International Review of Economics Education 16 (2014) 1–11

Contents lists available at ScienceDirect

International Review of Economics Education

journal homepage: www.elsevier.com/locate/iree

Construct validity of financial literacy

Michael Schuhen *, Susanne Schürkmann

University of Siegen, Germany

ARTICLE INFO

Article history:
Received 14 October 2013
Received in revised form 10 July 2014
Accepted 14 July 2014
Available online 25 July 2014

JEL classification:
A21

Keywords:
Financial literacy
Structural equation model

ABSTRACT

Various studies deal with the assessment of financial literacy. However, it is not always obvious whether actual competencies are assessed or if it is rather a measurement of knowledge or attitudes. Furthermore, it is questionable if the construct that is supposed to be assessed is valid. Using the Financial Literacy Study as an example, the following article describes how the underlying theoretical construct can be validated. The validation is based on the measurement of financial literacy through Rasch-modelled values, which are verified by means of structural equation models.

1. Introduction

The Programme for International Student Assessment (PISA) analyses literacy of adolescents aged 15–16 in the member states of the Organisation for Economic Co-operation and Development (OECD). The study is repeated every three years. In 2012, there was an additional assessment of financial literacy, which gained increased research and media attention. Germany and Austria, however, like some other countries,[1] did not participate in the assessment of financial literacy.

When asked, the project coordinators in charge in Germany and Austria mentioned doubts with regards to the preliminaries and the construct validity that were published in the Financial Literacy Framework of the OECD. According to the German Standing Conference of the Ministers of Education and Cultural Affairs (Kultusministerkonferenz) the current version of a Financial Literacy assessment is not sufficiently developed and reliable findings are therefore not possible (Sälzer, 2013, p. 56). The

* Corresponding author. Tel.: +49 2717403146.
E-mail address: schuhen@zoebis.de (M. Schuhen).

[1] The 18 countries or regions that participated in the additional survey can be found here: http://www.oecd.org/finance/financial-education/oecdpisafinancialliteracyassessment.htm.

http://dx.doi.org/10.1016/j.iree.2014.07.004
1477-3880/

similarity of Financial Literacy with other domains assessed in the PISA study, such as mathematics or reading comprehension tasks is a problem, because the Financial Literacy Framework only refers to a "working definition for the domain and a description of the assumptions that underlie that definition" (OECD, 2013, p. 144). This image is also supported by the "identification of a set of key characteristics that should be taken into account when constructing assessment tasks for international use" (OECD, 2013, p. 144), which is the first step in the working programme.

Taking up the scepticism of the countries that did not participate, this article consists of three steps: Leading from a focused discussion of the present state of research with regards to the dimensions "processes", "contexts", "test design" and "content" which are relevant for competence assessment, a categorically motivated approach for the fixing of content fields will be introduced. This approach was also used when identifying the content for the Financial Literacy Study (FILS). FILS is a computer-based study designed for 15–16 year old students from German general schools. The concept of FILS uses clearly defined content areas of financial literacy that were identified with help of related literature. The content areas refer to aspects from the students' direct environment and also introduce them to future scenarios from the working world for example. Among the study's goals are a competency specific assessment and validating the study's foundation. We would like to show that the theory driven structure of a study and their content specific assessment are elementary to studies about financial literacy, especially taking into consideration that no coherent studies exist in current research on the topic and that, therefore, it is not possible to validly interpret these studies' results. This and the validity of the resulting content construct of FILS are shown by means of a structural equation model (SEM).

2. A brief summary of research

Competence assessment is based on three different perspectives. "*Content* comprises the areas of knowledge and understanding that are essential in the area of literacy in question. *Processes* describe the mental strategies or approaches that are called upon to negotiate the material. *Contexts* refer to the situations in which the domain knowledge, skills and understandings are applied, ranging from the personal to the global" (OECD, 2013, p. 146). In the following, those dimensions are expanded by the perspective "test design".

2.1. Focus context

Most studies about financial literacy aim at examining the knowledge and the competences of adults or students. Consequently, questions usually refer to their life context in particular and discuss their consumer education (Disney and Gathergood, 2012), their investment behaviour (Guiso and Jappelli, 2008) or changes in investment behaviour caused by the financial crisis (Bucher-Koenen and Ziegelmeyer, 2011) as well as their attitude towards retirement provision and debt (Lusardi and Mitchell, 2006; Lusardi and Tufano, 2009).

