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EXPLORING GENDER DIFFERENCES IN THE FINANCIAL LITERACY DECISION-MAKING

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ABSTRACT. This study investigates how individuals choose to become financially literate and how these decisions account for the gender gap in financial literacy, the underlying mechanisms of which are not clear enough. To this end, a sample group of undergraduates at an online university is explored and multivariate regression analyses and Oaxaca-Blinder decompositions are performed in relation to the different learning options and personal features. Results indicate that individuals who utilize multiple learning sources tend to achieve higher levels of financial literacy. The study also reveals the different strategies adopted by men and women in their endeavours to enhance their financial skills. While men show a stronger interest in financing their financial education through non-formal and self-directed learning processes, women tend to prefer acquiring financial skills through formal education, workplace training and the use of internet, which are often available at no cost. Understanding how and why men and women have different levels of financial literacy is crucial for the design and implementation of policies to improve personal and household financial management, reduce the gender gap and improve financial inclusion.

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Introduction

Financial literacy is crucial for overcoming the challenges of an increasingly complex and risky financial environment and successfully developing and managing personal finances. Research has consistently shown that many individuals make suboptimal financial decisions and that a major cause of this is a lack of financial literacy (Disney & Gathergood, 2013; Lusardi & Mitchell, 2023; Van Rooij et al., 2012).

Although the existence of gender differences in financial literacy has been well documented, the underlying mechanisms of this gap are unclear, even after research has accounted for individual sociodemographic and personal characteristics (Bucher-Koenen et al., 2014; Cupák et al., 2018; Driva et al., 2016; Fonseca et al., 2012; P. J. Yakoboski et al., 2020). Research has demonstrated that financial literacy tends to increase with higher levels of education (Bucher-Koenen & Lusardi, 2011; Hernández-Mejía et al., 2021; Hung et al., 2009; A. C. Preston & Wright, 2019). However, this relationship is complex. For example, studies on gender specialization within couples have shown that relative education differences may undermine traditional gender roles when couples divide financial responsibilities (Fonseca et al., 2012, p. 10; Mullen & Zissimopoulos, 2010). Similarly, Mahdavi & Horton (2014) found that financial literacy among well-educated female alumni was still extremely low. This suggests that formal education alone may not be sufficient to close the gender gap. To design policies that can effectively reduce this gap and improve women's financial knowledge, it is crucial to understand the specific learning pathways and choices that influence how and why men and women have different levels of financial literacy.

In an attempt to understand the gender gap in financial literacy, our study examines financial literacy decision making in a group of undergraduate students at an online university. Despite individuals in the sample possessing high-level digital skills and education, the gender gap is still evident. Following previous studies suggesting the gender gap could be associated with how knowledge and skills are acquired rather than personal traits (Fonseca & Lord, 2020; Lusardi & Mitchell, 2014), we consider the impact of learning processes: how these individuals choose to become financially literate.

Technology has transformed ways of teaching and learning by providing constant access to information and knowledge. This shift has moved learning beyond traditional forms, which are limited in time and space, toward ubiquitous learning environments in our daily lives (Groff, 2013). Self-directed learning has emerged as both an extension of and an alternative to traditional education, prompting a reconfiguration of our understanding of lifelong learning (Boyer et al., 2014). Consequently, to fully comprehend the acquisition of financial knowledge within this new paradigm, it is necessary to consider all types of learning, including formal, non-formal, informal, and self-directed approaches.

This study introduces a novel perspective by addressing the impact of various financial education and learning choices on gender differences in financial literacy, offering a comprehensive framework for understanding how different educational pathways shape financial literacy. By analyzing diverse learning strategies, this paper highlights their role in influencing financial literacy and offers insights for policymakers, educators, and practitioners seeking to design more inclusive and effective financial education programs.

The results of this study reveal a persistent gender gap in financial literacy, even among individuals with advanced financial knowledge. Furthermore, the findings suggest that this disparity may be partly explained by men's higher inclination, compared to women, to invest both monetary and temporal resources in their financial education. These insights underscore the importance of addressing gender-specific barriers and motivations in the design of financial education strategies, providing a foundation for more equitable approaches to improving financial literacy.

The paper is organized as follows. After the introduction, section 1 provides the background, a review of the related literature, and the hypotheses to be tested; section 2 describes the sample and the methodology; and section 3 analyses the findings of the study. Finally, section 4 provides a summary of the conclusions drawn and a discussion of limitations and future directions.

1. Research context and hypotheses

‘Financial literacy’ (FL) has been shown to be a key determinant of improved financial decisions for individuals. Despite the multiple definitions of FL, financial knowledge is considered its core element (Bumcrot et al., 2013; Hilgert et al., 2003; Hung et al., 2009; Lusardi & Mitchell, 2023; Sundarasan et al., 2023). This knowledge is an understanding of the key financial terms and concepts needed to function daily in society, and it is acquired through financial education and learning (Bowen, 2002). Lusardi & Mitchell (2009) distinguishes two categories of financial knowledge: basic FL, which concerns fundamental concepts such as interest rates, inflation, and percentage calculation, and advanced FL, which relates to concepts like risk and return, stocks, bonds, mutual funds, and asset pricing. The set of questions proposed by these authors has become a widely accepted scale in empirical studies to measure objective financial knowledge. This instrument, which combines numerical and financial concept queries, has been used across various research contexts and is accepted as a standard by many in the field (Nicolini & Henager, 2022).

Research indicates that FL is determined by numerous demographics, socio-economic, geographic, psychological and cultural factors, including age, income, family situation, gender, occupation, and education. A common finding in the literature is an inverted ‘U’ shape relationship between FL and age peaking in middle age (Benjamin et al., 2013; Eberhardt et al., 2019; Hernández Mejía et al., 2022; Kadoya & Khan, 2020; Monticone, 2010). Furthermore, higher income is consistently associated with higher levels of FL (Atkinson & Messy, 2013; Behrman & Mitchell, 2010; Hernández Mejía et al., 2022; Monticone, 2010; Zhan et al., 2006). In terms of family structure, while some studies find the presence of children to be non-significant (A. Preston & Wright, 2024; Van Rooij et al., 2011a) other analysis suggest that a higher number of dependent children correlates with lower financial knowledge (Brown & Taylor, 2014; Potrich et al., 2015).

Other studies have explored how psychological and behavioral characteristics may account for differences in financial literacy. Factors such as numeracy (Almenberg & Dreber, 2015; Folke et al., 2021; Skagerlund et al., 2018), risk attitudes (Apartsin et al., 2013; Bannier & Neubert, 2016; Bonsang & Dohmen, 2015; Zhuang & Yang, 2025), self-confidence (Furrebøe et al., 2023; Imarhiagbe et al., 2017; Maheshwari et al., 2025; Mindra et al., 2017; Montford & Goldsmith, 2016), stereotype threat and gender roles (Arellano et al., 2018; Haag & Brahm, 2025; A. C. Preston & Wright, 2019; Rink et al., 2021; Tinghög et al., 2021) have been identified as possible drivers of gender differences in financial literacy. Indeed, the gender gap in the financial domain is a persistent finding across numerous studies; however, these variables alone do not fully explain this enduring disparity (Haag & Brahm, 2025; Hernández-Mejía & Moreno-García, 2023; A. C. Preston & Wright, 2019).

This study makes a significant contribution to the existing literature on FL by adopting a comprehensive analytical framework. This framework goes beyond traditional demographic analyses by incorporating personal attributes alongside a set of different learning strategies. These strategies encompass formal and non-formal education, as well as the crucial roles of workplace experience and self-directed learning through various media sources. By integrating these distinct pathways, the study provides a better understanding of how individuals acquire FL and which factors are most influential. The present research seeks to validate the research hypotheses set out below.

