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Financial literacy in Southern Brazil: Modeling and invariance between genders

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ABSTRACT

Financial literacy is an essential attribute that allows people to reach a successful financial state. Therefore, the objective of this paper is to develop a model to measure financial literacy, testing invariance in the proposed measure from three scales: financial knowledge, financial attitude and financial behavior. In this sense, a survey was conducted with 991 individuals who live in southern Brazil. For an analysis of the collected data, Structural Equations Modeling (SEM) was employed. The valid model indicates that financial literacy is measured as a combination of financial behavior, attitudes and knowledge. In addition, the tests indicated that this model is adequate for both male and female. However, male individuals showed a higher level of financial literacy on average compared to females.

1. Introduction

Financial literacy has been known as an essential ability for citizens who need to operate in a more complex financial scenario. Governments around the world are interested in finding efficient approaches to improve the population's level of financial literacy through the creation or improvement of national strategies for financial literacy with the objective of offering learning opportunities at different levels of education (Atkinson and Messy, 2012).

In recent years, developed and emerging countries have become preoccupied with the level of financial literacy of their citizens, mainly because of the difficult economic and financial contexts and the fact that the lack of financial literacy is one of the factors that have contributed to poor informed financial decisions with huge negative repercussions in financial situations (Gerardi et al., 2010). As a result, financial literacy comes to be known around the world as an important element to economic stability and development, and it reflects the approval of the High Principals Level about National Strategies for Financial Literacy from the Organization for Economic Co-operation and Development (OECD) endorsed for the G20 meeting (G20, 2012).

In addition to governments, international organizations and researchers who dedicate themselves to this theme, OECD (2012) is an example of an organization that conceptualizes financial literacy as a process in which individuals improve their comprehension of financial products and their concepts and risks in such a way that through information and clear recommendations, abilities and necessary confidence can be developed to make fundamental and safe financial decisions to improve their well-being.

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From this perspective, Anderloni and Vandone (2010) define financial literacy as a preventive measure that allows individuals to have enough conditions in which to understand financial problems and manage their personal finances in a satisfactory way, avoiding indebtedness.

Another aspect related to financial education is financial literacy. According to Robb et al. (2012), financial literacy involves the ability to understand financial information and make efficient decisions using the same information, while financial education simply involves remembering a group of facts. In this context, financial education can be considered an ability to develop a process of making correct decisions and successful management of personal financials and financial literacy is the ability to use the knowledge and abilities required. Simply, the main focus of financial literacy involves not only knowledge but also individuals' financial behaviors and attitudes.

However, there remains a lack of a consensus in the academic field about the instruments for measuring financial literacy. In recent years, many studies have been conducted in the USA, such as those by Chen and Volpe (1998, 2002), Murphy and Yetmar (2010) and Neidermeyer and Neidermeyer (2010). Studies with families from the United Kingdom have also been conducted by Lusardi and Tufano (2009) and Disney and Gathergood (2011). In addition, similar studies were conducted with university students from Japan by Sekita (2011) and from Ghana by Ansong (2011) and with retired people in Holland by Rooij et al. (2011). Among emerging countries, it remains common to find works that discuss the themes approached in this paper. In the Brazilian scenario, this subject has been the focus of studies conducted by Mendes-Da-Silva et al. (2012) and Norvilitis and Mendes-Da-Silva (2013) in student sample. A difference in our paper is the study of the general population.

Independent of the measure used, many studies have proved the associations and influences of socioeconomic and demographic variables on the levels of individuals' financial literacy (Chen and Volpe, 1998; Lusardi and Tufano, 2009; Hastings and Mitchell, 2011; Lusardi and Mitchell, 2011; Atkinson and Messy, 2012; Brown and Graf, 2013; Mottola, 2013; OECD, 2013). Gender is one of the main variables researched, and the majority of the evidence indicates that women generally show lower indices of financial literacy than men (Chen and Volpe, 1998; Lusardi and Mitchell, 2011; Atkinson and Messy, 2012; Lusardi and Wallace, 2013; Brown and Graf, 2013; Mottola, 2013).

Sekita (2011) broadens the evidence that women face greater difficulties than men in making financial calculations, which, in addition to not having the basic financial concepts and lower level of knowledge, make responsible financial decisions more difficult to achieve. This can be considered a worrisome factor because women are gaining space in the labor market and participating more in consumer decisions, income management and indebtedness; furthermore, women usually have the role of being responsible for the household. In the period between 2000 and 2010, Brazilian women that were responsible for the family grew from 22.2% to 37.3% according to the Brazilian Institute of Geography and Statistics (IBGE, 2010). Moreover, studies in the Brazilian's context are important because this country has had a set of very unique characteristics that promise the country a bright economic and social future, such as large and expanding domestic market; single language; sophisticated financial market; abundance of water, land, and sunlight; and others (Gouvea, 2012).

The extant literature has argued that financial literacy is a multidimensional concept and that a unique construct would not be sufficient to cover all dimensions involved. Although some studies have already been conducted, there is still uncertainty about the constructs and best proxies to evaluate financial literacy and also whether a model could be used for different genders. All of these facts suggest the necessity of building and validating models that are able to consider measures and their sub-relations simultaneously.

In this sense, we try to fill this gap by developing a model to measure financial literacy, testing the proposed model's invariance and the differences in the measures between female and male genders. To achieve this objective, a model that integrates financial knowledge, financial attitude and financial behavior of the individuals of southern Brazil is evaluated.

