Exploring **Financial Wellbeing and Literacy Disparities** across Population Groups in Ireland

Technical Appendix

CCPC

Coimisiún um Iomaíocht agus Cosaint Tomhaltóirí | Competition and Consumer Protection Commission

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1 Technical Appendix

This appendix is a companion paper to the report "Exploring Financial Wellbeing and Literacy Disparities across Population Groups in Ireland", published by the Competition and Consumer Protection Commission (CCPC) in 2024.[1] It provides technical details regarding the econometric approach to estimating group differences in financial wellbeing, as well as the association between financial wellbeing and financial literacy. This section will present the methodology, the results of the financial wellbeing models, and the results of our financial literacy model. These detailed results are added to provide technical details behind the findings presented in summaries of the published report.

1.1 Methodology

This report estimates group differences in financial wellbeing, while controlling for financial literacy. To avoid biased estimates we must take account of two issues; first, literacy varies by components of wellbeing, and second literacy requires resources. These two issues suggest that the association between literacy and wellbeing is endogenous. Thus, we develop a framework to explicitly consider endogeneity of literacy to explain wellbeing, starting with an OLS model for baseline comparison and then building the specification to include 2SLS and 3SLS models which explicitly account for endogeneity. The model specifications can be summarized as follows:

OLS Model:

$$lnY = \alpha + \boldsymbol{\beta X} + \boldsymbol{\gamma D} + lnZ + \varepsilon$$

2SLS Model

$$lnY = \alpha + \boldsymbol{\beta X} + \boldsymbol{\gamma D} + \varphi(\widehat{lnZ} = \boldsymbol{\delta W}) + \varepsilon$$

3SLS Model

$$lnY = \alpha + \boldsymbol{\beta X} + \boldsymbol{\gamma D} + \varphi\left(\widehat{lnZ} = \boldsymbol{\delta W}\right) + \varepsilon$$

$$lnZ = \alpha + \boldsymbol{\beta X} + \boldsymbol{\gamma D} + \varphi(\widehat{lnY} = \boldsymbol{\delta W}) + \varepsilon$$

Where:

Observations are individual scores and records from the OECD International Survey of Adult Financial Literacy 2023.

lnY – is the outcome variable – the natural log of OECD financial wellbeing score. This score is scaled to 100, hence taking the natural logs makes the model/coefficients on the key variables proportional and thus scale-independent. The general direction and conclusions and statistical significance of the models had no sensitivity to this assumption.

$\boldsymbol{X}$ – is a matrix of exogenous resources and economic status variables, including income group, economic status, education. In the 2SLS and 3SLS regressions we also included two variables as proxies of well-being: whether the respondent "currently holds" advanced or higher yielding assets

[1] Available for download here.

such as stocks or bonds and whether they held high-interest cost, poor value loans such as buy-now-pay-later.

$\boldsymbol{D}$- is a matrix of exogenous demographic variables including age, ethnicity, household composition, gender, country of birth.

$\boldsymbol{W}$– is a set of instrumental variables which are expected to impact the right-hand side endogenous variable but are excluded from the 2nd stage equation. These variables included education as well as whether a respondent "heard of" stocks and bonds or novel assets such as crypto and buy-now-pay-later (thus giving an indicator of knowledge but not wellbeing). These are included only in the 2SLS and 3SLS equations. We discuss the choice of instruments and these variables further below with the results.

lnZ – is log of the OECD financial literacy score. In the OLS model this is assumed exogenous while the 2SLS and 3SLS models relax this assumption. A first stage regression is used to obtain a predicted value (indicated by the hat). In the 3SLS regressions, a first stage regression is also used to obtain $\widehat{lnY}$ as an endogenous regressor for lnZ.

$\boldsymbol{\varepsilon}$ – is an appropriate assumed random error term.

$\boldsymbol{\alpha}$, $\boldsymbol{\beta}$, $\boldsymbol{\gamma}$, $\boldsymbol{\delta}$, and $\boldsymbol{\varphi}$ - are parameters to be estimated.

Sample

We use data from the OECD's 2023 International Survey of Adult Financial Literacy throughout. In most participating countries, data was collected by national authorities or research institutions. In Ireland, data was collected by Ipsos MRBI, and was overseen by the CCPC. Data collection took place between 16 December 2022 – 1 March 2023, where survey interviews consisted of a random sample of the population and were completed by phone.

