statistical analyses used in this study. Sections III and IV report the results and present a discussion of the findings.

II

Methodology and data

In the economic model of FL, the benefit of FL is defined as its expected impact on financial decision-making. If the expected trends in people's income and expenditure flows change, and they therefore have a strong reason to re-evaluate their financial situation, then the expected benefit of acquiring FL will rise. If, at the same time, the cost of acquiring FL remains constant, people would be expected to acquire more FL. A comparison of measurements of FL before and after a change in the expected trend of income and expenditure flows ought to reflect a positive effect under these circumstances.

For this study, we used survey data to select a series of observable events that can reasonably be supposed to trigger changes in people's expected income and expenditure flows. These events are of a sort that has far-reaching, multidimensional effects on people's lives and include changes in civil status, health, job training status and household composition. It is unlikely that changes in FL could be the factor that would bring about these transitions, and it is therefore reasonable to assume that they are exogenous to FL. It can also be reasonably assumed that, given the amount of time between one survey and the next (two years), most of the people concerned will have resolved the attendant time constraints and will have avoided paying a higher "price" to acquire FL. Under these assumptions, we should find some extent of a positive correlation between the events in question and people's financial behavior.

The methodology used for this study was based on the regression of an FL indicator with the occurrence of these events while controlling for fixed effects at the individual level and for variables that change over time. Panel data were used for a sample of approximately 14,000 people over a span of seven years. The events were selected beforehand and those that exhibited a correlation with changes in people's financial portfolios were retained. In addition to fixed effects at the individual level, the econometric model incorporated variations in people's incomes as a control variable, and an independent analysis was conducted of each age, sex and education-level subgroup.

Another reason for using the events that were selected for this study is that they are ones that usually involve coordination with government agencies, which facilitates the implementation of public policies dealing with personal finances. This is why it is so important to understand the FL patterns associated with these events, which can also create "teachable moments" (i.e., certain types of health and education learning opportunities) (Hansen, 1998; Syvertzen, Stout and Flanagan, 2009; Demark-Wahnefried and others, 2005; McBride, Emmons and Lipkus, 2003; McBride and Ostroff, 2003, among

others) that may also be applied to the field of FL (Willis, 2008; GAO, 2004; Mandell and Klein, 2007 and 2009). During these teachable moments, people are unusually receptive and are actively seeking out information.

1. Data

The data used in this study are drawn from the longitudinal Social Protection Survey, which is conducted roughly every two years in order to obtain information about the operation and development of the social protection system in Chile (Bravo and others, 2004). This study uses data from the last three rounds for which results are available (2004, 2006 and 2009). The questionnaire used in the previous round (2002) was substantially different from the one used in the following rounds, so the 2002 questionnaire could not be used to construct comparable measurements of variables such as income

and expenditure. A brief quantitative description of the database is given in table 1.

The first Social Protection Survey round, conducted in June 2002 and January 2003, used a representative nationwide sample of 17,246 persons registered with the country's pension system. The second round (November 2004-May 2005) included a sample of approximately 3,000 people who were not covered by the pension system. In the third and fourth rounds (2006 and 2009), only people who had been surveyed in one of the previous rounds were covered. The 2006 round included a new module on financial knowledge and non-cognitive skills.

Balancing panel data from the last three rounds yields a sample with a total of 12,223 observations per round, with 5,905 men (48.3%) and 6,318 women (51.7%). The distribution of the sample by age group and level of education is shown in table 1.

TABLE 1

Number of observations per Social Protection Survey round, 2004-2009

| | 2004 | | | | 2006 | | | | 2009 | | | |
| | Total | | Current contributors to the pension system | | Total | | Current contributors to the pension system | | Total | | Current contributors to the pension system | |
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
Men	5 905	48.3	4 346	54.6	5 905	48.3	4 200	55.1	5 905	48.3	4 442	54.5
Women	6 318	51.7	3 611	45.4	6 318	51.7	3 423	44.9	6 318	51.7	3 699	45.4
Age<35	1 663	13.6	1 092	13.7	1 358	11.1	973	12.8	976	8	790	9.7
34<age<55	5 040	41.2	3 737	47	4 786	39.2	3 453	45.3	4 321	35.4	3 351	41.2
54<age	5 522	45.2	3 130	39.3	6 081	49.8	3 198	41.9	6 928	56.7	4 002	49.1
Educ<=12	9 990	81.7	6 122	76.9	9 935	81.3	5 765	75.6	9 951	81.4	6 177	75.9
12<educ	2 235	18.3	1 837	23.1	2 290	18.7	1 859	24.4	2 274	18.6	1 966	24.1
Total	12 223	100	7 959	100	12 223	100	7 624	100	12 223	100	8 143	100

Source: Prepared by the authors, on the basis of data from the Social Protection Survey.

2. Selection of events

The events that were selected meet the following criteria: (i) they are presumably associated with a reassessment of people's long-term financial positions; (ii) they are captured by the available data; and (iii) they exhibit a significant correlation with changes in the consumption of financial goods.

A number of such events were selected beforehand. For each of the consecutive rounds (2004-2006 and 2006-2009), each of these events was coded as 1 or 0, depending on whether or not it occurred. The initial list included 17 events:

1. Birth of a child
2. Retirement of a member of the household (other than the interviewee)
3. Marriage
4. Divorce
5. Widowed
6. Award of a professional degree
7. Award of a diploma
8. Completion of a job training or in-service training course
9. Learning a trade
10. Commencement of a person's first permanent job
11. Becoming unemployed
12. Re-employment
13. Retirement
14. Disablement
15. Termination of a period of disablement
16. Deterioration in health status
17. Improvement in health status

The frequencies of occurrence of each of these events for each consecutive pair of survey rounds and for each category are shown in table 2. These 17 events can be grouped into six categories: changes in household structure, changes in civil status, changes in level of education, training, changes in occupational status and changes in health status.