2. Financial literacy

The term financial literacy has been frequently used as a synonym for financial education or financial knowledge, but in reality, these constructs are conceptually different, and using them as synonyms can cause problems because financial literacy is deeper than financial education. Huston (2010) says that financial literacy has two dimensions: understanding, which represents the personal financial knowledge of financial education, and use, which means the application of the management of personal financial knowledge. Hung et al. (2009) define financial education as a process by which people improve their comprehension about financial products and services, and financial literacy is defined as the ability to use the knowledge and abilities acquired to manage resources effectively, providing financial wellbeing.

According to Lusardi and Tufano (2009), financial literacy is the ability to make simple decisions about debt contracts, and more specifically, the application of basic knowledge about compound interest in the context of financial decisions. Financial literacy for Mandell (2007) refers to the ability to evaluate new and complex financial instruments and make informed judgments regarding the choice of instruments and their more adequate use as well as being guided in efficient decision-making in relation to the use of money and management (Servon and Kaestner, 2008).

One of the dilemmas in financial literacy analysis is the understanding of the differences between this construct, financial knowledge and financial education. In this sense, Robb et al. (2012) make a distinction among these terms, indicating that financial literacy involves the ability to understand financial information and make efficient decisions using this information, while financial education is only the ability to remember a group of facts or simply financial knowledge. Xiao et al. (2011) argue that financial knowledge is not sufficient for efficient financial management, and the influence of financial knowledge on behavior

is a measure of the student's financial attitudes. According to Criddle (2006), having financial literacy includes learning when choosing from many alternatives to establish financial objectives. All in all, financial literacy goes further than the idea of basic financial education (Huston, 2010; Robb et al., 2012).

Another dilemma in the study of financial literacy is the lack of models that present the different dimensions involved. In a comprehensive review of the literature, Huston (2010) has found that out of the seventy-one works revised, more than fifty could not define financial literacy, and in the twenty works that gave a definition, eight different definitions could be found; two definitions focused on ability, and three definitions focused on knowledge only.

Although there are many definitions and dimensions used to describe financial literacy, most of them refer to an individual's ability to obtain, understand and evaluate financial information that is necessary to make an efficient decision aiming at the individual's financial wellbeing. In this way, a broader definition is given by the OECD, measuring financial literacy as a combination of the consciousness, knowledge, ability, attitude and behavior necessary to make solid financial decisions, and finally, reach financial wellbeing (Atkinson and Messy, 2012). The OECD describes financial literacy in terms of three dimensions: financial knowledge, financial behavior and financial attitude.

Financial knowledge has been proposed by as a particular type of human capital acquired in the life cycle through learning aspects that affect the ability to manage income, expenditures and savings in an effective way. It has been developed through interactions when transmitting and receiving information in groups (Danes and Haberman, 2007). Financial attitude is defined by Shockey (2002) as a combination of concepts, information and emotions about the process of learning and results in a predisposition to act favorably. Hence, the development of attitudes can be a result of the direct experiences of individuals due to the exposure or conditioning of the content (Winkielman et al., 2006). In addition, financial behavior is defined as an essential element of financial literacy (OECD, 2013), whereas recent studies have related financial behavior as an element of financial literacy (Lusardi and Mitchell, 2013).

The development of a financial literacy measure is another complex issue. Lusardi and Mitchell (2011) state that although it is important to evaluate the way in which people are literate, in a practical way, it is difficult to explore the way in which people proceed with financial information and make decisions based on this knowledge. According to Schmeiser and Seligman (2013), the current questions used to measure financial literacy have not been rigorously tested to guarantee that financial literacy is measured on the individual level. Huston (2010), Remund (2010) and Robb et al. (2012) conclude that financial literacy has a definition, but it does not have a standardized instrument to measure it.

Therefore, it seems that there is not a "common" or "usual" way in which investigators and professionals measure financial literacy. However, this does not mean that financial literacy has not been measured in a consistent way in the literature and practically. Annamaria Lusardi and Olivia Mitchell developed a group of three questions that are commonly used in many studies (Knoll and Houts, 2012). The questions comprehend three basic concepts of finance: the tax rate, inflation and risk aversion.

The utility of these questions lies in the fact that they have been the subjects of many studies, building a useful base to compare among countries with regard to financial literacy. Among these studies, it is important to refer to those by Hastings and Mitchell (2011) in Mexico; Lusardi and Mitchell (2011) in the USA, Sekita (2011) in Japan; and recently, those in Sweden (Brown and Graf, 2013), France (Arrondel et al., 2013) and Romania (Beckmann, 2013).

The lack of measures and international data as well as the request from many countries asking for a robust measure of financial literacy on a national level have led the OECD and its International Network for Financial Education (INFE) to develop a research instrument that can be used to evaluate the financial literacy of people in many countries, centralized in aspects such as the knowledge, attitudes and behavior associated with global concepts of financial literacy.

Apart from these instruments, some authors have evaluated the dimensions of financial literacy separately. Rooij et al. (2011) examined the relationship between financial knowledge and retirement planning in Holland. Studies by Chen and Volpe (1998) and Johnson (2001) developed evaluative instruments for financial behavior. Another instrument used in some research is the FLABK (financial literacy—attitude, behavior and knowledge) elaborated by Susan Sminth Shockey (2002), who analyzes the attitudes and behavior of respondents.

Despite the differences in the concepts, evaluation and dimensions inherent to financial literacy, there is an agreement that its importance brings benefits to individuals as well as families in many aspects (Blalock et al., 2004; Grable and Joo, 2006). An increase in financial literacy promotes an improvement in self-confidence, control and independence (Allen et al., 2007) and an improvement in the conjugal relationship (Oggins, 2003). According to Schmeiser and Seligman (2013) and Lusardi and Mitchell (2011), an increase in the financial literacy level contributes to changes in national prosperity over time, and for Fonseca et al. (2012), financial decisions are sensitive to developing men's and women's levels of education and positively impact this development.