There are 1,505 individuals in the sample, and their demographics are presented in Table 1.1. Females represent 40.25% of the sample. While age is recorded as an integer in the survey, most respondents fall within the 30-50 age group (56.20%), followed by the 60+ age group (32.75%). About 62.44% have attained tertiary or post tertiary education, and about 53.76% of respondents are employed. Income is categorised into three groups - low (up to €2,750 per month), medium (between €2,750 and €4,500 per month), and high (over €4,500 per month). The distribution of respondents across income groups is relatively balanced, with 29.45% of respondents falling in the low-income group, 33.75% in the medium-income group, and 34.48% in the high-income group. About 33.75% of respondents live in as a couple with kids; followed by couples with no kids who live alone (26.64%), and people who live alone (17.14%).

Table 1.1: Summary Statistics for Gender, Age, Education, Economic Status, Household Composition, Income		
		Full Sample (% of Respondents)
Gender	Female	40.25%
	Male	59.75%
	Number of Observations	**1,503**
Age	19-29	11.05%
	30-59	56.20%
	60+	32.75%
	Number of Observations	**1,475**
Education	Tertiary	62.44%
	Secondary	33.69%
	Primary or less	3.87%
	Number of Observations	**1,499**
Economic Status	Employed	53.76%
	Self-employed	13.44%
	Unemployed	3.13%
	Inactive	29.34%
	Other	0.33%
	Number of Observations	**1,503**
Household Composition	Lives alone	17.14%
	Couple no kids live alone	26.64%
	Couple with kids (any age)	33.75%
	Lone parent does not live with relative	5.12%
	No partner no kids with relative	8.90%
	Other including house sharing couples	8.44%
	Number of Observations	**1,505**
Income	Up to €2750 a month	29.45%
	Between €2750 and €4500 a month	36.06%
	€4500 or more a month	34.48%
	Number of Observations	**1,392**

Source: Authors' analysis of OECD Ireland data

Measures

We use methodological guidance from the OECD/INFE Toolkit for Measuring Financial Literacy and Financial Inclusion (2022) to construct measures for financial wellbeing and financial literacy. The toolkit's framework provides instructions for defining and assessing financial wellbeing and literacy, drawing extensively from established surveys and existing literature. These two measures are derived from respondents' answers to the survey.

Our financial wellbeing measure, guided by the latest INFE/OECD guidelines, consolidates established indicators for financial wellbeing from previous literature into an overall score in index format. More specifically, financial wellbeing is based on specific questions that explore elements such as current and future finances, assessing people's objective and subjective perceptions for financial wellbeing. Key components include questions on retirement planning; questions about debt and additional measures previously demonstrated to be reliable indicators for financial wellbeing. One of these indicators assesses the respondent's ability to pay for a major expense equivalent to the respondents' monthly income. Each question is coded as a binary variable - answers which are agreeable to wellbeing are given a value of 1; answers which are neutral/disagreeable to wellbeing (or missing) are given a value of 0. The overall score for financial wellbeing is obtained by combining objective and subjective questions into an overall measure standardised to score out of 100. Variable descriptions and responses to questions on financial wellbeing are presented in Table 1.2 below.

Table 1.2: Definition of Financial Wellbeing and Summary Statistics		
Question in OECD/INFE Survey	**Coding**	**Full Sample (% with score = 1)**
1. If you, personally, faced a major expense today – equivalent to your own monthly income – would you be able to pay it without borrowing the money or asking family or friends to help?	=1 if Yes; =0 if No	80.41%
2. Sometimes people find that their income does not quite cover their living expenses. In the last 12 months, has this happened to you, personally?	=1 if No; =0 if Yes	75.33%
3. If you lost your main source of income today, how long could you continue to cover your living expenses, without borrowing any money or moving house?	=1 if At least three months, but not six months, OR if Six months or more ; =0 otherwise	71.40%
4. I have money left over at the end of the month	=1 if Always, OR if Often; 0= otherwise	60.45%
5. I am satisfied with my present financial situation	=1 if Completely Agree, OR if Agree; =0 otherwise	57.61%
6. My financial situation limits my ability to do the things that are important to me	=1 if Completely Disagree, OR if Disagree; =0 otherwise	47.93%
7. I have too much debt right now	=1 if Completely Disagree, OR if Disagree; =0 otherwise	74.93%
8. I tend to worry about paying my normal living expenses	=1 if Never, OR if Rarely; =0 otherwise	56.26%
9. My finances control my life	=1 if Never, OR if Rarely; =0 otherwise	55.09%
10. Because of my money situation, I feel like I will never have the things I want in life	=1 if Very Little, OR if Not at all; =0 otherwise	65.57%
11. I am concerned that my money won't last	=1 if Very Little, OR if Not at all; =0 otherwise	52.64%
12. I am just getting by financially	=1 if Very Little, OR if Not at all; =0 otherwise	45.21%
Number of Observations		**1,505**