The next step is to confirm that these events actually are associated with a change in financial behaviour. In order to do so, we measured the correlation between the occurrence of these events and changes in four variables that entail some sort of interaction between the person concerned and the financial system. These variables are: (i) changes in savings rate; (ii) changes in total debt over income; (iii) changes in health insurance, and (iv) changes in the amount of insurance.

The econometric model used to find correlations was a linear fixed-effect model, since this allowed us to make sure that any omitted static variable that did not interact with the dynamic variables would not influence the results. The incidence of homogeneous phenomena caused by a round or time effect is partially captured by the constant:

$$\Delta Y_{it} = \sum\nolimits_{j=1}^{17} \beta_j \Delta X_{ijt} + \Delta income_{it} + \Delta household\_income_{it} + d_{region\ it} + d_{34} + \delta + \Delta \varepsilon_{it} \quad (1)$$

where Y denotes the variable of interaction with the financial system, X corresponds to the vector of the 17 events and δ to the constant, $i = 1…N$ indicates the individual concerned, d_{34} is a dummy variable that indicates whether the difference is in the 2006-2009 rounds rather than in the 2004-2006 rounds, d_{region} is a dummy that captures temporal heterogeneity by region, $\Delta income$ is the variation in the logarithm of the interviewee's inter-round income, $\Delta income\_household$ is the variation in the logarithm of the income of the rest of the household members and $t = 1,2$ corresponds to the periods 2004-2006 and 2006-2009, respectively. It is assumed that the variables for all the rest of the observables and unobservables are sufficiently fixed to be eliminated from the model or that they change over time in a similar way for all the individuals concerned and are therefore incorporated in the constant. The rest of the assumptions made by Liker, Augustyniak and Duncan (1985) are also used to obtain consistent, unbiased estimators.

The results of these regressions are shown in table 3. Each of the four variables that capture interaction with the financial system is analysed separately.

The criterion used to construct the definitive list of events was the existence of a correlation having a significance level of at least 10% between the event and one of the indicators of interaction with the financial market. This exercise allows us to immediately rule out four events: retirement of a household member, divorce, and the two types of changes in employment status.

In order to rule out the presence of multicollinearity, inter-event correlations were examined. All of these correlations were under 0.1 except in a few cases during the second period and, even in those cases, the correlation was barely above that figure.

TABLE 2

Distribution of the occurrence of the selected events, by round and category, 2004-2009
(Number of observations)

Event	Round	Total			Men			Women			Young people			Adults			Older adults			Education < 13			Education > 12		
		0	1	n.a.	0	1	n.a.	0	1	n.a.	0	1	n.a.	0	1	n.a.	0	1	n.a.	0	1	n.a.	0	1	n.a.
1	2004-2006	11 592	599	32	5 581	301	23	6 011	298	9	1 161	194	2	4 550	224	9	5 879	181	21	9 466	446	21	1 995	146	10
	2006-2009	11 655	534	34	5 620	260	25	6 035	274	9	828	145	2	4 130	186	4	6 697	203	28	9 540	386	23	1 972	141	10
2	2004-2006	10 913	623	687	5 289	280	336	5 624	343	351	1 206	67	84	4 494	98	193	5 213	458	410	8 881	475	577	1 910	140	101
	2006-2009	10 692	649	882	5 235	269	401	5 457	380	481	869	48	58	4 008	74	238	5 815	527	586	8 726	508	715	1 834	135	154
3	2004-2006	11 674	339	210	5 639	176	90	6 035	163	120	1 266	62	29	4 588	102	95	5 820	175	86	9 476	274	183	2 066	61	24
	2006-2009	11 386	451	386	5 496	238	171	5 890	213	215	870	57	48	4 017	160	143	6 499	234	195	9 265	356	318	1 981	93	49
4	2004-2006	11 940	73	210	5 784	31	90	6 156	42	120	1 324	4	29	4 646	44	95	5 970	25	86	9 698	52	183	2 106	21	24
	2006-2009	11 734	103	386	5 691	43	171	6 043	60	215	921	6	48	4 124	53	143	5 545	44	195	9 545	76	328	2 048	26	49
5	2004-2006	11 927	86	210	5 784	31	90	6 143	55	120	1 325	3	29	4 674	16	95	5 928	67	86	9 670	80	183	2 121	6	24
	2006-2009	11 721	116	386	5 702	32	171	1 019	84	215	927	0	48	4 162	15	143	5 632	101	195	9 513	108	328	2 070	4	49
6	2004-2006	12 148	75		5 870	35		6 278	40		1 318	39		4 771	14		6 059	22		9 933	0		2 078	73	
	2006-2009	12 150	73		5 873	32		2 677	41		939	36		4 308	12		6 903	25		9 949	0		2 051	72	
7	2004-2006	11 867	273	83	5 732	141	32	6 135	132	51	1 302	48	7	4 637	111	37	5 928	114	39	9 682	182	69	2 050	89	12
	2006-2009	11 985	165	73	5 775	88	42	6 210	77	31	943	21	11	4 222	72	26	6 820	72	36	9 795	104	50	2 054	56	13
8	2004-2006	11 285	855	83	5 373	500	32	5 912	355	51	1 213	137	7	4 350	398	37	5 722	320	39	9 408	456	69	1 751	388	12
	2006-2009	11 736	414	73	5 640	223	42	6 096	191	31	910	54	11	4 119	175	26	6 707	185	36	9 689	210	50	1 911	199	13
9	2004-2006	11 848	292	83	5 747	126	32	6 101	166	51	1 295	55	7	4 617	131	37	5 936	106	39	9 647	222	69	2 071	68	12
	2006-2009	11 988	162	73	5 782	81	42	6 206	81	31	950	14	11	4 222	72	26	6 816	76	36	9 772	127	50	2 078	32	13
10	2004-2006	11 711	512		5 679	226		6 032	286		1 175	182		4 597	188		5 939	142		9 532	401		2 044	107	
	2006-2009	11 851	372		5 749	156		6 102	216		835	140		4 202	118		6 814	114		9 681	268		2 020	103	
11	2004-2006	11 163	1 060		5 472	433		5 691	627		1 200	157		4 341	444		5 622	459		9 024	909		2 019	132	
	2006-2009	11 251	972		5 471	434		5 780	538		877	98		3 945	375		6 429	499		9 118	831		2 002	121	
12	2004-2006	11 645	578		5 587	318		6 058	260		1 278	79		4 545	240		5 822	259		9 440	493		2 067	84	
	2006-2009	11 658	565		5 596	309		6 062	256		907	68		4 069	251		6 682	246		9 483	466		2 026	97	
13	2004-2006	11 854	369		5 725	180		6 129	189		1 357	0		4 772	13		5 725	356		9 588	345		2 133	18	
	2006-2009	11 506	717		5 546	359		5 960	358		975	0		4 307	13		6 224	704		9 274	675		2 087	36	
14	2004-2006	11 591	613	19	5 607	287	11	5 984	326	8	1 337	19	1	4 639	138	8	5 615	456	10	9 363	555	15	2 096	52	3
	2006-2009	11 615	554	54	5 616	261	28	5 999	293	26	966	7	2	4 176	127	17	6 473	420	35	9 406	497	46	2 072	46	5
15	2004-2006	11 805	399	19	5 693	201	11	6 112	198	8	1 343	13	1	4 689	88	8	5 773	298	10	9 555	363	15	2 120	28	3
	2006-2009	11 588	581	54	5 597	280	28	5 991	301	26	962	11	2	4 202	101	17	6 424	469	35	9 377	526	46	2 071	47	5
16	2004-2006	11 993	224	6	5 824	80	1	6 169	144	5	1 351	6		4 692	91	2	5 950	127	4	9 719	209	5	2 140	11	
	2006-2009	11 989	226	8	5 803	100	2	6 186	126	6	968	7		4 252	65	3	6 769	154	5	9 737	204	8	2 104	19	
17	2004-2006	11 982	235	6	5 786	118	1	6 196	117	5	1 323	34		4 692	91	2	5 969	110	4	9 722	206	5	2 123	28	
	2006-2009	12 039	176	8	5 806	97	2	6 233	79	6	960	15		4 249	68	3	6 830	93	5	9 788	153	8	2 103	20	