This question is even more important in developing countries like Brazil, where the educational level is often less smaller, have a large population with budget restrictions, the economy is unstable with periods of great fluctuation in interest rates, availability of credits and changes of risk and return on financial products. It requires from the population increased application of financial literacy, which becomes even more essential.

3. Relationship between gender and financial literacy

The relationship between gender and financial management has been gaining space because knowing individuals' profiles and levels of financial literacy is extremely

relevant due to the increase in their financial responsibilities. This increase in attention is mainly because there is some empirical evidence that financial literacy positively impacts an individual's financial situation in relation to matching incomes, saving money and controlling spending (Perry and Morris, 2005), controlling debts (Lusardi and Tufano, 2009), participating in financial markets (Yoong, 2011, Rooij, Lusardi and Alessie 2001), planning for retirement (Lusardi and Mitchell, 2011) and accumulating wealth (Stango and Zinman, 2009). In addition, financial literacy is connected with an individual's financial situation and other important aspects of social wellbeing, where a poor financial situation is associated with bad emotional results for the whole family and a lower level of education for children (Shanks and Danziger, 2010).

Therefore, low levels of financial literacy can reduce the ability to manage and accumulate assets and in terms of final analysis, guarantee a promising financial future (Mottola, 2013). Specifically, in terms of differences between genders, many authors found that women generally show lower levels of financial literacy than men (Chen and Volpe, 1998; Lusardi and Mitchell, 2011; Atkinson and Messy, 2012; Lusardi and Wallace, 2013; Brown and Graf, 2013; Mottola, 2013). In the USA, Lusardi and Mitchell (2011) found that women are less prone to answer correctly and are more prone to say that they do not know the answers to questions related to financial literacy. Similar results have been found in other countries such as Australia, France and Romania (Lusardi and Wallace, 2013). Similarly, women evaluate their own levels of financial literacy in a more conservative way in both developed countries and developing countries.

Studies conducted by Chen and Volpe (1998) broaden the evidence that women experience greater difficulty in making financial calculations and possess a lower level of knowledge, leading to difficulties in their ability to make financial decisions. However, in a study conducted in Sweden (2013), this difference in the level of financial literacy is not influenced by a lack of women's interest in financial questions, but in reality, the difference in gender is slightly lower when comparing the participation of individuals who answered all of the questions during the interviews to individuals who are interested in finance. Furthermore, Shambare and Rugimbana (2012) examined the financial literacy in South Africa and found that 20% of men answered the compound interest questions correctly compared to 10% for women, besides the association between gender and financial illiteracy.

4. Methodology

This study investigates the resident population in southern Brazil with a random sample of 991 individuals. The instrument to collect data has been formed by four blocks of questions. Initially, we attempted to identify the respondents' profiles with eight questions related to socioeconomic and demographic variables: gender, age, marital status, dependents, race, ascendency, occupation and income.

Because there is not a valid instrument to measure financial literacy in its totality (Remund, 2010), we have chosen the use of proxies according to the procedures adopted by many researchers (Knoll and Houts, 2012, Shim et al., 2009, 2010, Atkinson and Messy, 2012) who have evaluated literacy through factors. In this study, financial literacy consists of financial behavior, financial knowledge and financial attitude.

To measure financial behavior, several questions developed by Chen and Volpe (1998), Johnson (2001) and Shockey (2002) have been used and adapted to Brazilians' contextual reality. Formed by 20 questions, the survey is organized into a 5-point Likert scale (1—never, 5—always) and evaluates individuals' behavior in terms of financial management, the use of personal credit, planned consumption, investment and savings. High scores on the scale indicate a good financial behavior.

To evaluate the level of financial knowledge, a factor from the average punctuation of two groups of multiple-choice questions adapted from Rooij et al. (2011) has been constructed. The first group (basic knowledge) is formed by 3 questions and aims to measure basic financial abilities with questions related to inflation, tax rates and the value of money over time. The second group (advanced knowledge) is formed by 5 questions to explore the level of knowledge in relation to complex financial instruments such as shares, public bonds and risk diversification. For each question from the basic knowledge group, 1.0 point has been attributed to each correct answer, and for each question from the advanced knowledge group, 2.0 points have been attributed. This way, the individual who scored 3 answers from the basic knowledge group achieved 1 point for each question, while the individual who answered one question in the advanced knowledge group correctly got 2 points. According to this scale, the higher the score, the higher the financial knowledge.

To measure financial attitude, the scale developed by Shockey (2002) has been used. This scale is formed by 9 questions and is organized in a 5-point Likert scale model (1—absolutely disagree, 5—absolutely agree) and aims to identify how individuals evaluate their financial management. Therefore, a higher score indicates better financial attitudes.

The scales choice has taken into consideration the best adjustment for the Brazilian context, which is translated and the content validation of which is analyzed. These scales have been chosen for this study because they adapt to Brazilian reality best. Based on the model of Churchill (1979), scales were validated by two specialists and applied to one hundred and thirty students to improve and refine measures through Exploratory Factorial Analysis.