Note: questions refer to the OECD/INFE Toolkit for Measuring Financial Literacy and Financial Inclusion 2022 (OECD, 2022). Question 1 to Question 4 represent the objective component of financial wellbeing; Question 5 to Question 12 represent the subjective component of financial wellbeing, as per the latest OECD guidelines. The objective component is based on the sum of the four statements (with a score out of four, standardised to 50). The subjective component is based on the sum of the eight statements (with a score out of eight, standardised to 50). The total financial wellbeing score is based on the sum of the objective and subjective components.

The financial literacy measure is a combination of financial knowledge, financial behaviour, and financial attitude measures and these are also defined in OECD Toolkit (OECD, 2022).

The financial knowledge score considers respondents' level of understanding on basic financial concepts. This measure includes the "Big Three" financial literacy questions on understanding inflation, interest rates and risk diversification, which were adapted to ensure applicability to OECD countries. Responses to questions on financial knowledge are summarised in Table 1.3 below. Most respondents answered the simple interest rate questions correctly. However, comprehension of compounding interest rates posed more difficulty, with 41.00% of respondents answering this question correctly.

Table 1.3: Distribution of Responses (%) to Financial Knowledge Questions by Gender

Text of Question in the OECD/INFE Survey	Female	Male
Inflation Question 1. Five brothers must wait for one year to get their share of the €1,000 and inflation stays at 9 percent. In one years' time will they be able to buy more/same/less?		
a. More with their share of the money than they could today	12.2%	12.5%
b. The same amount	9.3%	4.9%
c. Less than they could buy today (correct)	50.6%	64.6%
d. It depends on the types of things that they want to buy (correct)	19.5%	13.1%
c. Don't know	8.1%	4.6%
e. Refused	0.3%	0.1%
f. Irrelevant answer	0.0%	0.2%
Understanding Interest Rate Question (open response) 2. You lend €25 to a friend, and he gives you €25 back the next day. How much interest has he paid on this loan?		
0 (Correct)	91.4%	94.2%
Answer different than 0	1.3%	1.3%
Don't Know	6.4%	3.5%
Irrelevant Answer	0.8%	1.0%
Simple Interest Rate Question (open response) 3. Someone puts €100 into a tax-free savings account with a guaranteed interest rate of 2% per year. They don't make any further payments into this account, and they don't withdraw any money. How much would be in the account at the end of the first year, once the interest payment is made?		
102 (Correct)	64.3%	79.5%
120 (Incorrect)	4.5%	3.0%
Other incorrect Answers	10.4%	8.2%
Don't Know	19.8%	7.9%
Irrelevant	1.0%	1.3%

Note: questions refer to the OECD/INFE Toolkit for Measuring Financial Literacy and Financial Inclusion 2022 (OECD, 2022).

Table 1.3 (cont.): Distribution of Responses (%) to Financial Knowledge Questions by Gender		
Text of Question in the OECD/INFE Survey	**Female**	**Male**
Compounding Interest Rate Question 4. Someone put €100 in a tax-free savings account with a guaranteed interest rate of 2% per year. How much would be in the account at the end of five years remembering there are no fees or tax deductions?		
a. More than $110 (Correct)	39.2%	59.2%
b. Exactly $110	33.4%	23.9%
c. Less than $110	3.6%	2.8%
d. Impossible to tell from the information given	14.2%	9.8%
e. Don't know	8.8%	3.7%
f. Refused	0.5%	0.2%
g. Irrelevant answer	0.3%	0.3%
Return-risk Question 5. An investment with a high return is likely to be high risk.		
False	8.6%	6.2%
True (Correct)	88.9%	92.7%
Don't know	2.5%	1.1%
Inflation and Cost of Living Question 6. High inflation means that the cost of living is increasing rapidly.		
False	1.5%	1.1%
True (Correct)	97.9%	98.3%
Don't know	0.7%	0.6%
Risk Diversification Question 7. It is usually possible to reduce the risk of investing in the stock market by buying a wide range of stocks and shares.		
False	25.6%	17.4%
True (Correct)	60.8%	77.1%
Don't know	13.6%	5.2%
Refused	0.0%	0.3%
Number of Observations	**1,503**	
Note: questions refer to the OECD/INFE Toolkit for Measuring Financial Literacy and Financial Inclusion 2022 (OECD, 2022).		