Source: Prepared by the authors, on the basis of data from the Social Protection Survey.

TABLE 3

**Regressions in first differences, indicators of interaction with financial markets
in comparison to the preliminary selection of events, 2006-2009**

Event	Activity	Change in amount of insurance	Change in health insurance	Change in savings rate	Change in debt/income ratio
Birth of a child		0.089	0.053**	0.09	2.252*
Retirement of household member		0.044	0.013	0.067	-0.637
Marriage		0.115	0.054*	0.034	2.665***
Divorce		0.358	0.044	0.031	1.847
Widowed		-0.086	-0.041***	0.069	1.17
Award of a professional degree		0.626	0.236**	0.461***	6.645
Award of a diploma		0.17	0.032	0.089	2.74***
Job training		0.413***	0.082***	-0.069	1.361
Learning a trade		0.23*	0.005	-0.067	-0.191
First permanent job		-0.086	-0.011	-0.15***	0.127
Becoming unemployed		-0.092	0.003	0.044	-0.441
Re-employment		-0.009	-0.022	0.279	-7.497
Retirement of interviewee		-0.156**	-0.014	-0.129***	-0.624
Disablement		0.048	-0.037***	0.07	-0.855
Termination of a period of disablement		-0.086	-0.029***	0.055	-0.163
Improvement in health status		0.183	-0.026	-0.157***	4.737
Deterioration in health status		-0.031	-0.06***	-0.168	0.558

Source: Prepared by the authors, on the basis of data from the Social Protection Survey.

Note: * Significant at 10%; ** significant at 5%; *** significant at 1%.

3. FL indicators

Two indicators are used to measure people's stock of FL: their basic financial skills (BFS), which is determined on the basis of information drawn from the last two survey rounds, and their knowledge about the pension system (KPS), which is determined on the basis of information from the last three rounds. This second indicator is intended to capture a different dimension of FL and to replicate the exercise conducted on the basis of BFS while extending it to include the 2004 round.

(a) *Measurement of basic financial skills (BFS)*

The indicator used to measure BFS was calculated for the 2006 and 2009 rounds on the basis of responses to six questions. These questions were grouped into a submodule whose purpose was to measure people's ability to understand or perform basic mathematical and financial calculations. The questions were as follows:

1. If the probability of falling ill is 10%, how many people out of every 1,000 persons will fall ill?
2. If five people have winning lottery tickets and the jackpot is two million pesos, how much money will each person receive?
3. Suppose that you have $100 in a savings account. The account earns interest at a rate of 2% per year. If you keep the money in your account for five years, how much money will you have at the end of those five years? (four ranges of figures given).

4. Let's say that you have $200 in a savings account. The account interest at a rate of 10% per year. How much will you have after two years?
5. Suppose that you have $100 in a savings account. The account earns interest at a rate of 1% per year. The rate of inflation is 2% per year. If you withdraw your money after one year, you will be able to buy something that costs: (i) more than $100; (ii) exactly $100; (iii) less than $100; (iv) don't know or no response.
6. Is the following statement true or false?: "Using a given amount of money to buy shares in one company is less risky than using that same amount of money to buy shares in a number of different companies."