The first step was to ascertain the identification profiles of the respondents and then to develop a model to analyze the direct and indirect influences of the constructs. Structural Equation Modeling (MEE) was used; according to Urbach and Ahlemann (2010), this is a statistic technique to estimate and test the causal relationship among variables based on statistical data and quantitative causal hypotheses and is considered to be a second multivariate analysis generation because it allows the consideration of relationships between dependent and independent constructs simultaneously. In the structural model, many multivariate equations have been used to predict and explain a set of

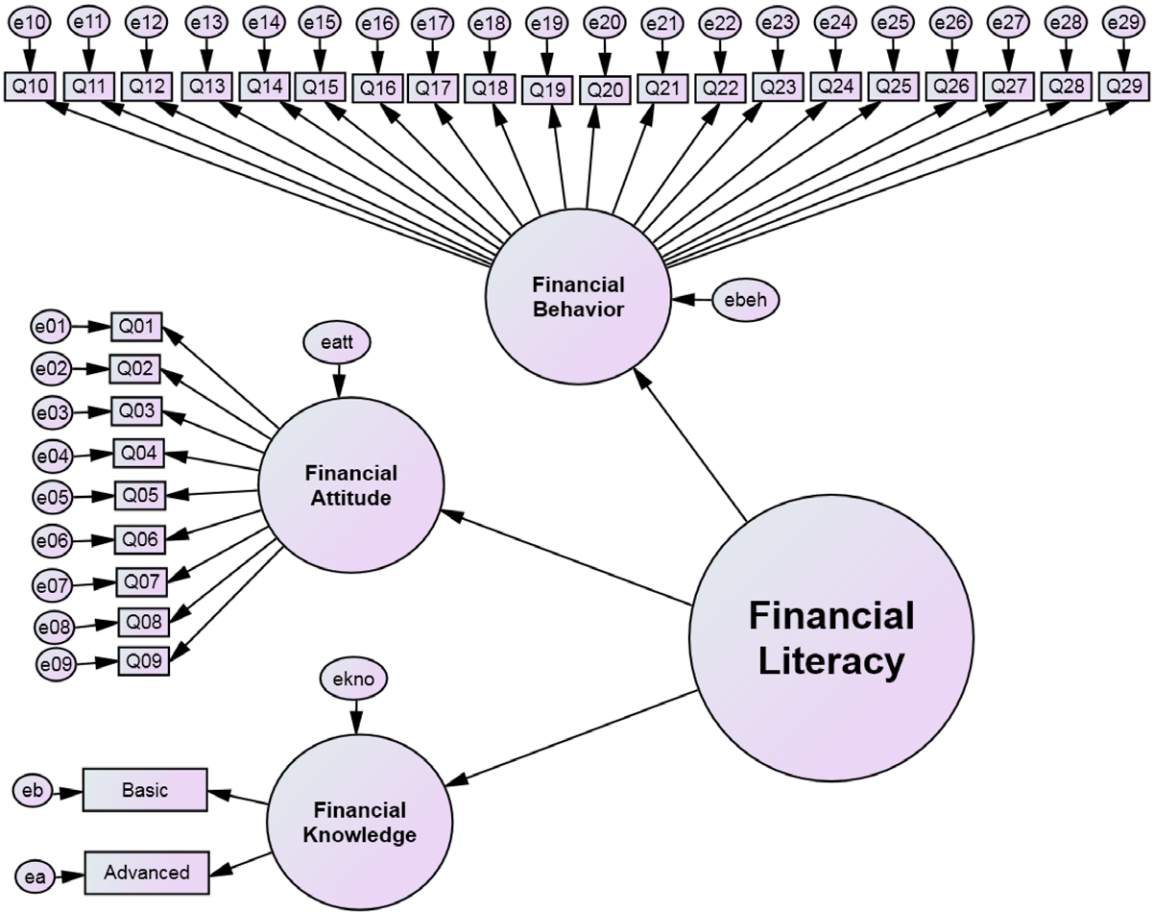

Fig. 1. Proposed model.

endogenous and exogenous constructs (Hair et al., 2009). Therefore, this study seeks to build an integrated model that combines the measurement model and the structural model. The MEE has been used in two steps. First, the Confirmatory Factor Analysis (AFC) has been made to validate the constructs. The relationship among the observed variables and its constructs has been estimated by the maximum likelihood. In the second step, the hybrid model has been validated through the global adjustment indices and the significance and magnitude of coefficients in regressions estimated. Fig. 1 shows the model tested, and the questions referred to in the scales are found in the Appendix.

The model proposed is a second-order factorial model in which original constructs form financial literacy. The construct is a way to consider the arguments of Shockey (2002), OECD (2013) and Atkinson and Messy (2012), who measure financial literacy as a combination of financial behavior, attitudes and knowledge.

To analyze the model, a confirmatory factors analysis (CFA) was conducted to validate the financial behavior and financial attitude constructs; in the second part, a structural model was used. In both strategies, correlations between errors from observed variables have been introduced, as suggested by the AMOS 18 report, which makes theoretical sense.

The measure of the model's validity has been evaluated through convergent validity, unidimensionality and construct reliability. The convergent validity of each construct has been analyzed by the magnitude and meaningful statistics of its standardized coefficients and absolute fit indices: chi-squared statistics (χ^2), the root mean square residual (RMR), the root mean square error of approximation (RMSEA), the goodness-of-fit index (GFI) and comparatives fit indices: the comparative fit index (CFI), the normed fit index (NFI) and the Tucker–Lewis index (TLI). There remains a lack of a consensus in the literature about acceptable values for these indices. For chi-squared/degrees of freedom, the recommendations vary from less than 5 to less than 2 (Hooper et al., 2008). For CFI, GFI, NFI and TLI, the values are less than 0.95, and for RMR and RMSA, the values are less than 0.05 and 0.08, respectively (Hooper et al., 2008).