The financial behaviour score measures the propensity of respondents to exhibit various behaviours that are considered by the OECD to be 'financial savvy', using questions relating to budgeting decisions, saving, borrowing, and paying bills on time. In general, respondents have good financial behaviour in Ireland. Data show a high rate of budgeting among respondents (91.43%), with 51.23% of respondents setting financial goals. This data is summarised in Table 1. below.

Table 1.4: Definition of Financial Behaviour and Summary Statistics		
Text of Question in the OECD/INFE Survey	**Coding**	**Full Sample (% of respondents with score = 1)**
1. Do you do any of the following for yourself or your household? — Make a plan to manage your income and expenses — Keep a note of your spending — Keep money for bills separate from day-to-day spending — Make a note of upcoming bills to make sure you don't miss them — Use a banking app or money management tool to keep track of your spending — Arrange automatic payments for regular outgoings	=1 if respondent chose 2 or more responses on Q1; AND if respondent makes decisions "by yourself" OR "makes decisions with someone else"; =0 otherwise	91.43%
2. Who is responsible for making day-to-day decisions about money in your household?		92.91%
3. In the past 12 months have you been [personally] saving money in any of the following ways, whether or not you still have the money? — Saving cash at home or in your wallet — Paying money into a savings or deposit account — Giving money to family to save on your behalf — Saving in an informal savings club — Buying bonds or time deposits — Investing in Crypto assets — Investing in stocks and shares — Saving or investing in some other way	= 1 if respondent chose 1 or more; =0 otherwise	85.78%
4. What did you do to make ends meet last time it happened? — Borrow from family — Borrow from employer or salary advance — Pawn something You own — Take a loan from your savings or from loan clubs or other — Use someone else's credit card — Take money out of a flexible mortgage account — Apply for loan withdrawal from pension fund — Use authorised arranged overdraft or line of credit — Use credit card for a cash advance or to pay bills/buy food — Take out a personal loan from a financial service provider — Take out a payday loan — Take out a loan from an informal provider — Take an online loan — Use an unauthorised overdraft — Pay bills late or miss payments	= 1 if respondent chose none of these; =0 otherwise	92.43%

Note: statements refer to the OECD/INFE Toolkit for Measuring Financial Literacy and Financial Inclusion 2022 (OECD, 2022). The financial behaviour score is calculated out of 9. For further instructions, see (OECD 2022).

*Includes responses coded as 1 and 2.

Table 1.4 (cont.): Definition of Financial Behaviour and Summary Statistics		
Text of Question in the OECD/INFE Survey	**Coding**	**Full Sample (% of respondents with score = 1)**
5. Which of the following statements best describes how you made your most recent choice? — I considered several options from different companies before making my decision — I considered various options from one company — I didn't consider any other options at all — I looked around but there were no other options to consider	= 1 if respondent chose first or last option; =0 otherwise	44.92%
6. Which of these sources of information do you feel significantly influenced your decision? — Specialist product comparison — A price comparison website — A recommendation from an independent financial advisor — Information from an advert or brochure — Recommendation from friends, family or acquaintances — A recommendation from people you do not know — Information provided by staff of the financial product provider	=2 if used any of the first three options in Q6; =1 if used any of the last 4 options in Q6 AND if Q5=1; =0 otherwise	67.31%*
7. I keep a close personal watch on my financial affairs	=1 if Completely Agree, OR if Agree; =0 otherwise	80.40%
8. I set long term financial goals and strive to achieve them	1 if Completely Agree, OR if Agree; =0 otherwise	51.23%
9. Before I buy something I carefully consider whether I can afford it	=1 if Always, OR if Often; 0= otherwise	70.90%
10. I pay my bills on time	=1 if Always, OR if Often; 0= otherwise	95.81%
Number of Observations		**1,505**

Note: statements refer to the OECD/INFE Toolkit for Measuring Financial Literacy and Financial Inclusion 2022 (OECD, 2022). The financial behaviour score is calculated out of 9. For further instructions, see (OECD 2022).

*Includes responses coded as 1 and 2.