Each response is compared with the correct response to arrive at binary variables (knows/does not know). A quantitative description of the responses given by the total sample to each question is shown in the upper portion of table 4. For all the questions in both rounds, men gave a larger number of correct answers than women did. Young people generally had more correct answers for all the questions except for the question about inflation in 2009, where adults scored higher. More educated people scored higher than their less educated counterparts, with the biggest differences (differentials of over 30%) corresponding to the first three questions. As for inter-round differences, the scores on questions 2, 4, 5 and 6 were generally better for the 2006 round, while the scores on questions 1 and 3 were higher for

TABLE 4

Basic financial skills: percentage of correct answers, by round and cohort
(Percentages)

Question	Round	Total	Men	Women	Age<35	34<age<55	54<age	Educ<=12	12<educ
					Total sample				
1	2006	44.3	49.8	39.4	60.0	46.7	39.0	37.9	73.0
	2009	44.4	50.0	39.0	65.4	48.0	39.2	37.7	76.0
2	2006	40.4	45.0	36.0	48.6	42.1	37.3	35.7	62.0
	2009	38.4	43.1	34.0	51.9	41.8	34.5	33.2	63.6
3	2006	45.7	49.5	42.2	57.9	47.7	41.6	40.6	69.0
	2009	47.1	51.1	43.2	63.5	50.8	42.5	41.5	72.9
4	2006	1.7	2.3	1.1	2.4	1.8	1.5	0.7	6.1
	2009	1.3	2.0	0.6	2.2	1.4	1.0	0.5	4.9
5	2006	25.2	27.5	23.0	27.1	25.3	24.7	22.2	38.4
	2009	17.8	20.0	15.8	17.8	19.5	16.8	15.3	30.3
6	2006	43.6	46.0	41.3	49.7	45.5	40.7	40.2	59.5
	2009	40.4	43.2	37.7	48.3	45.1	36.4	37.1	55.9
					Current contributors to the pension system only				
1	2006	51.9	54.6	48.6	62.0	51.9	48.9	45.0	73.3
	2009	52.3	55.9	48.0	67.7	51.8	49.9	45.2	76.7
2	2006	45.9	48.6	42.6	49.6	45.9	44.9	40.7	62.5
	2009	44.5	47.0	41.5	53.4	45.2	42.3	38.9	63.8
3	2006	51.6	53.9	48.9	59.0	51.5	49.6	45.9	69.4
	2009	54.9	56.8	52.6	66.5	55.1	52.6	49.0	74.3
4	2006	2.1	2.6	1.6	1.9	2.1	2.2	0.9	5.9
	2009	1.6	2.3	0.8	2.2	1.7	1.5	0.6	4.9
5	2006	27.5	29.1	25.5	27.3	26.7	28.3	23.8	38.7
	2009	20.2	21.8	18.3	18.4	20.9	19.9	17.2	30.2
6	2006	47.3	48.6	45.6	50.7	47.2	46.3	43.3	60.0
	2009	44.9	46.3	43.2	48.1	47.4	42.2	41.5	55.9

Source: Prepared by the authors, on the basis of data from the Social Protection Survey.

the 2009 round; these differentials were generally less than 5%, however, except in the case of question 5 (on inflation), where the differential amounts to 7%.

The same information is given in the lower portion of table 4 for the subgroup of persons who were paying into the pension system at the time they were interviewed. In general, the differentials between rounds and categories are much the same as they were in the first case, but the scores are higher In all cases with the exception of the scores for more highly educated persons. This is no doubt due to the existence of a correlation between having a higher level of education and the probability that the person is paying into the pension system.

(b) *Measurement of knowledge about the pension system (KPS)*

The 2004, 2006 and 2009 rounds of the Social Protection Survey included over 30 questions designed to measure people's knowledge about the pension system. This makes it possible to construct a KPS indicator that can be used in conjunction with the BFS indicator.

Because the wording of some of the questions differed from one round to the next, and given the findings of Lusardi, Mitchell and Curto (2012) regarding the ways in which differences in the wording of questions can significantly influence the answers given, we decided to use only those questions which were worded in the same way in all three rounds. This left us with 11 questions:

1. Do you know what percentage of your taxable income is deducted (was deducted or would be deducted) each month for social security tax? [Between 11.1% and 13]
2. Do you know how the pension fund management boards (AFPs) calculate pension benefits? [On the basis of the balance in the individual pension account, retirement age or other factors]
3. Do you know about or have you heard about the Voluntary Retirement Savings (Ahorro Previsional Voluntario (APV)) system that has been in place since 2002?
4. Do you know how much you have in your individual pension account?
5. Do you know how much of a commission your AFP charges for managing your funds?
6. Do you know about or have you heard about multi-funds?
7. Do you know how many different types of funds there are? [5]

8. Do you know what type of fund your pension contributions are in?
9. By law, at what age can a man begin to draw his pension? [65]
10. By law, at what age can a woman begin to draw her pension? [60]
11. Do you know what the different types of old-age pensions are? [Scheduled withdrawals, life annuities, fixed-term withdrawals with a deferred life annuity and immediate life annuities with scheduled withdrawals]

The responses to questions 1, 2, 7, 9, 10 and 11 can be checked, whereas the answers to the other questions consist of statements about the person's knowledge. Bravo and others (2004, 2006 and 2008) report some discrepancies between self-reported knowledge and actual knowledge, but they nonetheless find a close correlation between the two. Chan and Huff (2003) find that responses regarding self-reported knowledge

provide supplementary data about the importance that people attribute to the information referred to in the question and about their degree of assurance in that regard. Landerretche and Martínez (2011) suggest that, in order to avoid overestimating the parameters in question, the results for these types of responses should be regarded as the upper limit for accurate results when the time comes to interpret them, with the assumption being that the actual value is lower.