First, to explore the determining factors of financial literacy related to the personal characteristics, the following hypotheses are proposed:

H1. Levels of FL are determined by personal characteristics.

H1a. Levels of FL are influenced by age.

H1b. Levels of FL are influenced by level of income.

H1c. Levels of FL are influenced by family situation.

One factor that has been shown to significantly influence FL levels is education in economic and financial matters (Ira Eka, 2023; Kaiser & Lusardi, 2024; Wong et al., 2023). Defined by the OECD (2015) as the process of equipping people with the necessary skills to make sound financial decisions, financial education is essential for promoting financial well-being. Financial education can be formal, non-formal and informal. Formal financial education takes place within national education systems (i.e., public and recognised private high schools, colleges, and universities) and is therefore institutionalised, intentional and planned, with structured educational arrangements and recognised qualifications. Non-formal education is additional, alternative and/or complementary and is institutionalised, intentional and arranged by an education provider, usually in the form of short courses, workshops and/or seminars (International Standard Classification of Education, 2012). Informal education is a lifelong learning process through which individuals develop attitudes, values, skills, and knowledge from the various influences and resources in their environment and daily experiences. This type of learning occurs through interactions with family and neighbours, in marketplaces, libraries, art exhibitions, workplaces, and through activities like playing, reading, and sports (Pozgaj, 2008). Chen et al. (2022) found that informal financial education can play a significant and positive role in enhancing consumer financial capability, while Lai et al. (2011) showed that informal learning appears to be the most popular approach among adults. Regarding the interactions in the work environment, previous studies have shown that the workplace may affect an employee's informal learning in financial matters (Horwitz et al., 2021; Hvide & Östberg, 2015).

Self-directed learning, a process in which individuals take the initiative to design and manage their own learning experience, is especially crucial in adult education. This form of learning is supported by a variety of resources, both human (e.g., family, friends, and co-workers) and non-human, such as print media, broadcasting, and online platforms. Boyer et al. (2014) highlight the importance of these diverse resources, while Mountain et al. (Bucher-Koenen et al., 2021; 2021) suggest that self-directed financial learning activities are the most effective way to improve financial behaviors.

Second, for the purpose of examining the relationship between FL and decision making process involved in acquiring financial knowledge, the following hypotheses are proposed:

H2. Levels of FL are shaped by formal, non-formal and informal learning processes.

H2a. Levels of FL are determined by formal education.

H2b. Levels of FL are determined by non-formal education.

H2c. Levels of FL are influenced by tasks performed in the labour market.

H2d. Levels of FL are influenced by self-directed financial learning.

A wide body of literature confirms that a gender gap in FL has been evidenced in various countries and population sub-groups (Atkinson & Messy, 2013; Berlinger et al., 2025; Kadoya & Khan, 2020; Lusardi & Mitchell, 2008, 2014). This gender gap persists in highly developed countries and, despite higher levels of education and labour force participation among young women, across age groups. However, women without a college degree experience a more significant gender gap in FL (Kaiser & Lusardi, 2024). A OECD (2022) study indicates while this gap is relatively small, it varies across countries, with gender differences in FL primarily

driven by disparities in financial knowledge rather than financial attitudes or behavior. Furthermore, the extent of the gap differs by country, region, racial and ethnic groups, and across generations (P. Yakoboski et al., 2023).

Research consistently finds that women's investment behavior differs from men's, with women exhibiting lower participation in the stock and derivatives markets (Almenberg & Dreber, 2015; Balloch et al., 2015; Bucher-Koenen et al., 2021; Van Rooij et al., 2011b) and holding less risky financial assets than men with similar characteristics (Meriküll et al., 2021). Furthermore, women tend to prepare less for retirement (Hernández-Mejía & Moreno-García, 2023; Lusardi, 2015; Lusardi & Mitchell, 2008) and face greater challenges accessing financing for female-led firms (Alesina et al., 2013; Cole & Mehran, 2018; Sundarasan et al., 2023). Additionally, women are less likely to consult financial advisors to compensate for their lack of knowledge (Rink et al., 2021; Stolper & Walter, 2017).

One possible factor in the FL gender gap may be household specialisation: men tend to specialise in family financial decision making, thereby acquiring financial knowledge (Davoli & Hou, 2021). However, research has shown that decision making depends on a partner's relative education: as education level increases relative to a spouse, both men and women undertake more financial activity (Fonseca et al., 2012; Rink et al., 2021). Beyond household dynamics, the role of social and empirical learning is also a factor. Although married women may have fewer social and empirical learning opportunities than men, which could hinder their financial skills, studies also find that single, educated women with social learning opportunities can still exhibit low levels of FL (Kadoya & Khan, 2020). Research has shown that the FL gender gap tends to be smaller in countries where women are more integrated in the labour market and there is greater income equality (Morsy, 2020). However, a contrasting view posits that labor market determinants, rather than age and education, are the primary drivers of the financial gender gap (A. C. Preston & Wright, 2019). This is supported by evidence showing that employed and retired women have higher FL than those who are unemployed or disabled (P. J. Yakoboski et al., 2020).

And third, in order to investigate the gender gap in financial literacy decision making, the following hypotheses are proposed:

H3. There is a gender gap in FL influenced by how men and women decide to become financially literate.

H3a. Men show higher levels of FL.

H3b. Higher levels of FL are related to higher income regardless of gender.

H3c. Levels of FL are influenced by age regardless of gender.

H3d. Levels of FL in women are shaped by tasks performed in the labour market.

H3e. The sources used to potentially improve FL vary between genders.

H3f. Gender differences are higher for advanced levels of FL.

H3g. Men are more willing to invest in their financial education.

2. Data collection and methods

The design of this investigation was based on a combination of quantitative methods, utilized to test the research hypotheses. The required data and information were collected through a specific survey aimed to describe a case study. The survey instrument was administered to students, tutors and academic advisors in different degrees, masters and other undergraduate programs in a Spanish university, based entirely online (Universitat Oberta de Catalunya, UOC). The sampling method involves random selection and data were collected

through a self-administered and semi-structured online survey launched in May and June 2023. We received 865 valid responses, suggesting a sampling error of 3.29% (for $p=q=0.5$, and $\alpha=0.05$).

To test our research hypotheses and collect the necessary data, we designed a structured questionnaire consisting of 57 items aimed at identifying the financial knowledge and attributes of undergraduate students. To address bias from self-selection and non-response, reminder messages were sent to members of less represented groups, and an ex-post analysis was implemented to validate sample representativeness according to age distribution and gender. The correlation of age distribution between sample and population was significant (0.407), and the proportions of women with paid employment in the sample (56.6%) and the university as a whole (56.7%) were very close, providing an acceptable sampling design.

Table 1 summarises the main characteristics of the sample and the structure of the surveyed population. The study sample comprised 865 valid participants, of which 56.6% were female and 43.4% were male. The age distribution of the sample was primarily concentrated in the professional mid-career stages, with the largest group aged 35–44 years representing 32.6% of the total. This was closely followed by the 25–34 years old cohort at 28.4% and the 45–54 years old cohort at 25.3%. Younger and older participants were less numerous, with the 18–24 years old group accounting for 6.9% and those over 54 years old representing 5.8%. This age distribution is consistent with the typical profile of students enrolled in the online university where the study was conducted, which often attracts individuals seeking to balance professional development with existing careers.