The third component of the financial literacy score is the financial attitude score. Respondents were asked to rate three statements relating to money spending and saving: (1) "I find it more satisfying to spend money than to save it for the long-term"; (2) "Money is there to be spent"; and (3) "I tend to live for today and let tomorrow take care of itself". Starting from a scale of completely agree (1) to completely disagree (5), a higher score is an indicator for a better financial attitude. The level of disagreement with these three statements ranged between 26.18% to 61.06%, with the second statement, "Money is there to be spent", reporting the lowest disagreement among respondents. This data is summarised in Table 1.5.

Table 1.5: Definition of Financial Attitude and Summary Statistics		
Text of Question in the OECD/INFE Survey	**Coding**	**Full Sample (% of Disagree/Completely Disagree)**
1. I find it more satisfying to spend money than to save it for the long term	=1 if completely agree; =2 if Agree; =3 if neutral or invalid response; =4 if Disagree; =5 if completely disagree	38.07%
2. Money is there to be spent	1 if completely agree; =2 if Agree; =3 if neutral or invalid response; =4 if Disagree; =5 if completely disagree	26.18%
3. I tend to live for today and let tomorrow take care of itself	1 if completely agree; =2 if Agree; =3 if neutral or invalid response; =4 if Disagree; =5 if completely disagree	61.06%
Number of Observations		**1,505**
Note: statements refer to the OECD/INFE Toolkit for Measuring Financial Literacy and Financial Inclusion 2022 (OECD, 2022). The score is computed as the average response across the three statements. The average is rescaled from 0 to 4. For further instructions, see OECD (2022).		

The overall financial literacy score is calculated as the sum of the three scores described above, and it is shown in Table 1.66.

Table 1.6: Construction of Financial Literacy	
1. Financial knowledge	This score is calculated as the number of correct responses out of seven questions on basic concepts of financial decision-making, aspects relating to the impact of inflation on spending power; simple interest calculations and compounding; risk diversification; and relationship between risk and reward.
2. Financial behaviour	This score measures the propensity to exhibit various behaviours defined by the OECD to be 'financial savvy'. These include aspects related to budgeting, saving, borrowing and paying bills on-time. The score is calculated out of 9.
3. Financial attitude	The financial attitude score is computed as the average across the following three statements: "I find it more satisfying to spend money than to save it for the long-term"; "money is there to be spent"; and "I tend to live for today and let tomorrow take care of itself". Each statement was rated on a scale of completely agree (1) to completely disagree (5). Responses were rescaled from 0 to 4; a higher score indicates better financial attitudes.
Financial literacy (1-3)	The overall financial literacy score is calculated as the sum of the three scores described above. The score, out of 20, is normalised to 100.

1.2 Results

Our regression results are presented in Table 1..7. The dependent variable is the natural log of the financial wellbeing score. Variable coefficients are interpreted as the % change in the dependent variable relative to the baseline for categorical variables or relative to a 1 unit change in a continuous explanatory variable (or a 1% change in the case of a logged control).

Table 1.7: Summary of model results: Dependent Variable ln Financial Wellbeing					
Concept	**Category**	**OLS model**	**2SLS Model**	**2SLS Model Full**	**3SLS Model-Robust**
Economic Status	Employed	Baseline	Baseline	Baseline	Baseline
	Self-employed	0.031	0.02	0.008	0.012
		(0.044)	(0.047)	(0.047)	(0.031)
	Unemployed	-0.309**	-0.229*	-0.217*	-0.285**
		(0.124)	(0.125)	(0.124)	(0.111)
	Inactive	0.021	0.059	0.062	-0.019
		(0.047)	(0.052)	(0.053)	(0.037)
	Other	0.187	0.318*	0.301	-0.039
		(0.138)	(0.193)	(0.198)	(0.109)
Income	Up to €2750 a month	Baseline	Baseline	Baseline	Baseline
	Between €2750 and €4500 a month	0.229***	0.147***	0.140**	0.135**
		(0.044)	(0.056)	(0.057)	(0.056)
	€4500 or more a month	0.386***	0.290***	0.288***	0.277***
		(0.047)	(0.062)	(0.063)	(0.062)
Household Composition	Couple no kids live alone	Baseline	Baseline	Baseline	Baseline
	Lives alone	0.011	0.08	0.084	0.074
		(0.046)	(0.053)	(0.054)	-0.053
	Couple with kids (any age)	-0.137***	-0.140***	-0.138***	-0.154***
		(0.039)	(0.041)	(0.041)	(0.040)
	Lone parent does not live with relative	-0.271***	-0.217**	-0.210**	-0.228***
		(0.085)	(0.088)	(0.089)	(0.088)
	No partner no kids with relative	0.198***	0.223***	0.220***	0.231***
		(0.059)	(0.064)	(0.064)	(0.064)
	Other including house sharing couples	-0.066	-0.024	-0.032	-0.02
		(0.068)	(0.073)	(0.073)	(0.073)
Gender	Female	Baseline	Baseline	Baseline	Baseline
	Male	0.007	-0.070*	-0.075**	-0.076**
		(0.033)	(0.037)	(0.038)	(0.037)
Age	Age	0.011***	0.011***	0.010***	0.011***
		(0.001)	(0.001)	(0.001)	(0.001)
Source: Author's analysis Note: Robust standard errors in parentheses					
*** p<0.10, ** p<0.05, *** p<0.01**					