It is very important to note that several of these questions are posed only to people who are paying into the pension system at the time that they were interviewed. The estimates discussed in the following section include this subsample so that the results for BFS and KPS can be compared. As in the case of the BFS indicator, the responses are coded in order to obtain binary variables (correct/incorrect or knows/does not know). The percentages of correct answers in each round in each of the various categories are given in table 5.

TABLE 5

Knowledge about the pension system: percentage of correct answers, by round and cohort, 2006-2009

(Percentages)

Question	Round	Total	Men	Women	Age<35	34<age<55	54<age	Educ<=12	12<educ
1	2004	22.5	24.0	20.8	26.8	22.3	21.3	19.4	33.0
	2006	19.4	20.0	18.6	24.2	19.1	18.2	16.3	29.4
	2009	16.5	17.5	15.3	23.0	16.5	15.2	13.2	27.7
2	2004	10.8	12.0	9.4	10.3	10.8	11.1	8.6	18.1
	2006	11.4	11.9	10.8	10.9	10.8	12.2	9.5	17.6
	2009	13.1	14.4	11.5	14.7	12.3	13.4	10.8	20.4
3	2004	55.8	56.3	55.2	53.3	57.4	54.7	49.0	78.4
	2006	61.8	61.6	62.1	66.0	62.8	59.4	55.2	82.8
	2009	44.3	44.3	43.6	44.8	45.8	42.9	37.3	67.3
4	2004	50.2	53.8	46.0	44.4	51.7	50.5	47.4	59.6
	2006	50.1	53.1	46.3	41.3	52.0	50.6	47.5	58.4
	2009	43.7	46.2	40.6	35.3	45.4	43.9	41.4	51.3
5	2004	3.1	4.0	1.9	2.3	3.2	3.2	2.2	5.8
	2006	4.9	5.7	3.9	4.7	4.7	5.2	3.6	9.0
	2009	5.1	5.8	4.3	5.8	4.9	5.2	3.8	9.3
6	2004	43.6	44.5	42.5	46.9	44.2	41.7	35.4	71.0
	2006	40.9	42.8	38.6	42.3	41.5	39.8	32.7	67.2
	2009	41.5	43.5	39.2	45.1	42.3	40.2	33.1	69.6
7	2004	17.9	18.8	16.9	17.6	18.4	17.5	12.6	36.0
	2006	17.1	18.4	15.5	18.7	17.0	16.7	12.0	33.5
	2009	24.5	26.2	22.4	27.1	24.5	23.9	17.6	46.9
8	2004	29.4	31.2	27.1	31.1	30.2	27.7	21.6	55.3
	2006	30.2	32.6	27.2	31.4	30.5	29.4	22.7	53.8
	2009	35.0	37.6	31.9	39.2	36.0	33.4	26.7	62.3
9	2004	82.9	83.8	81.8	76.6	83.3	84.7	81.5	87.7
	2006	86.1	87.6	84.4	81.1	85.7	88.1	84.5	91.5
	2009	86.8	90.6	80.4	79.3	85.9	89.0	85.6	90.7
10	2004	79.0	77.7	80.6	74.1	78.6	81.1	77.0	85.8
	2006	81.6	81.4	82.4	77.6	81.6	82.8	78.8	90.7
	2009	73.9	73.7	74.1	70.3	73.8	74.8	71.4	82.1
11	2004	1.1	1.3	0.8	0.5	1.2	1.2	0.6	2.9
	2006	9.1	10.4	7.5	4.8	8.0	11.6	6.7	16.8
	2009	0.9	1.1	0.8	0.5	0.7	1.3	0.4	2.6

Source: Prepared by the authors, on the basis of data from the Social Protection Survey.

Here again, with the exception of the question about the age at which women can retire, men gave a larger percentage of correct answers to all of the questions in all of the rounds than women did. The ranking in terms of age group is not as clear here as it was in the preceding case. Young people seem to know more about the percentage that is deducted from their pay in the form of social security taxes and about how their funds are being invested, but older adults show themselves to be more knowledgeable about retirement ages and the different types of pension systems. Adults in the intermediate age group appear to know the most about how pension funds are calculated and about how much they have in their accounts. Level of education once again appears to be a significant differentiating factor in terms of the results, with the biggest differentials (around or slightly higher than 30%) being in the level of knowledge about the "solidarity insurance contribution" and about the different pension-fund investment options. The members of this group are the ones who know the least about retirement ages.

As far as inter-round differences are concerned, there does not, generally speaking, appear to be any clear-cut trend. People scored the highest on questions 1, 2, 4 and 6 in the 2004 round, the highest on questions 3, 10 and 11 in the 2006 round, and the highest on questions 5, 8 and 9 in the 2009 round. The differentials between consecutive rounds are below 5%, however, except for a 20% drop between the 2006 and 2009 rounds for the question regarding knowledge about the Voluntary Retirement Savings system. These coefficients were obtained after the panel was balanced, so the same people were the respondents in all of the rounds.

(c) *Principal Component Analysis of Ridit Scores (PRIDIT) indices*

In order to obtain the BFS and KPS indicators, interviewees' responses in each round were recoded using a psychometric methodology for analysing the principal score components (Lieberthal, 2008). A brief discussion concerning the PRIDIT methodology can be found in annex 1. This is a non-parametric technique that has also been used by Lusardi, Mitchell and Curto (2012) in a similar context to reduce the restrictions associated with some of the assumptions that are implicit in the simple average. In particular, it makes it possible to give more weight to unusual responses in the final indicator (the RIDIT component) and to the responses to questions that appear to explain the responses given to other questions.

Table 6 provides a quantitative description of these indicators. It should be noted that the indicators constructed using this technique may take on negative values and that the values obtained are comparable only within their particular context (the BFS and KPS indicators cannot be compared to one another). In order to provide a point of reference, the last two columns of table 6 show the overall average for each indicator for all the rounds and the corresponding standard deviation.