The income distribution indicates a concentration in the lower and middle ranges, with the largest group (33.5%) reporting an annual net income below €30,000. The next largest group, with an income between €30,000 and €50,000, represented 27.9%. Higher income brackets were less represented, with 17.2% earning between €50,000 and €70,000, and only 10.2% earning over €70,000. Regarding employment and family status, most of the sample was either employed (75.8%) or self-employed (12.1%). Most participants reported being in a partnership (73.5%) and a significant portion had children (31.8%).

Table 1. Sample distribution

Characteristic	Total	Percentage
Number of valid answers	865	
Men	375	43.40%
Women	490	56.60%
Age		
18–34 years old	305	35.30%
35–44 years old	282	32.65%
Over 45 years old	278	32.10%
Annual Net Income		
Income < €30.000	290	33.50%
€30.000 =< Income < €50.000	242	27.90%
€50.000 =< Income < €70.000	149	17.20%
Income >= €70.000	88	10.20%
Married or cohabiting	636	73.50%
With children	275	31.80%
Employed	656	75.80%
Self-employed	105	12.10%

Source: *Own compilation*

Note: The table shows the demographic and socio-economic distribution of the 865 valid study participants. Percentages are calculated based on the total sample. It is important to note that

while the number of valid responses for some characteristics such as gender and age is 865, for others such as income level and employment participants responded with 'prefer not to answer,' which is reflected in the total number of responses being lower than $N = 865$.

A primary methodological challenge was the relatively high proportion of employed individuals in the sample (75.8%), which is significantly higher than the Spanish average (53.0%). This high employment rate is also a consequence of the case study's focus on an online university, which is highly oriented toward lifelong learning. Consequently, the average age and work experience of students are higher than the national university average. Most of these students pursue part-time studies to balance their educational and professional commitments. This profile, however, also presents a unique opportunity to study the development of human capital through on-the-job learning.

Table 2 presents the gender differences in personal characteristics. Significant differences were observed in age distribution, marital status, and income level, as revealed by the ANOVA test. Furthermore, significant disparities were found in the distribution of annual net income. Men are more highly represented in the upper income brackets, with 14.50% earning over €70,000, compared to 9.00% of women. Similarly, 22.90% of men fall into the €50,000 to €70,000 range, while only 16.50% of women do. The lowest income group is overrepresented by women (44.70% versus 29.00% of men). As with age distribution, this income disparity could be related to the higher percentage of men in the older age group, which is often associated with higher salary levels.

Table 2. Personal characteristics situation by gender

Characteristic	Male*	Female*	ANOVA (Sig)
Age			
18–34 years old	27.20%	41.60%	0.010
35–44 years old	32.80%	32.20%	0.863
Over 45 years old	40.00%	26.10%	<.001
Annual Net Income			
Income < €30.000	29.00%	44.70%	<.001
€30.000 =< Income < €50.000	33.60%	29.80%	0.09
€50.000 =< Income < €70.000	22.90%	16.50%	0.009
Income >= €70.000	14.50%	9.00%	0.007
Married or cohabiting	76.00%	71,4%	0.076
With children	38.40%	26.70%	0.000
Employed	78.00%	75.30%	0.194
Self-employed	13.40%	11.30%	0.209

Source: *Own compilation*

*:Share of the total number of respondents

Note: The table shows the distribution of personal characteristics and employment status by gender. The ANOVA (Sig) column presents the significance values from the ANOVA test used to compare the means between the gender groups. The values for each gender are percentages of the total for each group ($N = 375$ for men and $N = 490$ for women).

2.1. Variable description

Dependent Variable: Financial Literacy

Our survey contained two sets of seven questions intended to assess financial skills: the first to measure basic FL, the ability to perform simple financial calculations; the second to evaluate advanced FL through gauging familiarity with financial products and concepts relating to investment and portfolio options. The majority of questions had been used in earlier studies, such as the US Health and Retirement Survey, the Rand American Life Panel, and in each wave of the National Financial Capability Study (Lin et al., 2025).

The variable *Financial Literacy* was created as the total correct responses to questions relating to basic and more advanced financial skills. *Table 3* presents a summary of the financial literacy levels, observed in the basic and advanced indices, based on the quartile analysis.

Table 3. Quartile distribution of basic and advanced financial literacy indices

Basic FL score quartiles	N (Count)	% (Percent)*
1st Quartile (0-3 correct answers)	291	33.6
2nd Quartile (4 correct answers)	170	19.6
3rd Quartile (5 correct answers)	210	24.2
4th Quartile (6-7 correct answers)	195	22.5
Total	866	100
Advanced FL score quartiles	N (Count)	% (Percent)*
1st Quartile (0-2 correct answers)	255	29.4
2nd Quartile (3 correct answers)	205	23.7
3rd Quartile (4-5 correct answers)	315	36.4
4th Quartile (6-7 correct answers)	91	10.5
Total	866	100

Source: *Own compilation*

*:Share of the total number of respondents

Note: The table shows the sample distribution in quartiles based on the number of correct answers for the basic and advanced financial literacy indices. The total number of respondents is 865.

The basic FL index revealed that 33.6% of respondents correctly answered 3 or fewer questions. The median number of correct responses for this index was 4.0. By contrast, 22.5% of the surveyed individuals answered 6 or 7 questions correctly, indicating a more robust level of basic financial knowledge within a segment of the sample.

Regarding the advanced FL index, 29.4% of respondents provided correct answers to 2 or fewer questions, while only 10.5% correctly answered 6 or 7 questions. The median number of correct responses for this advanced index was 3.0. These findings, across both indices, underscore generally low levels of financial literacy, particularly concerning more complex financial concepts. Such results are highly consistent with those reported in prior research (Lusardi, 2015).

Previous research consistently highlights a persistent gender gap in financial literacy, with studies often reporting lower levels among women compared to men. Consistent with these findings, Figure 1 clearly illustrates a significant difference in the different FL indices between men and women.