Table 1.7 (cont.): Summary of model results: Dependent Variable ln Financial Wellbeing					
Concept	**Category**	**OLS model**	**2SLS Model**	**2SLS Model Full**	**3SLS Model-Robust**
Education	Tertiary	Baseline			
	Secondary	-0.156***			
		(0.037)			
	Primary or less	-0.193*			
		(0.103)			
Country of Birth	Elsewhere	Baseline			
	Ireland	0.051			
		(0.061)			
		(0.099)	(0.106)	(0.106)	(0.103)
Financial Products	Own advanced measures (0-6)		0.012	0.013	0.022*
			(0.015)	(0.015)	(0.012)
	No BNPL		Baseline	Baseline	Baseline
	Holds BNPL		-0.314**	-0.316**	-0.245**
			(0.134)	(0.133)	(0.108)
	Did not use price comparison website			Baseline	Baseline
	Used price comparison website			-0.146***	-0.137***
				(0.047)	(0.046)
Financial literacy	Log financial literacy score	0.854***	2.096***	2.208***	2.080***
		(0.101)	(0.399)	(0.427)	(0.413)
Model Details	**Constant**	**-0.333**	**-5.508*** **	**-5.926*** **	**-5.413*** **
		(0.448)	**(1.674)**	**(1.781)**	**(1.729)**
	N	**1325**	**1325**	**1325**	**1325**
	R^2	**0.266**	**0.172**	**0.163**	**0.179**
	Endogeneity test H0: exogenous (Robust score- (χ^2))	**.**	**0.001**	**0.001**	**.**
	Overidentification test H0: Overid satisfied (χ^2)	**.**	**0.128**	**0.107**	**.**
Source: Author's analysis Note: Robust standard errors in parentheses					
*** p<0.10, ** p<0.05, *** p<0.01**					

OLS estimates

The first column presents the baseline OLS estimates which assume literacy is exogenous. This model has many statistically significant estimates with expected signs which fit standard financial wellbeing narratives. Unemployed respondents have significantly lower financial wellbeing than employed respondents, controlling for the exogenous factors. We also find that the highest income group reports significantly higher levels of financial wellbeing when compared to the middle-income group, independent of demographics, literacy, and other factors. Similarly, the lowest income group reports significantly lower financial wellbeing when compared to the middle-income group.

Respondents living with children (both couples and lone parents) show lower financial wellbeing compared to couples without children. Meanwhile, those who live with parents or family and without children or partners, report having higher financial wellbeing than coupled households. This result is surprising but may stem from people having fewer financial obligations when living with family, or perhaps this estimate is disproportionally capturing a specific type of person; someone who is living with family to save for a home and so has significant financial resources for a brief period.

Education impacts wellbeing as expected. People with third level education (the baseline) have higher financial wellbeing than people with a secondary or post-secondary education. However, primary education is not a statistically lower indicator of wellbeing than secondary education (F-statistic = 0.13, p-value = 0.72, results calculated using Stata's margin command). Education, included in the OLS model, is the excluded instrument from the wellbeing equation and so does not appear in 2SLS or 3SLS equations.

2SLS and 3SLS models

The next three columns show models explicitly allowing for the endogeneity of literacy in explaining wellbeing. Table 1. shows these main estimates, while Table 1.8 further shows the 3SLS estimates for the literacy equation with wellbeing as an endogenous explanatory variable along with the first stage literacy regressions from the 2SLS models. The focus will be the estimates in Table 1., which considers financial wellbeing as the outcome.

A first question is whether we find evidence of endogeneity; we do. We tested several specifications using standard tests for endogeneity and overidentification using Wooldridge's (1995) robust score (found in the final rows of the table) which indicate likely endogeneity. The overidentification test is a test of the lost explanatory cost of excluding certain variables from the second stage equation. The H0 is that this cost is not too large, and thus a significant chi-squared indicates a problematic choice of excluded exogenous variables. The overidentification test is passed in both models.