To measure the construct's reliability, extracted variance, score reliability and Cronbach's alpha were used. The construct is considered reliable if score reliability and extracted variance values are equal or superior to 0.7 and 0.5, respectively (Garver and Mentzer, 1999; Hair et al., 2009). Alphas at approximately 0.7 are considered adequate (Kline, 2011, p. 70). The construct's unidimensionality is verified through the evaluation of the adjusted

Table 1
Descriptive statistics.

Variable	Alternatives	*N*	Weighted percent
Gender	Male	398	40.2
	Female	593	59.8
Marital status	Single	678	68.4
	Married	274	27.6
	Separated	30	3.0
	Widower	8	0.8
Have dependents	No	776	78.3
	Yes	215	28.5
Ethnicity	White	844	85.2
	Black	56	5.6
	Eastern	7	0.7
	Mulatto (mixed white and black)	81	8.2
	Indigenous	3	0.3
Ancestry	Brazilian	456	46.0
	German	180	18.2
	Italian	236	23.8
	Japanese	2	0.2
	Portuguese	42	4.2
	Do not know	35	3.5
	Other	40	4.0
Work	Civil servant	115	11.6
	Self-employed	85	8.6
	Waged employment	318	32.1
	Farmer	20	2.0
	Retired	15	1.5
	No work	221	22.3
	Other	217	21.9

residuals. Absolute values lower than 2.5 do not suggest problems (Hair et al., 2009). The baseline model is validated through the fit indices of global models and the significance and magnitude of coefficients from the regressions estimated. All models were estimated using a bootstrap maximum likelihood method with a sample size of 1.000, as suggested by Cheung and Lau (2008).

For the model's validation, a multi-group analysis between groups of invariance has been conducted with the aim of evaluating whether the structures of the measurement model and structural model are equivalent in both groups.

The multi-group invariance analysis is conducted by testing a series of nested models, starting with model reduced in restrictions and imposing growth restrictions accordingly (Arbuckle, 2011). The invariance analysis is conducted through chi-squared and CFI differences tests (Byrne, 2010). A non-significant difference in chi-squared and values lower than 0.01 in CFI difference indicate invariance in both groups (Cheung and Rensvold, 2002). Furthermore, a failure in one test does not permit the continuity of other parameter tests (Koufteros and Marcoulides, 2006). The null hypothesis tested is that the data originated in the same group, meaning that both groups do not differ and that the covariance effects do not impact structural relationships (Byrne, 2010).

After the invariance analysis between groups, the average difference test between groups was performed. Assuming that the invariance of structure and averages between groups are sufficient conditions in which to compare the groups and if these conditions exist, the test for significant differences between groups about the constructs can be performed (Bollen, 1989; Dimitrov, 2006).

5. Results

The choice of the southern region of Brazil in this research is related to the fact that this region leads the Human Development Index (IDH) among other regions, it has superior indicators compared to the average among Brazilian regions, and the majority of cities (64.7%) are in range of high development according to Human Development Atlas In Brazil (2013). Descriptive statistics are shown in Table 1.

The final sample is formed by 991 individuals, of which 59.84% are female, 68.4% are single, the average age is 27 years old, and they have no dependents (78.3%). The majority also considers themselves as white (85.2%) and have Brazilian ascendency (46.0%). With regard to occupation, 32.1% of individuals have a formal job and waged employment. This sample has some similar characteristics with the population of the southern region of Brazil, of which 51% are female, the average age of 35 years old and 83% consider themselves as white (IBGE, 2010).

When the averages found in the original scales are analyzed, it can be observed that financial attitudes among both genders are adequate and similar; considering that the scale varies from one (1) to five (5), male and female individuals presented the averages of 4.41 and 4.43, respectively. Financial behavior is at an intermediate level, with the average 3.69 for men and 3.58 for women. For financial knowledge, it can be observed that respondents have had some difficulties in understanding; this construct varies from zero (0) to three (3), and low levels of financial knowledge were found for men (average 1.62), but mainly for women (average 1.21). Both genders have presented adequate levels for financial attitude, intermediate levels

Table 2
Fit indices for the constructs of financial behavior, financial attitude and the baseline model.

Fit Indices	Financial behavior		Financial attitude		Baseline model	
	Proposed	Final	Proposed	Final	Proposed	Final
Chi-square (value)	1913.617	2.017	357.840	2.652	91.807	26.027
Chi-square (probability)	p - 0.000	p - 0.365	p - 0.000	p - 0.103	p - 0.000	p - 0.165
Degrees of freedom	170	2	27	1	25	20
Chi-square/Degrees of freedom	11.257	1.009	13.253	2.652	3.672	1.301
GFI	0.798	0.999	0.915	0.998	0.980	0.994
CFI	0.683	1.000	0.850	0.998	0.973	0.998
NFI	0.664	0.998	0.841	0.997	0.963	0.989
TLI	0.646	1.000	0.800	0.994	0.960	0.996
RMR	0.123	0.014	0.028	0.007	0.026	0.013
RMSEA	0.102	0.003	0.111	0.041	0.052	0.017
Extracted variance	0.243	0.525	0.321	0.586	–	–
Score reliability	0.853	0.813	0.802	0.846	–	–
Cronbach's alpha	0.844	0.803	0.781	0.746	–	–

for financial behavior and low financial knowledge; for the last two constructs, women presented the lowest indicators.

The finding of a low level of financial knowledge is not exclusive to this study. In recent years, many studies have had worrisome results indicating unsatisfactory levels of knowledge for financial questions as well as personal financial management and in other specific questions dealing with areas such as credit, loans, savings accounts and investments (Disney and Gathergood, 2011, Rooij et al., 2011).