Many of those surveys are based on questions stemming from Lusardi et al. Their validity has been checked within the context of the Health and Retirement Study 2004. For this study, however, the questions had to be simple, relevant, and short. They also should have the capacity to differentiate (Lusardi and Mitchell, 2011). Therefore, the testlet design with one stimulus and several individual tasks as it is usually used in competence assessment (Wainer et al., 2007; Pommerich and Segall, 2008; Sireci et al., 1991) could not always be applied. Approaches can be seen in the following sequence of questions (Lusardi, 2008, p. 5):

1. Suppose you had $100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow: more than $102, exactly $102, less than $102?
2. Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, would you be able to buy more than, exactly the same as, or less than today with the money in this account?

3. Do you think that the following statement is true or false? "Buying a single company stock usually provides a safer return than a stock mutual fund".

The questions focus on the individual financial decision-making power: "In designing the questions, we relied on economic models of saving and portfolio choice to identify three economic concepts that individuals should have some understanding of, if they are to use them when making financial decisions" (Lusardi and Mitchell, 2011, p. 499), such as "(i) understanding of interest compounding; (ii) understanding of inflation and (iii) understanding of risk diversification" (Lusardi and Mitchell, 2011, p. 499).

However, it is doubtful whether the decision-making power tested in Lusardi's example above can be attributed to "domain knowledge" or whether general mathematical skills, particularly in the first question have a higher influence on the skill which is being tested (see also Macha and Schuhen, 2012). The logical connection of interest and inflation, however, refers to mathematical skills and, at the same time, requires dealing with both concepts. Yet, it is not clear whether the participants actually applied their knowledge. Since they are given a selection of answers they are taken the chance to perform a calculation of interest and if necessary compare it to inflation loss in the second task. The basic requirement "*Contexts* refers to the situations in which the domain knowledge, skills and understandings are applied" (OECD, 2013, p. 146) is therefore not fulfilled in Lusardi's investigation.

Thus, focusing on the students between the age of 15 and 16 that are to be tested, the present studies have two deficits on the context level: The present insights can only partly be transferred to the perspective (context) of adolescents because their life and experience context is fundamentally different (cf. Jugendstudie 2010). Furthermore, there are doubts with regards to the application of knowledge and the skills within the construct of financial literacy. For that reason PISA 2012 is calling itself "the first large-scale international study to assess the financial literacy of young people" (OECD, 2013, p. 143).

2.2. Focus processes

A core element of PISA is to differentiate and describe competence levels that build upon each other (Sälzer, 2013, p. 56). According to Chomsky (1965) and Weinert (1999, 2001) competences under test theoretical focus can be seen as cognitive dispositions that refer to a superordinate, meaningful, thematic context – the domain. If those skills are applied in order to solve tasks, it is called performance. In the concrete task solving process the dispositions are visible on a performative level. Conversely, performance indicates competence (Winther and Achtenhagen, 2012, p. 12). Consequently, if the usual assumptions and sequence of activities are to be integrated in a test design, they have to be exactly analysed beforehand (see also Klieme and Leutner, 2006) to make sure that drawing inferences on the competence by encoding the observable performance is possible. In the Framework of Financial Literacy this fact is mentioned ("process categories relate to cognitive processes" (OECD, 2013, p. 151)), but not dealt with in more detail. The current competence levels of the OECD are not sufficient for the selective competence levels as they are necessary for financial literacy. A clear differentiation from the competence levels of mathematics or reading is missing (Sälzer, 2013, p. 56). A competence model that has been developed in this way is the connecting link between the construct of "competence" and real-world tasks. This is also why the discussion of financial literacy as an independent skill is relevant and necessary (OECD, 2005; Aprea, 2012). Competences, competence structure and competence level models are necessary (Koeppen et al., 2008) to allow conclusions on the competence level. In this regard, looking at existing studies on financial literacy shows that especially the acting aspects in particular have not been considered individually and have been neglected (with the exception of the Framework of Financial Literacy). Therefore, in some studies it does not become clear whether actual competencies are assessed or if it is rather about measurement of knowledge or attitudes (Schürkmann and Schuhen, 2013). Furthermore, it is precarious to use questions based on Lusardi (cf. 2008, p. 5) for competence assessment with regards to financial literacy in other studies: There is no assessment of competences with these questions alone (cf. inter alia Bright and Keller, 2012).