Looking across the rows in Table 1., economic status, and household composition have the same signs, significance, and relative size across all the models. The effects of income are also somewhat similar, despite a decrease in the estimates for 2SLS and 3SLS models. Unemployed status is the only significant factor relative to the baseline employed, and income has positive significant impact which rises as income rises. Similarly, household composition's impact has no sensitivity to the model choice, and lone parents are significantly worse off than the baseline, as are couples with children. Lone parents have statistically similar financial wellbeing when compared to couples with children (F-statistic = 2.50, p-value 0.11, results calculated using Stata's margin command). Education is excluded from the wellbeing equation in all the endogenous model specifications.

Gender has no effect on wellbeing in OLS models, but a significant negative effect when accounting for endogeneity between literacy and wellbeing. In the first stage regressions and the literacy-equation-3SLS model, gender has a strong negative impact on literacy, with females scoring lower than males. Age has a significant positive effect across all the models.

Of particular interest in the models in Table 1. are inclusion of variables for whether a respondent "currently holds" certain products and/or "had heard" of them. These provide interesting instruments as it can be argued that holding the products are indicators of wellbeing as they are higher risk, but they also form exogenous explanatory instruments for literacy. At the same time, we exclude having 'heard of' certain products from wellbeing. We considered a number of different specifications but found that one product Buy-now-pay-later, seemed to be driving a significant negative effect. Advanced products such as stocks and bonds were significant in some specifications but in the final seemed to be insignificant in the 2SLS, while significant in the 3SLS model.

Further, we consider the effect of financial literacy in Table 1.. Financial literacy is again an important and statistically significant determinant of wellbeing. Despite financial literacy being a 'predicted value' from the first stage regression, financial literacy's coefficient is increased substantially in the 2SLS and 3SLS models. As the coefficients are interpreted as elasticities, a 1% rise in literacy leads to a 2.08% (3SLS) to 2.21% (2SLS model 2) rise in wellbeing.

Finally, we consider the first stage regression results with where financial literacy is the outcome (Table 1.). These models show similar differences to the models predicting wellbeing and are worth discussing explicitly. Financial literacy is higher among the employed and lower among the unemployed and inactive. Financial literacy is also higher among higher earners, for all models except the 3SLS models. Importantly, we find a consistent gender difference and a consistent education difference in financial literacy for each model.

Table 1.8: Model results: First-Stage Regression Dependent Variable ln Financial Literacy					
Concept	**Category**	**OLS model**	**2SLS Models - First stage**	**2SLS Models Full - First stage**	**3SLS Models- Robust**
Economic Status	**Employed**	Baseline	Baseline	Baseline	
	Self-employed	-0.001	-0.003	0.003	
		(0.012)	(0.012)	(0.012)	
	Unemployed	-0.046	-0.070**	-0.072**	
		(0.034)	(0.035)	(0.034)	
	Inactive	-0.034**	-0.030**	-0.030**	
		(0.014)	(0.014)	(0.014)	
	Other	-0.126*	-0.130*	-0.117	
		(0.069)	(0.073)	(0.072)	
Income	**Up to €2750 a month**	Baseline	Baseline	Baseline	Baseline
	Between €2750 and €4500 a month	0.049***	0.064***	0.064***	0.033*
		(0.013)	(0.013)	(0.013)	(0.019)
	€4500 or more a month	0.050***	0.068***	0.066***	0.018
		(0.014)	(0.014)	(0.013)	(0.027)
Household Composition	**Couple no kids live alone**	Baseline	Baseline	Baseline	Baseline
	Lives alone	-0.046***	-0.046***	-0.045***	-0.041***
		(0.015)	(0.015)	(0.015)	(0.015)
	Couple with kids (any age)	0.009	-0.001	-0.001	0.023*
		(0.011)	(0.011)	(0.011)	(0.012)
	Lone parent does not live with relative	-0.014	-0.037	-0.039	0.004
		(0.024)	(0.024)	(0.024)	(0.027)
	No partner no kids with relative	-0.035*	-0.019	-0.017	-0.047**
		(0.018)	(0.018)	(0.017)	(0.019)
	Other including house sharing couples	-0.03	-0.032*	-0.027	-0.02
		(0.018)	(0.019)	(0.019)	(0.020)
Gender	**Female**	Baseline	Baseline	Baseline	Baseline
	Male	0.056***	0.054***	0.053***	0.049***
		(0.009)	(0.009)	(0.009)	(0.010)
Age	**Age**	-0.001*			-0.001**
		(0.000)			(0.001)
Education	**Tertiary**	Baseline			Baseline
	Secondary	-0.056***	-0.061***	-0.056***	-0.035**
		(0.010)	(0.011)	(0.010)	(0.015)
	Primary or less	-0.151***	-0.152***	-0.145***	-0.107***
		(0.029)	(0.031)	(0.031)	(0.034)
Robust standard errors in parentheses					
*** p<0.10 ** p<0.05, *** p<0.01**					