In the following proposed strategies, the measure model has been initially adjusted, and the baseline model is then evaluated (Table 2).

For the financial behavior and financial attitude constructs, the models proposed are those with all variables in the original scale. The results indicate that both models are inadequate because the chi-squared/degrees of freedom are greater than three, the fit indices GFI, CFI, NFI and TLI have not reached the maximum value of 0.95, and the RMSEA and RMR indices are greater than 0.08 and 0.05, respectively. In addition, the extracted variance is lower than 0.5.

After these utterances, the constructs of financial behavior and financial attitude presented adequate adjustment in terms of the following: (i) convergent validity because the CFI, GFI, NFI and TLI indices were higher than 0.95 and the RMR and RMSEA indices were lower than 0.05; (ii) reliability, bearing in mind that score reliability and Cronbach's Alphas were higher than 0.7 and the extracted variances were higher than 0.50, and, (iii) unidimensionality because all of the standardized residuals were lower than 2.58 ($p < 0.05$). In addition, chi-squared results were not significant at the 1% level.

The results for the baseline model shown initially indicated that the model is not adequate because the chi-squared/degrees of freedom results are greater than three, and the insertion of correlations between observable variable errors has been conducted. Kline (2011, p. 358) states that "correlations between residuals can be inserted when justified".

After the insertions, it has been found that the model presents adequate adjustments, showing convergent validity because the CFI, GFI, NFI and TLI indices were higher than 0.95 and the RMR and RMSEA indices were lower than 0.05 and because the chi-squared results were significant at the 1% level. Fig. 2 shows the final model for the construct of financial literacy with standardized coefficients and the significance of relationships in this model.

While the model has shown significance in all of the proposed relationships, the construct of financial behavior is the one that had the most impact on financial literacy. This result supports the results obtained by Lusardi and Mitchell (2013), OECD (2013) and Klapper et al. (2013) who state that financial behavior is an essential and determinant element of financial literacy.

Furthermore, the investigation of the invariance of the factorial structure of the construct of financial literacy between female and male individuals has been analyzed. This procedure has been achieved through the difference in chi-squared tests and the difference in CFI between two nested models. The parameter restrictions between groups were created according to Byrne (2010), generating five models:

- Model 1. Combined baseline models (males and females): no restrictions, with all free parameters.
- Model 2. Measurement weights: with the same factorial load between groups.
- Model 3. Structural weights: with factorial wages and the same structural coefficient between groups.
- Model 4. Structural residuals: with the same factorial load, structural coefficient and covariance between groups.
- Model 5. Measurement residuals: with the same factorial load, structural coefficients, covariance and variance of errors between groups.

Table 3 presents the results of the Goodness-of-Fit Statistics for the analysis of the invariance between groups.

The comparison between the free model (Model 1) and the model with fixed factorial loads (Model 2) shows that the factorial weights are invariant between groups, meaning that the model with fixed factorial weights adjusted itself well in both groups and shows the equivalence in the measuring model for both genders. The comparison between Model 1 and the model with factorial loads and equal structural coefficients (Model 3) showed that the loads as well as the relationship among constructs are invariant in terms of gender.

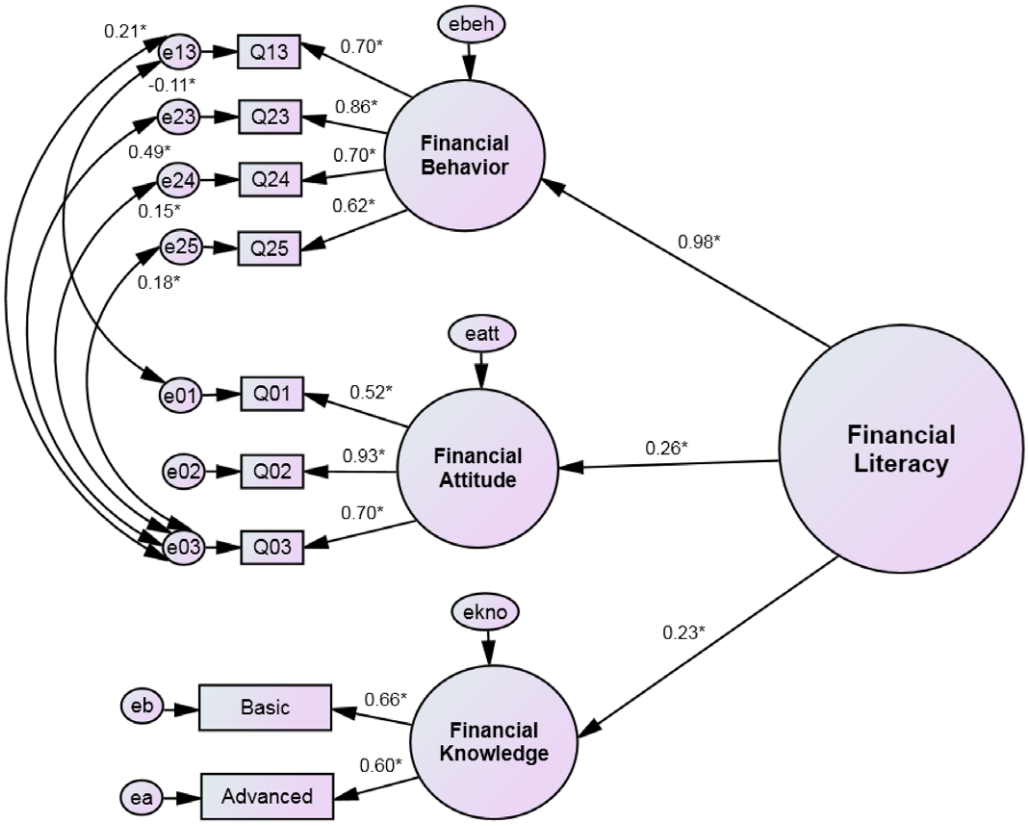

Fig. 2. Final measure model with standardized coefficients and relationship significance. Note: $^{*}p < 0.01$.