2.3. Focus test design

Weinert (1999, p. 5) asks for problem oriented and different situations in which problems are to be solved. Furthermore the task format should vary (Klieme, 2004, pp. 10–13). There should be multiple-choice tasks as well as tasks that allow open answers. Other possibilities include working samples, talking formats, etc. It is crucial that distortions in the outcomes resulting from the fact that some participants are familiar with the task format are minimised (see criticism of only multiple-choice tests by Rodriguez, 1997; Plessis and Plessis, 2009; Scouller, 1998). Furthermore, according to Weinert (1999, p. 10; 2001, p. 27) motivation and volition are to be analysed as well.

2.4. Focus content

From the German point of view the derivation of content areas and the construct validity have been especially questioned. For PISA 2012 it was attempted to derive content areas from "existing financial literacy frameworks from a wide range of countries" (OECD, 2013, p. 146). However, the framework also states, "that there is *some* consensus on the financial literacy content area" (OECD, 2013, pp. 146–147). This might be due to the fact that the domains dealing with financial literacy have different focuses. These different focusses are described using the examples of consumer education and on the other hand the financial services sector.

Financial literacy from the viewpoint of *consumer education*, which can look back on a long tradition in the USA and the UK, primarily wants "to transfer knowledge". It is a kind of financial education focusing on knowledge and understanding in which the ability to make decisions with regards to financial topics in private life is also seen as part of consumer education. Imparting financial knowledge aims at recognising financial services (risks and rewards) and at applying that knowledge in the process of choosing financial services in real life. The aim "to transfer knowledge" is expanded by the objectives "generate comprehension" and "decision-making power" in the area of personal finances. From a consumer education point of view also awareness in the sense of problem consciousness is part of an extensive consumer education portfolio. In that sense sensitisation for the necessity of financial services (Ford and Jones, 2006) and trust in advisory services (CEA, 2007; OECD, 2005) like those offered by banks and consumer consulting are crucial aspects for an approach to financial literacy. Expanding perspective the knowledge of where to find help (OECD, 2005) and the knowledge of rights (Financial Literacy and Education Commission, 2006) are included in a more extensive definition of financial literacy. Public institutions such as government agencies or the federal bank as well as some commercial banks hope that a more intense consumer education in the financial sector will lead to informed customers that constitute a counterweight, a development of the concept of countervailing power (Galbraith, 1952), to the service providers. For this reason, the education programmes (e.g. Financial Literacy and Education Commission, 2006; Ilves, 2007) state the objective to reach higher consumer mobility in order to increase competition within the sector.

The *financial services sector* wants to increase financial skills in adults; however, it considers financial education rather as an element of economic development policy (Reifner, 2006; Vitt, 2000). From the financial services sector's point of view it is not sufficient to accumulate knowledge, but potential customers should also be able to enunciate their own interests for others. Consequently, financial literacy is expanded by the issues "negotiation between customers and financial services provider" and in some cases by political enunciation (FSA, 2004; FTE, 2005). Given all this, a consumer who is financially literate, who is able to act and to weigh opportunities and risks keeping his personal interest in mind, is more interesting and useful to the industry than one who does not know what he is doing.

3. Content areas of financial literacy

In the German tradition of economics education, financial literacy is part of an extensive economic literacy (see Hedtke and Weber, 2008 as an example). Before the empirical shift in teaching methodologies took place, contents were "categorically" derived according to the tradition of human science. Categorical didactic was established by Klafki during the 1960s in Germany (for the different

choice of terms for pedagogy, didactics and curriculum in the Anglo-American region and mainland Europe see Hamilton, 1999). It orientates itself towards an extensive educational concept that is broken down to the individual domains. The basis was a *narrower concept of Didactic* (as theory of contents and curriculum, Didaktik als Theorie der Bildungsinhalte und des Lehrplans) (Klafki, 1995, p. 14). Contents only obtain their educational value ("Bildungswert") (Klafki, 1995, p. 20) for the learner through availability and internalisation. The goal of categorical didactic is to work out contents of education, which develop specific categories of experiencing, thinking and acting. Therefore, Klafki (1995) demands teaching contents that promote and develop universal skills. A person is considered educated if he knows contents as well as methods. One content of education (Bildungsinhalt) (Klafki, 1995, p. 15) always represents many contents of culture (Klafki, 1995, p. 15). Not only does a student learn the specific contents, but also he is supposed to recognise the universal in it. This is why Klafki differentiates between the material aspect and the formal aspect of the education process. In the former the student understands reality and in the latter the student is preparing himself for reality. The student understands and assimilates the universal and by doing this he acquires a category with which he can understand similarly structured contents independently in the future. According to Klafki this is the actual value of this approach.