TABLE 6

Indicators of financial literacy: averages, by round and category, 2006-2009

Indicator	BFS		BFS (contributors only)		KPS		
Round	2006	2009	2006	2009	2004	2006	2009
Total	0.0166	-0.0189	0.1406	0.1138	0.0918	0.1039	0.0324
Men	0.0978	0.0710	0.1857	0.1648	0.1223	0.1410	0.0792
Women	-0.0634	-0.1050	0.0840	0.0521	0.0543	0.0571	-0.0237
Age<35	0.2332	0.2659	0.2611	0.3015	0.0871	0.1029	0.0704
34<age<55	0.0676	0.0617	0.1417	0.1319	0.0543	0.0571	-0.0237
Age>54	-0.0716	-0.1087	0.1025	0.0634	0.0767	0.0921	0.0109
Educ<13	-0.1007	-0.1296	0.0105	-0.0038	-0.0741	-0.0590	-0.1293
Educ>12	0.4562	0.4426	0.4967	0.4733	0.5706	0.5496	0.5270
Mean	0.0000		0.1277			0.0777	
Standard deviation	0.7052		0.6936			0.7513	

Source: Prepared by the authors, on the basis of data from the Social Protection Survey.
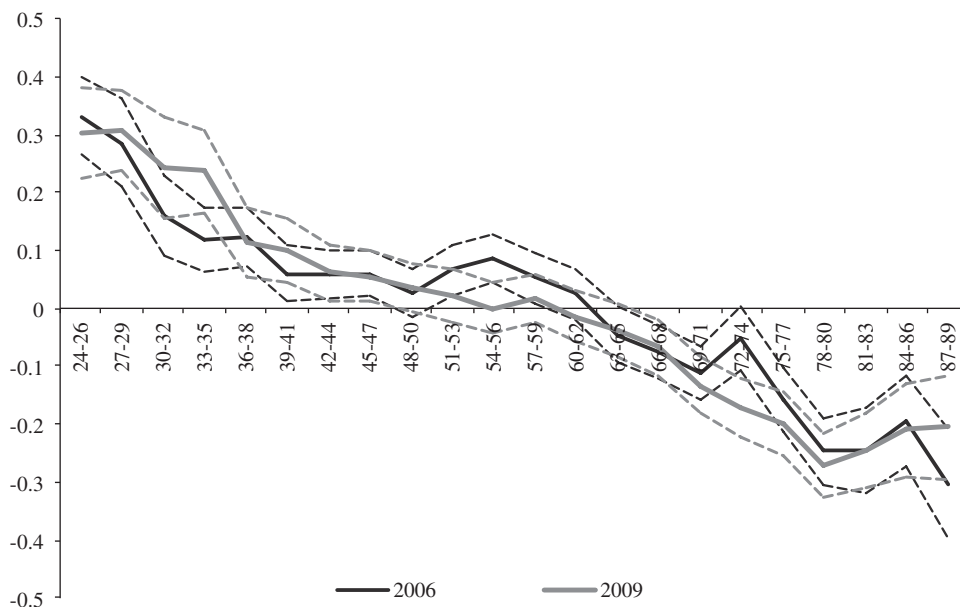
Note: BFS: Basic financial skills; KPS: Knowledge about the pension system.

As can be seen from the analysis of the responses to the survey questions, men tended to exhibit a greater extent of FL than women did. This finding is corroborated by all of the indicators, with differentials of between approximately 0.10 and 0.25 standard deviations. The value of the BFS indicator appears to decline as people age, whereas the values of the kps indicator do not exhibit any clear-cut trend (see figure 1 (A and B)).

FIGURE 1

A. Average values for the BFS indicator, by age group, for each round
(Confidence intervals of 10%)

B. Average values for the KPS indicator, by age group, for each round
(Confidence intervals of 10%)
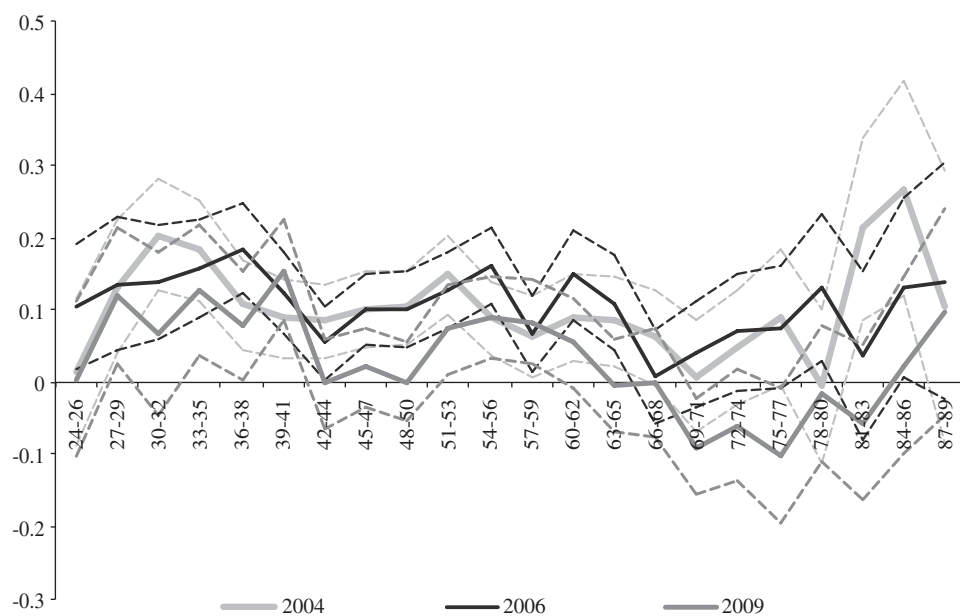
Source: Prepared by the authors, on the basis of data from the Social Protection Survey.