Table 3
Goodness-of-Fit Statistics for tests of invariance across males and females: A summary.

Model description	$\chi 2$	df	$\Delta\chi 2$	Δdf	Statistical significance (p)	CFI	ΔCFI
1. Combined baseline models (males and females)	55.533	41	–	–	–	0.994	–
2. Measurement weights	63.763	47	8.230	6	0.222	0.993	0.001
3. Structural weights	70.761	50	15.228	9	0.085	0.991	0.003
4. Structural residuals	89.482	51	33.949	10	0.000	0.984	0.010
5. Measurement residuals	115.069	65	59.536	24	0.000	0.979	0.015

(Note: $\chi 2$ = chi-square values; df = degrees of freedom; $\Delta\chi 2$ = difference in chi-square values; Δdf = difference in degrees of freedom.).

In the comparison of the free model (Model 1) and the model with factorial loads, the structural coefficients and equal errors' covariance between groups (Model 4) showed ΔCFI = 0.010, $\Delta\chi 2$ = 33.949 with Δdf = 10, which are statistically significant ($p = 0.000$), indicating that the models are not invariant between groups. We can conclude that the last two models do not show invariance for female and male genders; however, for Brown (2006), the total invariance test for errors is considered by some authors to be too restrictive and not very important.

When estimating the model for both genders, a difference in the construct of financial knowledge has been found. The construct of female gender positively impacts financial literacy, while the impact of male gender is not significant. For women, the three constructs impact financial literacy; however, for men, financial knowledge does not influence financial literacy; therefore, only financial behavior and attitude impact financial literacy (Fig. 3).

In this context, there is a great deal of evidence that men have a superior level of financial knowledge compared to women. Lusardi et al. (2010) verified that men have more knowledge. A possible reason for this is men's motivation and enthusiasm to learn generalized financial issues, savings and loans, insurance and investment in addition to possessing high levels of self-confidence (Chen and Volpe, 2002).

The difference between financial literacy between groups is significant. The positive coefficient (0.228) at the 1% significance level indicates that males show higher levels of financial literacy. This result is similar to results found in other countries, such as developing countries and financially different countries (Lusardi and Wallace, 2013). Mottola (2013) found differences not only in financial literacy but also in financial behavior.

In addition, Falahati and Paim (2012) found that differences between men and women are justified due to differences in the process of socialization experienced by these

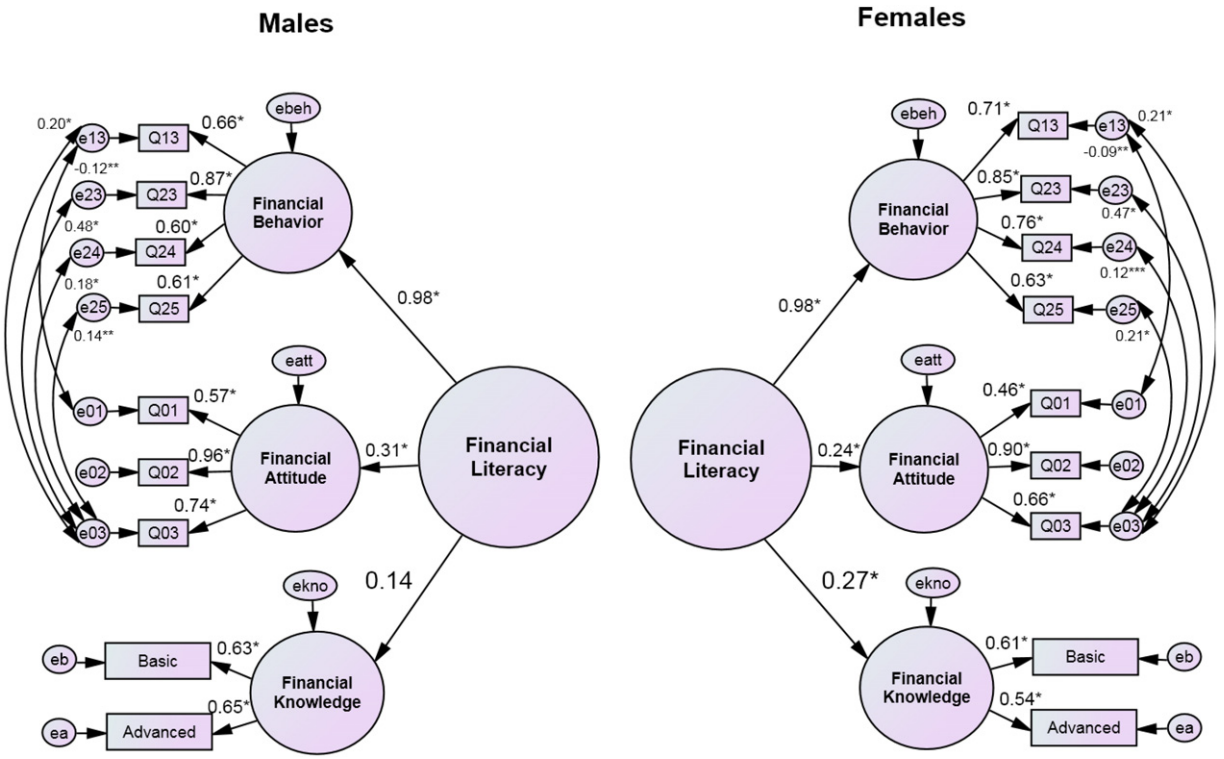

Fig. 3. Final measure model with standardized coefficients and relationship significance for female and male genders. Note: $^{*}p < 0.01$; $^{**}p < 0.05$; $^{***}p < 0.10$.

individuals. While families adopt a more protectionist financial strategy for women, protecting them from financial practice, they incentivize men to participate in financial decision-making, and it leads them to acquire a higher knowledge and a wider vision of these questions.