In this regard content areas have been developed for FILS that are attributed to financial literacy in Germany (Schlösser et al., 2011; Schuhen and Macha, 2011; Weber, 2008; Kaminski and Friebel, 2012). The following content areas were theoretically derived for FILS: debt, creation of wealth, insurance and taxes, monetary transfers and monetary policy. In international studies about this topic there is often a connection of a general topic (content of education) and an particular question for example on saving and handling credit cards, debt and paying bills, etc. (Lusardi and Mitchell, 2006; Lusardi and Tufano, 2009; Klapper et al., 2012; NFCC, 2013). No international study presents a design of contents of education in the way as our categorical approach and assigns subtopics to the specific content areas.

At the same time, the authors (Schlösser et al., 2011; Kaminski and Friebel, 2012; Macha and Schuhen, 2012) try to determine the relationship between economic and financial literacy. However, a systematic analysis of the relationship of these two constructs is still outstanding. It could explain whether financial literacy is an individual dimension of competence or if it is only a stock of financial knowledge which, due to the participants' ability to think economically (concept of scarcity, opportunity cost, dealing with risks, etc.), led to the fact that the test persons were more competent.

Another study, ECOS (Economic Competencies Study), about economic literacy analysed the relationship between economic competence, mathematical competence, language competence and general intelligence. It could prove that students who have a higher mathematical competence also obtain higher values for economic literacy. This is especially true for the area "money". Furthermore, we observed a positive correlative connection between general intelligence and economic literacy (Schuhen and Macha, 2011). Whether financial literacy is in fact an individual competence needs to be analysed. Financial literacy should be constructed distinct from other partial competences such as mathematical or economic competence. For this, a consistent and valid construct that fulfils the general requirements of a competence model is needed. We will derive and describe this model for financial literacy in the following chapter.

4. Determination of construct validity of the financial literacy study (FILS)

4.1. The theoretical model

In the middle of the year 2012, the pilot of FILS on financial literacy of student's aged 15–16 was carried out in Germany. 400 students from different types of schools (Germany has a three-tier school system) and regions in Germany participated in the study. 346 data records were analysed. The conceptual structure of the 60-min web-based study orientates itself towards a skills oriented framework, which considers task design, external influences like attitude and motivation as well as the above mentioned contents areas. Thus the structure of financial literacy, which this study is basing on, includes several facets. Firstly, a clearly defined content field is created comprised of the five content areas mentioned above and 45 items. Secondly, the construct includes a competence-oriented construction level that determines how the tasks and the test design are developed. During the tasks

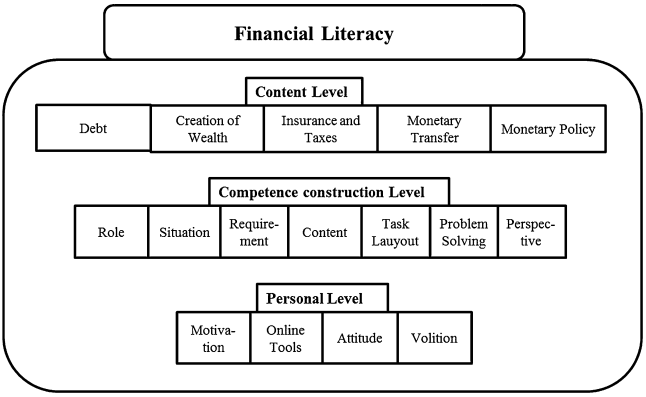

Fig. 1. Construct of financial literacy for FILS.

the respondents take over different roles and have to cope with different problems. The last level is the personal level and refers to attitude aspects that are taken into consideration with 35 questions (28 about attitude and 7 about motivation) as well as to further variables about the respondents (Fig. 1). New aspects of competence research are taken into consideration, such as the acting variable "PSI" which measures the ability to use web-based instruments like loan calculators, savings calculators, etc. (Schürkmann and Schuhen, 2013). The online tools are integrated into the content fields and are used to calculate loan instalments and savings rates. With the help of the calculators' individual input fields incorrect entries can be identified. By means of dichotomous coding, the respondents' operation of said calculators could be transferred into Rasch-modelled values and represents the acting variable "PSI", which represents the competence in using online tools.