Table 1.8 (cont): Model results: First-Stage Regression Dependent Variable ln Financial Literacy					
Country of Birth	**Elsewhere**	Baseline			
	Ireland	-0.013			
		(0.014)			
Financial Products	**Own advanced measures (0-6)**		0.007*	0.007*	-0.126***
			-0.004	-0.004	-0.038
	No BNPL		Baseline	Baseline	
	Holds BNPL		-0.022	-0.02	
			-0.032	-0.031	
	Heard of basic measures (0-6)		0.016***	0.015***	0.014***
			(0.003)	(0.003)	(0.003)
	Did not use price comparison service			Baseline	Baseline
	Used price comparison service			0.064***	0.065***
				(0.009)	(0.009)
Financial wellbeing	**Log financial wellbeing score**	0.070***			0.130**
		(0.008)			(0.054)
Model details	**Constant**	3.987***	4.136***	4.114***	3.697***
		(0.040)	(0.029)	(0.029)	(0.173)
	N	1,325	1,325	1,325	1,325
	r2	0.278	0.255	0.276	0.274
	AIC	-1195.95	-1151.39	-1188.41	-1194.95
	BIC	-1081.79	-1032.04	-1063.87	-1096.35
Robust standard errors in parentheses					
*** p<0.10 ** p<0.05, *** p<0.01**					

These models also offer important insight into group differences between users of financial products. People who owned a greater quantity of advanced financial products had significantly higher literacy than people who owned a smaller quantity of advanced financial products. This effect emerged in the 2SLS models. In the 3SLS models, we found a negative effect for owning these products, suggesting respondents with a greater number of advanced financial products had lower financial literacy. However, in terms of hearing about financial products, we found that respondents who heard of a greater number of basic financial products, reported higher financial knowledge than those who heard of fewer financial products. Further, respondents who used price comparison services reported higher financial knowledge than respondents who did not use such services. Lastly, the estimates showed that for the first and last model. There was a significant and positive association between log financial wellbeing and log financial literacy.

1.3 Discussion

We find that literacy is a strong predictor of financial wellbeing even when we consider the endogeneity between these two measures. When we control for endogeneity, we find that the impact of literacy increases and the impact of income and economic activity decreases. This suggests that literacy may be especially important in closing gaps between vulnerable groups. However, it is important to note that several differences remain significant (like household type, education, and income).

We report a set of findings for gender which are important for future research. Gender differences in wellbeing are minor after models control for demographics, resources, and financial literacy. Despite most lone parents being women, we find that lone parenthood has its own challenges which are not strictly a gender issue. We find a weak negative impact of being male on wellbeing, while we find males consistently perform better in financial literacy, one that cannot be explained by either endogeneity or demographics, resources, and wellbeing. Lastly, we find that controlling for women's aversion for simple guesses (in that women are more likely to choose "I don't know" in answer to questions of financial literacy when compared to men) does not explain the gender difference in financial literacy.

Beyond gender, the results have insight on advanced financial products and Buy Now Pay Later loan holders. We find that those with more sophisticated financial products like stocks, bonds, and investment accounts record higher financial wellbeing than those without such products. We also note that respondents who held BNPL loans reported lower financial wellbeing, possibly due to financial difficulty. Finally, we also note the strong endogeneity between financial literacy and financial wellbeing.

Additional research should focus on unpacking drivers of causality between financial literacy and financial wellbeing controlling for endogeneity issues. For example, are there large causal differences between impacts of literacy between subjective vs objective wellbeing? Other additional work could also consider data from other OECD countries and make cross country comparisons. Ireland has experienced significant economic growth since 2012, despite challenges brought on by the COVID-19 pandemic and extreme inflation. It is possible that other countries, which did not have the same periods of growth, could reveal differences in terms of financial wellbeing, and group differences in financial wellbeing and different impact of literacy on wellbeing, or different interactions of exogenous variables such as gender and parental status with literacy.

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