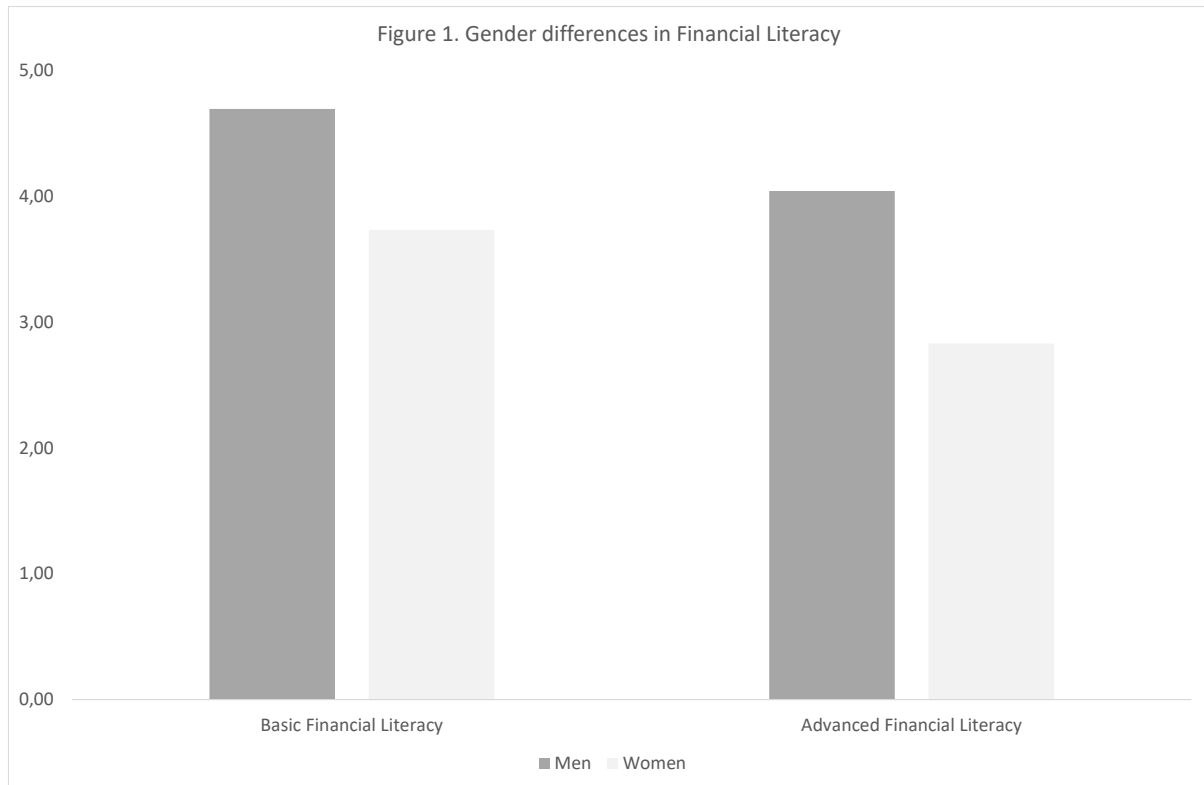


Figure 1. Gender differences in the basic and advanced financial literacy index

Source: *Own data*

Note: The chart shows the average number of correct answers for men and women (N = 865).

Our analysis of answers according to gender reveals a clear divergence in financial knowledge (*Table 4*), revealing that undergraduate women, on average, are less likely to be aware of a range of financial instruments and practices. This finding is consistent with a wide body of literature, which demonstrates that the gender gap in financial literacy persists across countries, regardless of their financial market development, institutional setups, or income levels (Haag & Brahm, 2025; Hasler & Lusardi, 2017; Rink et al., 2021).

Table 4. Gender differences in financial literacy

Characteristic	Male	Female	ANOVA (Sig)
Basic Financial Index	4.71	3.72	.000
Advanced Financial Index	4.03	2.81	.000
Financial Literacy Index	8.74	6.53	.000

Source: *Own compilation*

Note: Total number of respondents = 865. The table shows the mean number of correct answers for each financial knowledge index, by gender. The results of the ANOVA test indicate statistically significant differences ($p < .001$) between the gender groups for each index

Independent Variables:

As the aim of this research is to investigate the gender gap in financial education decision making among a sample of undergraduate students, we proceeded to model the influence and impact of personal attributes, learning processes and labour tasks.

The data for explanatory variables was also collected from answers to the questionnaire. Differences in personal attributes among individuals in the sample were measured and evaluated using two variables: partnership status (married or cohabiting) and children. Both characteristics could influence FL due to the duties involved, number of dependents, and time constraints. As Bucher-Koenen et al. (2021) stated in their work, a lack of family-friendly career paths and self-confidence can limit financial competence acquisition, especially among women.

In this research, four pathways of financial knowledge acquisition are considered, with the objective of understanding the factors that shape individuals' financial literacy: formal education, non-formal education, workplace experience, and self-directed learning.

Formal education encompasses the level of financial education obtained through regulated educational channels, such as secondary education and university programs. This variable captures structured financial learning provided within traditional academic institutions. Non-formal education pertains to financial training acquired outside the formal educational system, through courses, master's degrees, postgraduate programs, or other non-certified educational initiatives. Both formal and non-formal pathways represent structured or semi-structured instruction provided by third-party entities.

Given that the sample comprises individuals who are already employed, despite being part of an online university, it was relevant to include the level of financial knowledge required in the workplace. This variable is considered to significantly influence an individual's financial knowledge base due to practical application and continuous exposure within their professional environment.

The survey contained three specific questions to capture the effect of these sources through self-assessment single-item measures, based on the following questions: *On a scale from 1 to 5, where 1 means 'not at all' and 5 means 'very high', How much of your formal/non-formal was devoted to finance? And How much of an understanding do you need during your daily job-related activities?* For both formal and non-formal financial education, two dummy variables were created: one for the intermediate level of education (scale value 3), and another indicating an advanced level (scale values 4 and 5). Similarly, for the level of financial knowledge required in the workplace, two dummy variables were generated: one for a medium requirement (scale value 3) and another for a high requirement (scale values 4 and 5). The lowest category in each variable served as the reference group.

Finally, self-directed learning is also incorporated into the study. Mountain et al. (2021) have shown media sources can contribute to improved monetary practices and financial fulfilment. Thus, we also explored opportunities for FL education through self-directed learning. Four sources of information were considered: newspapers; books and magazines; radio and television (broadcasting); and the internet. Self-assessment single-item measures were used to verify the influence of each information source, based on the following question: *On a scale from 1 to 5, where 1 means 'never' and 5 means 'very often', how often you use the following sources of information to learn about financial topics?* two dummy variables were constructed for each information source. The first dummy, 'seldom', takes a value of 1 when respondents reported a frequency of 2. The second dummy, 'frequently', takes a value of 1 when respondents reported a frequency of 3, 4 or 5. The 'never' category served as the base group.

Table 5 details the distribution of participation in various financial knowledge acquisition pathways, disaggregated by gender. Among the self-directed learning sources, newspapers were the most widely utilized overall (80.4% of respondents reporting any use), followed by internet (66%), broadcasting (60.3%), and books&magazines (43.9%). Sources involving workplace requirements (50.8%) and formal education (48.0%) also show wide reach, while non-formal education is utilized only by 34.8% of the sample.

Regarding gender differences, men exhibit significantly higher participation in advanced formal education, both intermediate and advanced non-formal education, and roles with high financial knowledge requirements in the workplace. This pattern extends to self-directed learning; males are significantly more likely to engage frequently with books&magazines, internet, broadcasting and newspapers. These findings align with literature on gender disparities in financial engagement, suggesting that men engage more, and more often, across a range of financial learning options

Table 5. Gender differences in self-directed learning for financial knowledge

Source	Total*	Males*	Females*	ANOVA (sig)
Formal Education Intermediate	22.1%	46.6%	53.4%	0.306
Formal Education Advanced	25.9%	51.8%	48.2%	0.003
Non-Formal Education Intermediate	16.1%	56.1%	43.9%	<.001
Non-Formal Education Advanced	18.7%	53.7%	46.3%	0.003
FK at workplace Medium	23.3%	42.6%	57.4%	0.799
FK at workplace High	27.5%	51.3%	48.7%	0.004
Books&Magazines: seldom	20.3%	46.6%	53.4%	0.332
Books&Magazines: frequently	23.6%	60.3%	39.7%	<.001
Internet: seldom	24.1%	41.8%	58.2%	0.611
Internet: frequently	41.9%	55.9%	44.1%	<.001
Broadcasting: seldom	28.3%	47.1%	52.9%	0.16
Broadcasting: frequently	32.0%	50.5%	49.5%	0.003
Newspaper: seldom	22.9%	32.3%	67.7%	<.001
Newspaper: frequently	57.5%	51.3%	48.7%	<.001

Source: *Authors' calculation.*

*:Share of the total number of respondents

Note: The table shows the distribution by gender of the use of different sources for acquiring financial knowledge. The values in the 'Male' and 'Female' columns are percentages of the total for each category that correspond to men and women, respectively. 'ANOVA (Sig)' presents the significance value of the ANOVA test used to compare the means of use between the gender groups.