The test items regarding attitude and dealing with money (28 in total) were taken from the German testing instrument (Barry and Breuer, 2012) which goes back to test items developed by Yamauchi and Templer (1982), Furnham (1984) and Tang (1992). The individual items' test design takes into consideration the necessary criteria that were mentioned in the summary of research. Thus, the construct for competence measurement for financial literacy is complete and conclusive with regards to contents and formality. Therefore, content areas, attitudes and the acting variable can be shown in a structural equation model, which makes it possible to check whether the construct that was used for competence measurement was valid. Using this method it can be verified whether individual competence values, which are assigned to respective content areas, explain the latent construct of financial literacy.

4.2. Measurement

For FILS the students' results are generated by means of a Rasch-model (Ayala, 2009) in each of the five content areas. Thus, there is a Rasch-scaled value for every student and every content area, which as a whole represents the specific content area. The same is done for the acting variable "PSI" (Schürkmann and Schuhen, 2013). The attitude areas are presented as means. The data of the 346 participants are calculated in a structural equation model (SEM) with Mplus (Muthén and Muthén, 1998–2012). The SEM for FILS, which is to be verified, has the following structure (see Fig. 2). In the measurement model of the manifest endogenous variables, the content areas and acting variable that were generated from the Rasch-values are listed. The values generated by Rasch-model directly contribute to the SEM. The data were then entered into the SEM (Little et al., 2002). In a first step the variables were parcelled (Little et al., 2002) according to their content and then Rasch-modelled according to their content as well. This means that for every content area and for the acting variable PSI latent trait parameters of the person were estimated by means of Rasch-model.

The measuring model of the manifest exogenous variables consists of personal criteria such as attitude and the participants' money management. This testing instrument is based on

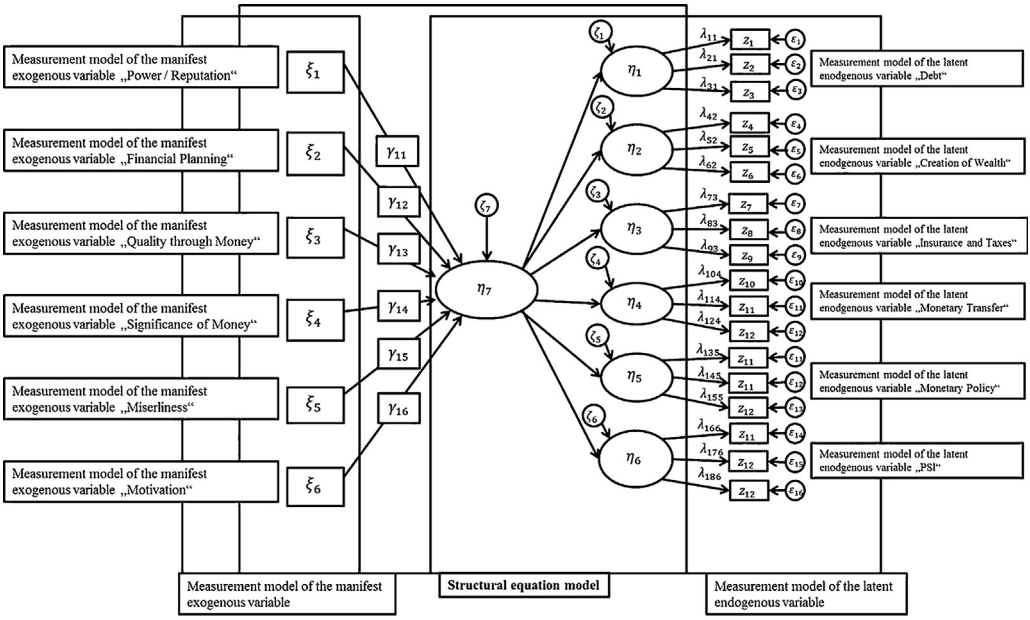

Fig. 2. Structural equation model of financial literacy.

self-assessment in which the data is gathered by a five-step Likert scale (Barry and Breuer, 2012). Here we investigate how far attitude criteria influence financial literacy or whether personal attitudes are irrelevant for financial literacy. For the exogenous variables, the impact on the latent variable financial literacy is measured, while the endogenous variables are trying to explain the latent variable financial literacy. During calculation of the SEM, the model's quality factors reveal the quality of concept of FILS. The structure of the model for financial literacy is based on the criteria that are shown in Fig. 2 and that form the basis for further data analysis of FILS.