6. Conclusions

The efficient learning of financial issues develops a central role when building responsible attitudes and behavior when considering personal financial management, mainly due to a cultural environment in which it is more difficult to achieve self-sufficiency and responsibility in a particular society.

This study had the objective of developing a model to measure financial literacy through testing the invariance of the measures proposed and the differences between averages in terms of female and male genders. To measure the level of literacy, a model that integrates financial knowledge, financial attitude and financial behavior has been proposed for individuals in southern Brazil.

In the estimation of the model, the scales were considered to be reduced. From the twenty items in the initial financial behavior scale, only four were kept, while for attitude, the items were reduced from nine to three. These results indicate the necessity of the greater use of analysis techniques and more rigorous criteria, improvements in scale items to achieve measurable instruments for constructs that may be considered valid.

In the second step, the correlation between the errors of the variables were added in order to achieve an adequate adjustment for the model, where the construct of financial literacy showed significance in all relationships that were initially proposed, and the construct that showed the greatest impact was financial behavior.

When investigating the invariance of the financial literacy construct between males and females, it could be seen that the measuring model and structural model to evaluate financial literacy are invariant. A significant difference in the regression coefficients has been found for both groups, but the financial knowledge construct does not influence financial literacy for males. Furthermore, the difference between the averages of the groups was significant, and male individuals showed higher levels of financial literacy than female individuals.

It is also important to note that the data collected have been restricted to individuals in southern Brazil, which presents explicit peculiarities. Therefore, different profiles should be researched using a larger sample. Three constructs for financial literacy have been used, but other scales can be relevant.

This study can be considered a pioneer in the attempt to model financial literacy for Brazilians and develop an invariant model for both genders. We hope that this research advances the literature in this sense due to the need to evaluate individuals' levels of financial literacy in the same proportion in which more complex financial products are created.

Table A.1
Questions related to financial attitude, financial behavior and financial knowledge.

Financial attitude	**01.** It is important to control monthly expenses. **02.** It is important to establish financial targets for the future. **03.** It is important to save money monthly. **04.** The way I manage my money today will affect my future. **05.** It is important to have and follow a monthly expense plan. **06.** It is important to pay the full value on credit cards. **07.** When buying in installments, it is important to compare available credit offers. **08.** It is important to stay within a budget. **09.** It is important to invest regularly to achieve targets in the long term.
Financial behavior	**10**. I always pay my credit cards on time to avoid extra charges. **11.** I worry about how to best manage my money. **12.** I take notes and control my personal expenses (e.g., expense and revenue spreadsheet). **13.** I establish financial targets for the long term that influence the management of my expenses. **14.** I follow a weekly or monthly plan for expenses. **15.** I go more than one month without balancing my expenses. **16.** I am satisfied with the way I control my finances. **17.** I pay my bills without delay. **18.** I can identify how much I pay when using credit. **19.** I use credit cards and overdrafts when I do not have money for expenses. **20.** When buying in installments, I compare available credit options. **21.** I use more than 10% of my monthly earnings to make payments on my credit cards. **22**. I check my credit card invoices to avoid possible mistakes and debts. **23.** I save monthly. **24.** I save so that I can buy something expensive (e.g., car). **25.** I have a financial reserve at least three times my monthly earnings, which can be used in unexpected moments (e.g., unemployment) **26.** I compare prices when buying something. **27.** I analyze my financial situation before a major purchase. **28.** I buy on impulse. **29.** I prefer to buy a financial product to save the money to buy in cash.
Basic financial knowledge	**30. Imagine you have R$ 100.00 in a savings account and the tax rate is 10% a year. After 5 years, how much money will you have in this account?** More than R$ 150.00 Exactly R$ 150.00 Less than R$ 150.00 Do not know **31. Imagine the tax rate applied to your savings account is 6% a year and the inflation tax is 10% a year. After one year, how much will you be able to buy with the money from this account?** More than today Exactly the same Less than today Do not know **32. Imagine Joseph inherits R$ 10,000.00 today and Peter inherits R$ 10,000.00 in three years. According to this heritage, who is going to be wealthier?** Joseph Peter They are equally as wealthy Do not know
Advanced financial knowledge	**33. Which of the options below best describes the stock market's functions?** Allow for the meeting of people who want to buy and sell shares Predict gains of shares Increase the prices of shares Do not know **34. Considering a long time period, (e.g., 10 years), which asset described below normally gives the highest rate of return?** Accounts Bonds Stocks Do not know **35. Which statement is correct?** Once investing in investment refunds, it is not possible to take the money out in the first year Investment refunds can be invested in many assets, such as shares and securities Investment refunds pay assured return rates that depend on past behavior None of them Do not know

(continued on next page)

Table A.1 (*continued*)

36. Normally, which asset shows the highest oscillations over time?
Savings accounts
Shares
Public securities
Do not know
37. When an investor diversifies, his investments are divided among different assets. The risk of losing money:
Increases
Reduces
Remains the same
Do not know

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Appendix

See Table A.1.

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