Note: BFS: Basic financial skills; KPS: Knowledge about the pension system.
The dotted lines indicate the confidence intervals.

4.   Statistical analysis

The statistical analysis focused on comparisons of the results for a given respondent as measured by the two FL indicators in consecutive rounds. The dependent variable is the change in the FL indicator and the independent variables are the occurrence or non-occurrence of the selected events. The 13 types of events are all included at one and the same time in the same regression.

Here too, a linear fixed-effect regression was used:

$$\Delta Y_{it} = \sum_{j=1}^{17} \beta_j \Delta X_{ijt} + \Delta income_{it}$$
$$+ \Delta\, household\_income_{it} + d_{region\ it} + d_{34} + \delta + \Delta\varepsilon_{it} \qquad (2)$$

where Y corresponds to the knowledge indicator, X to the vector for the 13 teachable moments, δ to the constant that captures the linear time effect; $\Delta income$ and $\Delta income\_household$ are the differentials in the logarithms for the income of the interviewee and for the rest of the household, respectively; d_{region} is a dichotomous variable, by region; d_{34} indicates whether the observation is for the period between 2006 and 2009; $i = 1...N$ denotes the individual in question; and $t = 1,2$ corresponds to 2006 or 2009, respectively. It is assumed that the variables for all the rest of the observables and unobservables are sufficiently fixed to be eliminated from the model. The other assumptions are the same as they were for the preceding regressions.

III

Results

An analysis of the sample as a whole yields results (shown in the first column of table 7) that generally hold true for the subsamples (see the remaining columns in table 7) as well: only 1 of the 13 events that were selected is clearly associated with variations in the FL indicator. This event —job training— has a significant impact on both basic financial skills (BFS) and knowledge about the pension system (KPS), with coefficients of 0.271 and 0.630 for the PRIDIT indicators of BFS and KPS, respectively. This is far higher than the median for these indicators (around 0.10 in both cases). None of the other 12 events had a significant impact.

In the subsamples, the only education-related event that had an impact on FL was job training.

An analysis of the subsamples by sex, age and education yields some additional results but does not reflect any pattern that could be extrapolated to the overall sample. The most salient of these results have to do with the impact of changes in health status among women and among people below 54 years of age. In these subsamples, health-related events have a positive influence on BFS but a negative one on KPS. The possible explanations for this may include the presence of divergent patterns in the appreciation and depreciation of individuals' FL stocks or to movements into and out of the labour force.

In this study, all the regressions have been replicated using indicators calculated as simple averages rather than using principal components analysis of RIDIT scores (PRIDIT). The two exercises yielded similar results.

TABLE 7

Results of the regressions

Subsample	Total sample	Men	Women	Age<35	34<age<54	54<age	Educ<=12	12<educ
Event	BFS indicator-total sample							
Birth of a child	0.154***	0.090	0.199***	0.066	0.057	0.267***	0.161**	0.018
Marriage	0.053	0.086	0.013	-0.019	0.066	0.055	0.040	0.054
Widowed	-0.187	-0.461	-0.069	0.820***	-0.427	-0.149	-0.120	-0.130
Award of a professional degree	0.180	0.045	0.274*	0.350**	-0.220	-0.003	-	-0.231*
Award of a diploma	0.129*	0.055	0.162	-0.277	0.116	0.368**	0.195**	-0.255**
Job training	0.363***	0.334***	0.360***	0.290**	0.288***	0.470***	0.297***	0.081
Learning a trade	0.034	0.211*	-0.131	0.075	-0.032	0.130	0.024	-0.093
Obtaining first permanent job	-0.060	-0.030	-0.052	-0.096	-0.096	-0.083	-0.033	0.030
Retirement	-0.287***	-0.299	-0.253***	-	-0.704***	-0.200***	-0.222***	-0.039
Disablement	-0.148**	0.008***	-0.255***	0.059	-0.032	-0.174**	-0.145**	0.128
Termination of a period of disablement	-0.056	-0.030	-0.079	0.902***	0.037	-0.068	0.002	-0.109
Improvement in health status	0.105	-0.331**	0.426***	0.560***	0.303**	-0.125	0.181	0.450*
Deterioration in health status	0.029	-0.032	0.042	0.024	-0.016	0.044	0.065	-0.110
Event	BFS indicator-persons paying into the pension system only							
Birth of a child	0.104*	0.052	0.139*	0.075	0.013	0.198**	0.114*	0.010
Marriage	0.027	0.012	0.045	-0.140	0.099	0.009	0.005	0.027
Widowed	-0.389	-0.116	-0.493	0.758***	-0.918***	-0.509**	-0.392	-0.256
Award of a professional degree	0.196*	0.000	0.325***	0.358**	-0.334**	0.177	-	-0.166
Award of a diploma	0.059	0.019	0.083	-0.411***	0.110	0.241	0.129	-0.273**
Job training	0.271***	0.263***	0.274***	0.212*	0.228***	0.338***	0.212***	0.055
Learning a trade	-0.034	0.252**	-0.248**	-0.001	-0.141	0.138	-0.020	-0.121
Obtaining first permanent job	-0.066	-0.038	-0.067	-0.193	-0.063	-0.032	-0.073	0.101
Retirement	-0.280**	-0.431***	0.163	-	-0.942***	-0.189*	-0.195*	-0.250
Disablement	0.039	0.091	0.003	-0.031	0.120	-0.011	0.028	0.115
Termination of a period of disablement	0.196**	0.188	0.225	0.776***	0.205*	0.156	0.217**	0.241
Improvement in health status	0.057	-0.361**	0.325*	0.517***	0.348**	-0.305	0.142	0.432*
Deterioration in health status	0.045	-0.089	0.163	0.091	0.008	0.041	0.051	0.020
Event	KPS indicator							
Birth of a child	0.087	0.039	0.125	-0.026	0.058	0.249**	0.105	-0.020
Marriage	0.124	0.116	0.105	0.207	-0.048	0.207	0.122	0.060
Widowed	-0.489	-0.227	-0.613**	0.988***	-0.735***	-0.635*	-0.453	-0.594***
Award of a professional degree	-0.004	0.105	-0.062	-0.212	-0.166	0.256	-	-0.444***
Award of a diploma	0.392***	0.546***	0.259**	0.315*	0.336***	0.585***	0.341***	0.184**
Job training	0.630***	0.646***	0.623***	0.709***	0.624***	0.607***	0.609***	0.301***
Learning a trade	0.241***	0.289**	0.188	0.001	0.161	0.468***	0.249***	0.138
Obtaining first permanent job	-0.214**	-0.015	-0.325***	-0.141	-0.391***	-0.016	-0.226***	-0.023
Retirement	-0.209	-0.210	-0.155	-	-0.743***	-0.155	-0.071	-0.436
Disablement	-0.211**	-0.147	-0.308**	-0.108	0.013	-0.431***	-0.224***	-0.108
Termination of a period of disablement	-0.148	-0.130	-0.183	0.000	-0.239*	-0.089	-0.132	0.042
Improvement in health status	-0.343***	-0.407**	-0.285*	-0.861***	-0.349**	-0.282	-0.206**	-0.348
Deterioration in health status	0.099	-0.067	0.232	0.537***	0.168	-0.114	0.118	0.098