In this model, the *z*-values represent the items that contribute to the respective content variable η_i. In total, 142 values can be generated from 52 items. Those values can be assigned to the respective content areas by means of the preceding conceptual structure of the model. The participants' answers are dichotomised and modelled according to Rasch. They constitute the endogenous latent variables η_i. The Rasch-model is based on the basic assumption of the Rasch-model: $P(U_{ij}=1|\theta_i,\beta_j)=e^{\theta_i-\beta_j}/1+e^{\theta_i-\beta_j}$ (Ayala, 2009). The people and difficulty parameters of the Rasch-models were estimated by the conditional maximum likelihood approach, whose mathematical estimation procedure is based on the following formula: $L_{u_i}(\theta_i,\beta)=\prod_{j=1}^{m}(e^{u_{ij}*(\theta_i-\beta_j)})/(1+e^{\theta_i-\beta_j})$. The verification of the Rasch-models was completed by the Wald test (Kodde and Palm, 1986) and by the likelihood-ratio-test (Andersen, 1973). In all, six content or acting areas the estimated data was sufficient for the model and there were no significant deviations or violations of the Rasch-model. Based on these results, the construct of financial literacy is tested with an SEM by means of a confirmatory factor analysis (CFA) (Muthén and Muthén, 1998–2012).

4.3. Results

The SEM results are represented by model accuracy values that show whether the hypothetic SEM is a valid construct. The χ^2 test value is supposed to be not significant and therefore the significance parameter should be higher than 0.05. Thus, the χ^2 index can be considered a *badness-of-fit criterion* in the sense that a high χ^2 value is a bad adjustment whereas a low value is a good adjustment. When χ^2 equals zero it is a perfect adjustment (Wang and Wang, 2012, p. 17). Another criterion is the value represented by χ^2/df It should be lower than two but still acceptable as long as it is lower than three.

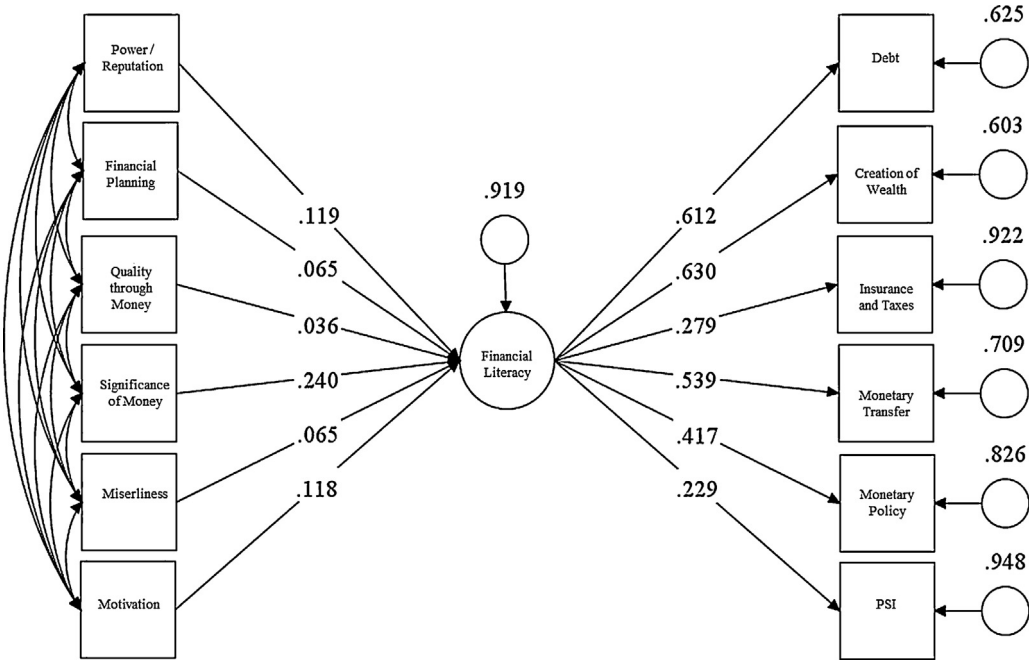

Fig. 3. Result of the structural equation model of financial literacy.

Furthermore, the root mean square error of approximation (RMSEA) is a factor that is relevant for the model accuracy. It should be lower than 0.05 (cf. Reinecke, 2005, p. 120f; Brown, 2006, p. 83f.).