2.2. Quantitative analysis

This study not only investigates individual choices in financial learning but also aims to explore the distinct types of learning required to acquire a certain level of FL. To achieve this, a theoretical framework was established to analyze variables influencing the financial literacy learning process, specifically exposing the mechanisms contributing to the gender gap.

To measure the influence and impact of these potential factors we ran several multivariate linear regression analyses, using the following model:

$$FL = \alpha(X) + \beta(Z) + errors$$

and $errors \sim N(0, 1)$.

where X is a vector of observed types of learning and Z corresponds to a vector of observed individual-specific characteristics that influence financial knowledge. Types of learning were formal education, non-formal education, informal learning in the workplace, and self-directed learning. A set of personal features such as gender, age, income, children and married or living with a partner are included in Z.

The size of the sample size makes it feasible to rely on the Central Limit Theorem (CLT), which states that for large sample size, the distribution of the regression coefficient estimators tends to be normal, regardless of the underlying distribution of the errors. The robustness of the results was further reinforced using robust standard errors, which correct for potential heteroskedasticity and non-normality in the residuals.

This model was performed for the overall sample and for the subsamples of men and women. In addition, determining factors for the acquisition of the most advanced financial skills were tested according to gender.

To explore the underlying mechanisms of gender differences in FL we applied the Oaxaca-Blinder decomposition statistical method (Blinder, 1973; Oaxaca, 1973). This enabled us to decompose FL differences into 'explained' parts or endowments, and 'unexplained' parts in unobserved variables that may also account for gender differences.

To analyze this gender gap, we estimated the following regression:

$$E[FL|W, d] = dW\beta^F + (1 - d)W\beta^M,$$

where FL is an $N \times 1$ vector representing the dependent variable, W is an $N \times K$ matrix of independent variables, β is a $K \times 1$ vector of coefficients, and d is a dummy variable indicating female status ($d=1$ for females and $d=0$ for males). This formulation allows for the decomposition of the gender gap as follows:

$$E[FL|d = 0] - E[FL|d = 1] = \Delta W\beta^F - \Delta\beta E[FL|d = 1] + \Delta W\Delta\beta,$$

where $\Delta W = E[W|d = 0] - E[W|d = 1]$ and $\Delta\beta = \beta^M - \beta^F$

The first term on the right-hand side represents the amount of the gender gap attributable to differences in observable characteristics between men and women. This term is frequently referred to as the "explained" component of the decomposition and it measures how differences in W between males and females contribute to the observed gap.

The second term represents the part of the gender gap that can be attributed to differences in the regression coefficients, assuming that men and women exhibit the same characteristics. And the third term represents the part of the gap attributable to differences in the constant terms, between males and females. Combined, the second and third terms are commonly known as the "unexplained" component.

3. Analysis and discussion of results

The Financial Literacy Index

Multivariate regression analyses and Oaxaca-Blinder decompositions were conducted to examine the factors influencing FL and the gender gap. Specifically, these methods were used to identify key determinants of financial literacy decision making and to quantify the contribution of personal characteristics and learning options to gender disparities in financial knowledge.

Table 6 displays the results of multivariate regressions for potential factors associated with FL for the whole sample. The regressions were estimated using robust standard errors to mitigate issues related to non-normality and ensure the validity of the results. The dependent variable is the normalised index of FL described in the previous section; therefore, the estimated coefficients represent the effects of covariates in terms of standard deviation increases in FL.

The study examines how personal traits and various learning pathways (formal, non-formal, workplace, and self-directed) influence the decisions individuals make to improve their financial knowledge. The goodness of fit of the different multivariate regressions improves from 26.1% when considering personal traits alone, to 35.8% (*Model 5*) once all ways of learning are included.

Our results show that gender, age and level of income are the main personal characteristics that explain different levels of FL (*Model 1*). Therefore, *H1a* and *H1b* are validated. The regression analyses also demonstrate that even when controlling for family situation, older and wealthier participants are more financially literate, a finding consistent with previous studies (Atkinson et al., 2015; Kadoya & Khan, 2020; Lusardi et al., 2015; Meriküll et al., 2021; Van Rooij et al., 2012). Conversely, family situation variables such as having children or partnership status show no significant association with differences in financial knowledge, leading to the rejection of hypothesis *H1c*.

The introduction of formal and non-formal financial education variables significantly improves the model's explanatory power (*Models 2 and 3*), suggesting that an advanced level of formal and non-formal education exert a positive and significant influence on an individual's level of FL. These outcomes validate *H2a* and *H2b*.

When the variable measuring the level of financial knowledge required in the workplace is introduced, the results demonstrate that only the medium level significantly improves financial knowledge (*Model 4*). This outcome could suggest that jobs requiring high financial competencies, due to their advanced nature, may not have an incremental impact on enhancing FL. Consequently, the findings imply that only those individuals who engage in a medium level of financial knowledge use will improve their FL levels, which validates hypothesis *H2c*.

In regards to the different self-directed learning pathways, model 5 demonstrates that these are also a key factor in an individual's FL. In particular, the use of the internet to improve financial knowledge is the source with the most positive impact on the results across all levels of frequency. Regarding other sources such as broadcasting (radio and television) or newspapers, they also significantly influence the improvement of financial knowledge levels. However, this impact is observed only when moving from no exposure to a minimal exposure to these sources. This suggests that the greatest increase in FL occurs simply by breaking the barrier of non-exposure. Hence, the mere act of seeking out financial information, even if only occasionally, already generates a significant difference in a person's knowledge level. Once this basic exposure has been achieved, the incremental benefit of a much more frequent exposure may be marginal or not large enough to be statistically significant.

This interpretation is supported by the results of the variance inflation factor (VIF), whose mean value of 1.5 allows us to rule out that the lack of significance in these coefficients is due to high multicollinearity with other variables in the model. The White test and de Cameron & Trivedi's decomposition of IM-test were conducted to verify the model's assumptions regarding heteroskedasticity, skewness, and kurtosis. The p-value for heteroskedasticity ($p = 0.4773$) indicates that there is no statistically significant evidence of heteroskedasticity. Likewise, the test did not find significant evidence of skewness in the residuals ($p = 0.28$) and the kurtosis component was not significant ($p = 0.4609$). Finally, the overall IM-test yielded a p-value of 0.1587. Hence, these results show that the model is correctly specified and that the residuals are independently and identically distributed and normal is not rejected.

These research findings reveal an interesting dynamic in how exposure to financial information through certain sources affects literacy, and they suggest that the type of source utilized, rather than the frequency, might be what truly drives knowledge. This implies that initiatives to improve FL through newspapers, radio, or television could be more effective if

they focus on reaching those who currently have no use, encouraging at least some initial exposure. Moreover, the results also reveal that access to the internet as a self-directed learning option helps to improve FL, and in this case, a higher frequency of use leads to higher acquired levels, which validates hypothesis *H2d*.

Finally, it should be noted that demographic variables remain robust and highly significant predictors across all models, as do the advanced levels of formal and non-formal financial education.

We conclude that all ways of learning (formal, non-formal, informal and self-directed) are valid for improving an individual's FL. As other studies have found (Atkinson et al., 2015; Lusardi et al., 2017; Mountain et al., 2021), our results show that the FL level of survey respondents was not only influenced by their personal characteristics but also their choice of learning style.