Source: Prepared by the authors, on the basis of data from the Social Protection Survey.

Note: BFS: Basic financial skills; KPS: Knowledge about the pension system.

* Significant at 10%; ** significant at 5%; *** significant at 1%.

IV

Discussion

Given the importance that is generally ascribed to financial literacy (FL) in terms of its implications for people's well-being, and in view of a number of studies that indicate that the population's level of FL is quite low, various government programmes designed to increase the population's level of FL have been introduced. There is, however, no consensus in the literature as to the effectiveness of these programmes or about the robustness of the current conceptual approach to FL.

According to the most prevalent way of thinking about FL (referred to here as the "economic model of FL"), people decide how much FL to acquire based on the expected benefits that it will yield in terms of decision-making. In this study, however, the economic model of FL did not fit the data very well, since the analysis did not turn up conclusive evidence of an increase in people's FL when they experienced events that are associated with changes in financial status. This conclusion was reached by analysing two different indicators of FL, both in conjunction with one another and separately, on the basis of a panel of over 12,000 respondents who were surveyed up to four times within seven years. This sample was also divided up into several subsamples.

In short, it is not clear that the economic model is a good fit for FL. While some criticism might be aimed at this study in terms of the quality of the data or of the FL indicators or the validity of the empirical strategy that it has employed, the fact remains that it backs up a number of other studies that have, for one reason or another, cast doubt upon the soundness of the current construct of FL.

It is possible that FL cannot be reduced to a simple concept. Even in a more general context, information goods are quite complex (Bates, 1990; Rafaeli and Raban, 2003). It may also be that FL should be viewed as an individual trait which, like intelligence, does not change in the short run. A model of fluid intelligence versus crystalized intelligence has been proposed that may help us to come to grips with a possible association between FL and age (Agarwal and others, 2009). Or perhaps FL is more a matter of attitude than of knowledge per se. Yet another possibility, which would not preclude the preceding one, is that individuals update their FL in ways that cause it to appreciate and/or depreciate such that the net variation in FL is usually very small.

ANNEX 1

PRIDIT

PRIDIT (i.e., principal component analysis of RIDIT scores) is a non-parametric aggregation technique that involves using two different procedures to rank samples based on categorical observables (Lieberthal, 2008).

The RIDIT methodology has been developed to analyse categorical (in this case, binary) variables serving as proxies for unobservables (Lieberthal, 2008). The underlying reason for using the ridit methodology in this study is that an incorrect response may provide more information about a person's level of FL than a correct one, and vice versa. This is because there are some questions that most people answer correctly and, in these cases, the incorrect answers allow us to identify a particular group of individuals; by the same token, when dealing with questions that most people get wrong, the correct answers provide us with more information.

Assigning ones and zeros to all correct and incorrect answers as a basis for constructing the indicator presupposes, first, that FL is metrically measurable —an assumption that we will not take exception to— and, second, that the metric can be scaled with equal intervals between responses for each survey question (Brockett and others, 2002). RIDIT deals with this problem by using sample information for each question to assign different values or weights to the responses (Lieberthal, 2008).

In line with Brockett and others (2002), the following algorithm was used to construct the RIDIT scores in this study: $\hat{p}_{ti}$ is the sample probability of obtaining answer i for question t, where $i = 0,1$ is the number of categories corresponding to answer t. RIDIT scores are therefore determined as follows:

$$R_{ti} = \sum_{j < i} \hat{p}_{tj} - \sum_{j > i} \hat{p}_{tj}$$

Thus, rather than assigning zeros and ones, we assign R_{t0} and R_{t1} to the answers to each question t. This score rises monotonically in the different categories, with the original classification being maintained at the same time that $E(R_t) = 0$ is fulfilled. In the words of Brockett and others (2002), this method "eliminates the necessity of assigning integer values in an ad hoc fashion and improves the statistical characteristics of the resulting scored data for subsequent standard statistical analysis, whatever it is" (Brockett and others, 2002).

PRIDIT: once the RIDIT scores for each question have been obtained, the principal component analysis weights the questions on the basis of how important a role the play in terms of the variance of the final scores. A convergent algorithm is used to compute the weightings, with the questions that are the least correlated with a linear combination of the other questions being given a greater weighting, since they are the ones that provide the most information. In other words, greater attention is devoted to the "strangest" answers when the time comes to compute the final scores (Lusardi, Mitchell and Curto, 2012).

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