Table 6. Financial literacy regression models (whole sample)

	Model 1	Model 2	Model 3	Model 4	Model 5
Constant	5.3673 *** (0.214)	0.0000 *** (0.000)	4.8460 *** (0.230)	4.3942 *** (5.298)	3.9905 *** (0.000)
Male	1.7342 *** (0.186)	1.6328 *** (0.184)	1.5688 *** (0.184)	1.2086 *** (1.929)	1.3885 *** (0.183)
Age dummies (Base group: age <35)					
35 =< Age < 45	0.3699 (0.237)	0.3626 (0.229)	0.3503 (0.226)	-0.0927 *** (0.793)	0.4375 * (0.225)
Age >= 45	1.0046 *** (0.252)	0.9776 *** (0.250)	0.9256 *** (0.250)	0.4352 *** (1.416)	0.9876 *** (0.252)
Income dummies (Base group: Income < €30.000)					
€30.000 =< Income < €50.000	1.0397 *** (0.226)	0.9174 *** (0.221)	0.9179 *** (0.218)	0.4907 *** (1.345)	0.8327 *** (0.214)
€50.000 =< Income < €70.000	1.6134 *** (0.276)	1.4485 *** (0.270)	1.4784 *** (0.268)	0.9531 *** (2.004)	1.3870 *** (0.263)
Income >= €70.000	2.7684 *** (0.323)	2.4696 *** (0.323)	2.4188 *** (0.324)	1.7834 *** (3.054)	2.2824 *** (0.322)
Children	0.0768 (0.232)	0.0687 (0.225)	-0.0065 (0.226)	-0.4503 *** (0.437)	0.0123 (0.220)
Married o cohabiting	0.0709 (0.211)	0.1181 (0.206)	0.1033 (0.204)	-0.2962 *** (0.503)	0.0598 (0.199)
Formal FinEdu dummies (Base group: Low)					
Formal Education Intermediate		0.1852 (0.216)	-0.0101 (0.223)	-0.4478 *** (0.428)	-0.1749 (0.222)
Formal Education Advanced		1.4940 *** (0.218)	1.0247 *** (0.244)	0.5450 *** (1.504)	0.7781 *** (0.244)
Nonformal FinEdu dummies (Base group: Low)					
Non-Formal Education Intermediate			0.4581 * (0.234)	-0.0016 *** (0.918)	0.3613 (0.231)
Non-Formal Education Advanced			0.8359 *** (0.276)	0.2936 *** (1.378)	0.6756 ** (0.285)
FK required at workplace dummies (Base group: Low/None)					
Medium				0.1898 *** (0.983)	0.4428 ** (0.199)
High				-0.1778 *** (0.833)	0.2207 (0.258)
Self-directed financial education dummies from: (Base group: None)					
Books&Magazines: seldom					0.0402 (0.236)
Books&Magazines: frequently					-0.0107 (0.294)
Internet: seldom					0.7730 *** (0.254)
Internet: frequently					0.9839 *** (0.256)
Broadcasting: seldom					0.5418 ** (0.216)
Broadcasting: frequently					0.1307 (0.232)
Newspaper: seldom					0.6274 ** (0.282)
Newspaper: frequently					0.4018 (0.272)
Observations	865	865	865	865	865
Prob > F	43.26	36.45	31.77	0	23.65
R-squared	0.261	0.314	0.320	0.000	0.3575
p-Value test Age coefficients=0	0.000	0.000	0.001	0.000	0.001
p-Value test Income coefficients=0	0.000	0.000	0.000	0.000	0.000
p-Value test Formal FinEdu coefficients=0		0.000	0.000	0.000	0.000
p-Value test NonFormal FinEdu coefficients=0			0.000	0.000	0.000
p-Value test FK at workplace coefficients=0			0.015	0.015	0.080
p-Value test Self-directed FinEdu coefficients=0					0.000

Source: *Authors' calculation.*

Note: The table shows the results of linear regression models on the financial literacy index. Coefficients are presented with robust standard errors in parentheses. The models were estimated using the whole sample (N=865). The base groups for the categorical variables are: "age < 35," "income < €30,000," "no children," "single," "low/none formal financial education," "low/none non-formal financial education," "low/none financial knowledge required at the workplace," and "no use of self-directed financial education sources." The statistical significance levels are: ***p < 0.01, **p < 0.05, and *p < 0.1.

The Financial Literacy Gender Gap

As mention previously, a large body of literature have found gender differences in FL, but the underlying mechanisms are poorly understood. In an attempt to understand the drivers of these differences we conducted an Oaxaca-Blinder decomposition to separate FL differences

into ‘explained’ and ‘unexplained’ parts. It is important to assess the effects of formal education, non-formal education, and informal learning by gender, to allow for men and women choosing different ways to expand their financial knowledge.

The decomposition for the gender gap is summarised in *Table 7*. The gap is confirmed, as men show a higher level of FL (33.7% higher). In addition, the ‘explained’ component is statistically significant in both the male and female sample and indicates that differences in personal traits and/or financial learning choices account for 37% of the difference. This ‘explained’ part measures the portion of the FL gender divergence that can be accounted by differences in the observed explanatory variables: age, income, partnership status, children and chosen learning process. The remaining portion, the ‘unexplained’ part, may arise from men and women providing different responses for a given change in the explanatory variable or because of unobserved variables. These results confirm the presence of a gender gap in financial education. As men show higher levels of FL, *H3a* is validated.

Table 7. Oaxaca-Blinder decomposition of financial literacy

Blinder-Oaxaca decomposition		N= 866				
1: Female = 0						
2: Female = 1						
FL Index	Coefficient	Robust std. err.	z	P>z	[95% conf. interval]	
Differential						
Prediction_1	8.7314	0.1378	63.3700	0.00	8.4613	9.0014
Prediction_2	6.5327	0.1344	48.5900	0.00	6.2691	6.7962
Difference	2.1987	0.1925	11.4200	0.00	1.8214	2.5760
Decomposition						
Explained	0.8151	0.1177	6.9200	0.00	0.5843	1.0458
Unexplained	1.3837	0.1800	7.6900	0.00	1.0308	1.7365

Source: *Authors’ calculation*.

Note: The table presents the results of the Oaxaca-Blinder decomposition, which analyzes the differences in the financial literacy index between men and women

Despite the high levels of education and digital skills within our sample, a persistent gender gap in FL remains evident, a finding consistent with previous research (Choung et al., 2023; Haag & Brahm, 2025; Hasler & Lusardi, 2017). While extant literature confirms that FL generally increases with education (Bucher-Koenen et al., 2014; A. C. Preston & Wright, 2019; Rink et al., 2021), this relationship does not fully explain the observed gender gap.

To further investigate the persistent gender gap, we next performed a linear regression analysis for the male and female sub-samples separately. The goodness of fit is 24.5% for the male sample and 30.4% for the female sample. The analysis of two separate regression models, one for men and one for women, reveals significant gender disparities in how financial knowledge is acquired. Results in *Table 8* reveal distinct patterns in the factors influencing financial literacy for men and women. Age emerges as a significant factor only for women. Regarding income, a significant positive association with FL is observed for both genders; however, this relationship differs in its nature. For women, any income level above the base category is positively associated with higher FL, whereas for men, only those in the highest income demonstrate a significant improvement. Consequently, *H3b* is validated and *H3c* must be rejected. This could explain conflicting results found in the literature about how personal traits affect financial knowledge (Cupák et al., 2018; Fonseca et al., 2012; Robson & Peetz, 2020).

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Regarding formal and non-formal education, the results indicate a clear difference. For women, only an advanced level of formal education is a highly significant and positive predictor of their FL level. However, the situation is reversed for men. For them, non-formal education at both the intermediate and advanced levels exert a positive and significant influence on their FL, while the effect is not significant for women. It is worth noting that formal education often incurs a lower cost, whereas non-formal education, such as master's or postgraduate programs, typically entails a high cost.

Similarly, the financial knowledge required at work shows a distinct dynamic by gender. While no significant correlation is detected for men, a medium level of required financial knowledge in the workplace is significantly associated with higher FL for women, highlighting the importance of professional context in their skill acquisition. This result validates *H3d*. Employment increases financial knowledge to a larger extent for women, probably due to their lower participation in the labour market. Employment could also relate to the favourable effect of age and income level on FL among women.

Finally, self-directed learning also reveals different usage patterns. For men, the only significant source of influence is consulting the internet, both occasionally and frequently. For women, while internet consultation (particularly frequent use) has a very strong impact on their FL level, the occasional use of broadcasting also has a significant effect. Despite presenting lower levels of FL, women appear to make use of more options to educate themselves in finance than men: women tend to use different learning processes to improve their financial skills. These results validate *H3e* and reinforce previous studies that have detected gender differences in ways of learning (Atkinson et al., 2015; Boeren, 2011; Tinghög et al., 2021).

Table 8. Financial literacy regression by gender

	Full Model - Male			Full Model - Female		
Constant	5.9476	***	(0.507)	3.7020	***	(0.334)
Age dummies (Base group: age <35)						
35 =< Age < 45	-0.2809		(0.349)	0.8036	***	(0.303)
Age >= 45	0.4112		(0.380)	1.2681	***	(0.348)
Income dummies (Base group: Income < €30.000)						
€30.000 =< Income < €50.000)	0.4244		(0.337)	1.1071	***	(0.289)
€50.000 =< Income < €70.000)	1.1915	***	(0.388)	1.4475	***	(0.377)
Income >= €70.000	1.7715	***	(0.425)	2.8998	***	(0.532)
Children	0.0567		(0.308)	-0.1192		(0.328)
Living with couple or married	0.4550		(0.331)	-0.0156		(0.261)
Formal FinEdu dummies (Base group: Low/None)						
Formal Education Intermediate	-0.1697		(0.330)	-0.1322		(0.308)
Formal Education Advanced	0.4314		(0.346)	1.1196	***	(0.354)
Nonformal FinEdu dummies (Base group: Low/None)						
Non-Formal Education Intermediate	0.6685	**	(0.326)	0.0734		(0.344)
Non-Formal Education Advanced	0.9922	**	(0.413)	0.3610		(0.406)
FK required at workplace dummies (Base group: Low/None)						
Medium	0.1789		(0.305)	0.6843	**	(0.269)
High	0.2843		(0.397)	0.2135		(0.348)
Self-directed financial education dummies from: (Base group: None)						
Books&Magazines: seldom	0.2439		(0.346)	-0.0173		(0.336)

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Books&Magazines: frequently	0.2236	(0.405)	-0.1969	(0.429)
Internet: seldom	0.8446	** (0.427)	0.5909	* (0.326)
Internet: frequently	0.7166	* (0.402)	1.1297	*** (0.345)
Broadcasting: seldom	0.3253	(0.337)	0.7079	** (0.296)
Broadcasting: frequently	0.0405	(0.365)	0.2668	(0.308)
Newspaper: seldom	0.6243	(0.489)	0.5606	(0.351)
Newspaper: frequently	0.3012	(0.423)	0.3596	(0.353)
Observations		375		490
Prob > F		0.000		0.000
R-squared		0.245		0.304
p-Value test Age coefficients=0		0.000		0.000
p-Value test Income coefficients=0		0.000		0.000
p-Value test Formal FinEdu coefficients=0		0.238		0.003
p-Value test NonFormal FinEdu coefficients=0		0.033		0.673
p-Value test FK at workplace coefficients=0		0.750		0.036
p-Value test Self-directed FinEdu coefficients=0		0.030		0.000

Source: *Authors' calculation.*

Note: The table presents the results of the linear regression models on the financial literacy index, separated by gender. Coefficients are presented with robust standard errors in parentheses. The base groups for the categorical variables are: "age under 35 years old," "income less than €30,000," "no children," "single," "low or no formal education," "low or no non-formal education," "little or no training required at work," and "no use of self-directed learning sources." The statistical significance levels are: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

The Advanced Financial Literacy Gender Gap

We then examined whether gender differences persisted in the advanced FL index, and if men and women presented different personal characteristics or made use of different ways of learning to attain financial knowledge. To this end, we conducted an Oaxaca-Blinder decomposition for both the basic and advanced FL indexes. As *Table 9* shows, the explained gender gap for the basic index (Panel A) is 28.31%, and almost 45% for the advanced index (Panel B), revealing larger gender differences for higher levels of FL. Therefore, 45% of the gender gap for the advanced subsample is due to differences between men and women in endowments or characteristics in their learning processes, rather than differences in coefficients, suggesting that if women had the same personal characteristics and chose the same ways of learning, they would significantly improve their individual FL. Thus, *H3f* is validated.

Table 9. Oaxaca-Blinder decomposition of gender gaps in financial literacy

1: Female = 0		N= 865				
2: Female = 1						
Panel A. Basic Financial Literacy Index						
Basic FL Index	Coefficient	Robust std. err.	z	P>z	[95% conf.	interval]
Differential						
Prediction_1	4.7048	0.0763	61.6500	0.00	4.5552	4.8544
Prediction_2	3.7204	0.0775	48.0000	0.00	3.5685	3.8723
Difference	0.9844	0.1088	9.0500	0.00	0.7712	1.1976
Decomposition						
Explained	0.2787	0.0549	5.0700	0.00	0.1710	0.3864
Unexplained	0.7057	0.1123	6.2800	0.00	0.4856	0.9258
Panel B. Advanced Financial Literacy Index						
Advanced FL Index	Coefficient	Robust std. err.	z	P>z	[95% conf.	interval]
Differential						
Prediction_1	4.0266	0.0853	47.1900	0.00	3.8593	4.1938
Prediction_2	2.8122	0.0763	36.8700	0.00	2.6628	2.9617
Difference	1.2144	0.1145	10.6100	0.00	0.9900	1.4387
Decomposition						
Explained	0.5364	0.0728	7.3700	0.00	0.3936	0.6791
Unexplained	0.6780	0.1026	6.6100	0.00	0.4770	0.8790

Source: *Authors' calculation.*

Note: The table presents the results of the Oaxaca-Blinder decomposition, which analyzes the differences in the basic and advanced financial literacy indices between men and women (N=865)

Following the previous analysis, we now conduct a multivariate regression for both genders regarding the advanced FL index. Results in *Table 10* show that the variables exerting a positive impact on women's advanced FL levels are the same as for the general index. The older they are, the higher their financial index, and a higher income promotes greater financial knowledge.

In men, only high levels of income and older age significantly increase the advanced financial literacy index. Unlike women, men primarily choose non-formal education to expand their knowledge, a finding that is consistent with the results for the overall financial literacy index.

A comparative analysis of *Table 8* and *Table 10* reveals distinct gender-specific patterns in the acquisition of financial knowledge. Men's approach to financial learning is characterized by a broad and proactive engagement across practically all available sources, demonstrating a strong interest in utilizing diverse learning options, regardless of the associated cost. In contrast, women's acquisition of financial knowledge appears to be more selective, with their skills primarily stemming from sources such as the internet, formal education, and the workplace. Consequently, our findings indicate that one key factor contributing to the gender gap is that men invest more in time and money to acquire financial skills than women. These outcomes support hypothesis *H3d* and *H3g*.

The findings reveal that a single source of information is not enough to increase FL. Men and women utilise different options to educate themselves in financial matters, indicating that these involve distinct ways of learning. According to reports by the OECD (2020), financial

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contents offered in formal education in Spain is inadequate and levels of financial knowledge among citizens remains relatively low. Furthermore, findings reveal that men often invest in financial education through paid non-formal courses, books, and magazines, while women primarily rely on formal education (mainly public education) and free Internet resources. This reliance, combined with challenges in selecting online reliable information, may explain why men tend to have greater financial knowledge. The financial gender gap could stem from men's higher willingness to invest in their financial education compared to women's lower motivation.

Table 10. Advanced financial literacy regression by gender

	Full Model		Full Model - Male		Full Model - Female	
Constant	1.3425	*** (0.155)	2.0557	*** (0.273)	1.3188	*** (0.190)
Age dummies (Base group: age <35)						
35 =< Age < 45	0.2556	** (0.128)	-0.1071	(0.199)	0.4704	*** (0.172)
Age >= 45	0.7420	*** (0.147)	0.4669	** (0.228)	0.8868	*** (0.201)
Income dummies (Base group: Income < €30.000)						
€30.000 =< Income < €50.000)	0.4362	*** (0.122)	0.1849	(0.203)	0.6546	*** (0.159)
€50.000 =< Income < €70.000)	0.9606	*** (0.147)	0.8877	*** (0.228)	0.9725	*** (0.202)
Income >= €70.000	1.3495	*** (0.174)	1.0146	*** (0.252)	1.7491	*** (0.264)
Children	-0.0819	(0.126)	0.0436	(0.180)	-0.2669	(0.188)
Living with couple or married	-0.1240	(0.115)	0.0712	(0.187)	-0.1647	(0.150)
Formal FinEdu dummies (Base group: Low)						
Formal Education Intermediate	-0.1416	(0.123)	-0.2125	(0.185)	-0.0663	(0.168)
Formal Education Advanced	0.2972	** (0.141)	0.1048	(0.211)	0.4740	** (0.202)
Nonformal FinEdu dummies (Base group: Low)						
Non-Formal Education Intermediate	0.1535	(0.138)	0.2124	(0.198)	0.1465	(0.202)
Non-Formal Education Advanced	0.3410	** (0.159)	0.4767	** (0.232)	0.1958	(0.225)
FK required at workplace dummies (Base group: Low/None)						
Medium	0.2031	* (0.118)	0.0340	(0.178)	0.3728	** (0.157)
High	0.1729	(0.149)	0.2326	(0.231)	0.1284	(0.197)
Self-directed financial education dummies from: (Base group: None)						
Books&Magazines: seldom	0.0224	(0.137)	0.1702	(0.218)	-0.0471	(0.181)
Books&Magazines: frequently	0.2907	* (0.161)	0.3867	* (0.230)	0.1753	(0.232)
Internet: seldom	0.5043	*** (0.144)	0.5574	** (0.239)	0.3964	** (0.180)
Internet: frequently	0.6361	*** (0.142)	0.4728	** (0.219)	0.7589	*** (0.190)
Broadcasting: seldom	0.3018	** (0.121)	0.3093	* (0.188)	0.2988	* (0.165)
Broadcasting: frequently	0.0727	(0.136)	0.1266	(0.210)	0.0898	(0.182)
Newspaper: seldom	0.4288	*** (0.159)	0.5824	** (0.276)	0.2925	(0.199)
Newspaper: frequently	0.3077	** (0.153)	0.5304	** (0.226)	0.0998	(0.206)
Observations	865		375		490	
Prob > F	0.000		0.000		0.000	
R-squared	0.385		0.326		0.326	
p-Value test Age coefficients=0	0.000		0.009		0.000	
p-Value test Income coefficients=0	0.000		0.000		0.000	
p-Value test Formal FinEdu coefficients=0	0.012		0.287		0.035	
p-Value test NonFormal FinEdu coefficients=0	0.093		0.117		0.599	
p-Value test FK at workplace coefficients=0	0.195		0.574		0.059	
p-Value test Self-directed FinEdu coefficients=0	0.000		0.000		0.000	

Source: *Authors' calculation.*

Note: The table presents the results of the linear regression models on the advanced financial literacy index, analyzed for the full sample and separately by gender. Coefficients are shown with robust standard errors in parentheses. The statistical significance levels are: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Conclusion

Previous research has highlighted the presence of gender differences in FL, a critical factor for overcoming the challenges of an increasingly complex and risky financial environment. We have explored these differences in a sample of undergraduate students at an online university. Findings confirm that the gender gap exists between individuals with similar digital skills, education levels and gender roles.

Understanding how and why men and women have different levels of FL is crucial for the design and implementation of policies to improve personal and household financial management. This study contributes to previous research clarifying the gender gap in FL acquisition. The gender gap in FL appears to be a consequence of variations in how knowledge and skills are acquired.

To explore the underlying mechanisms of the FL gender gap, we considered different ways of learning: formal and non-formal, workplace and self-directed. Our results reveal that the acquisition of advanced levels of FL depends not only on personal traits but also on the decision to use different learning options. In general, individuals who utilize multiple learning sources tend to achieve higher levels of FL, highlighting that a single source is not sufficient to increase their FL.

The study also reveals the different strategies adopted by men and women as they strive to enhance their FL. Our findings demonstrate that while men show a stronger interest in investing in their financial education through non-formal and self-directed learning processes, women typically prefer to acquire financial skills through formal education, workplace training and the use of internet, which are often provided at no cost. Additionally, women may face challenges in identifying and selecting the information that could effectively improve their financial skills. To bridge this gap, it is crucial to develop tailored financial education programs that address the unique preferences and needs of both genders, emphasizing accessible non-formal and self-directed learning opportunities for women. Our results suggest that even minimal exposure to diverse learning alternatives can significantly impact an individual's knowledge level, regardless of the frequency of use. Therefore, emphasizing accessible self-directed learning opportunities for women becomes particularly important.

Likewise, life and work experiences appear to be critical determinants for the acquisition of advanced financial skills. Thus, policies promoting women in occupations requiring the learning and use of these competences and encouraging their participation in structured programmes and processes designed to improve these skills outside the formal educational curriculum, could increase their FL. The influence of income levels suggests that reducing the gender gap in salaries may also have a positive influence on FL among women.

The present study has a number of limitations. The levels of education and expectations among our sample of undergraduates are probably above average, and this must be considered when interpreting our findings. In addition, the small size of the sample may influence results. Similarly, extrapolation of the results may also be limited by the biases arising from a sample selection based on students from a distance learning university and mostly with work experience as well as from the restrictions of collecting information through a self-reporting method. Consequently, and given that this study analysed the FL levels in a single university, further research is needed before these results may be extrapolated to other settings and circumstances. As recommendations for future research, it would be desirable to analyse the validity of these findings in a sample of individuals with much more disparate levels of formal education as well as between communities living in urban and rural settings.

This research may also have some practical implications related to the design of educational programmes and policies aimed at improving financial skills while pursuing equity

goals. Considering all the sources of learning as well as gender differences in learning strategies would enable the design of initiatives more effective in achieving financial inclusion and gender equality.

Declaration of interest statement

No potential conflict of interest was reported by the author(s).

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