The last criterion is the comparative fit index (CFI). It is one of the goodness-of-fit indices. The CFI should be at least higher than 0.90 in order to be acceptable or be higher than 0.95 to be considered good (Ullmann and Bentler, 2012).

The fitting model information for FILS has the following model accuracy values for the SEM of financial literacy: there are 24 free parameters; Pearson's chi-squared test for the goodness of fit has a value of 49.901 with 39 *df;* with $p = 0.1133$ it is not significant.

Other values that are relevant for the model accuracy are the root mean square error of approximation (RMSEA) which has an estimated value of 0.028 and is therefore very good, and the comparative fit index (CFI) which is 0.937 is considered acceptable. All criteria for model accuracy are in a sufficient or even very well range. Therefore, the SEM for financial literacy is good and can be declared valid (Ullmann and Bentler, 2012). Also, the value for model accuracy χ^2/df, which is 1.275, is in a very good range. Thus, the SEM for financial literacy with the conceptual construction of FILS is valid and the following standardised model values result (see Fig. 3):

The factor loadings of the five content variables (debt, creation of wealth, insurance and taxes, monetary transfer, monetary policy) and the acting variable (PSI) show how well they load on the financial literacy construct. The exogenous variables' results (left side) have significantly lower factor loadings. The effect of individual attitude and motivation criteria on financial literacy is, therefore, only very low. The highest influence has significance of money (.24) while quality through money (.036) has hardly any influence on financial literacy.

Furthermore, the content areas can be explained through the values of *R*-square, which are the squared factor loadings, on a percentage basis with the latent variable financial literacy.

The acting variable has the lowest explanatory value. With 5.6% it shows that, although this variable is part of the construct financial literacy, this action variable is not as well explained by the

R-SQUARE

Observed Variable	Estimate	S.E.	Two-Tailed Est./S.E.	P-Value
Debt	0.375	0.069	5.403	0.000
Creation of Wealth	0.400	0.077	5.189	0.000
Insurance and Taxes	0.078	0.036	2.155	0.031
Monetary Transfer	0.285	0.063	4.554	0.000
Monetary Policy	0.173	0.060	2.903	0.004
PSI	0.056	0.042	1.341	0.180

Fig. 4. *R*-square of the results.

latent variable the PSI variable is still influenced by other factors. This ability is only slightly connected to financial literacy; however, it is part of the construct. So PSI is measuring the ability to deal with online tools. In this case, this ability refers to financial literacy but can refer to other topics as well and is only sparsely explained by financial literacy (Fig. 4).

It can unambiguously be seen that the content areas can be explained by the latent variable financial literacy by up to 40%. However, there is still room for further factors that explain the construct such as general verbal and mathematical skills (see also Gerardi et al., 2013).

5. Discussion

FILS shows that a self-contained and valid construct can be derived from a categorical understanding of education. The model verification above secures a functioning testing instrument on which further data analyses can base on. For example, by means of multi-group analyses specific differences can be identified and applied on the determined competences.

Only under these conditions a competence assessment study can make statements on the participants' financial literacy quality. The countries rejected to participate due to a lack of transparency and due to the inconsistent construct in the PISA study about financial literacy (Sälzer and Prenzel, 2014, p. 15). The FILS and the evaluation model shown above illustrate that financial literacy is a complex construct that cannot easily be measured by a few items. Instead, it requires a thought-out and appropriately structured construct whose validity check is indispensable for valid interpretation of results.

Financial literacy does not consist of global contents that can be evaluated by the same question in all countries. The content areas have to be adjusted specifically for each country, especially when dealing with insurance or the tax system. We can assume that the standardisation, as it happens in many other studies as well, was seen critically by a number of potential participants and therefore, no valid results could be expected. International studies in the field of financial literacy should retain a national character and integrate country-specific criteria into their measuring models and test designs. Furthermore, studies about financial literacy should not be paper-based but computer-based in order to take into consideration acting variables, such as PSI, as a partial construct and partial competence.

FILS identified five content fields and an acting variable that clearly belong to financial literacy. We also showed that attitude criteria cannot be neglected and that they slightly influence financial literacy. Thus, financial literacy does not only comprise knowledge and skills but also the access to finances has an influence on financial literacy as a competence.

The construct of FILS is valid and consistent as demonstrated by the theory-driven construct validity. By using the method of theory-driven competence research, valid findings can be made. Besides group analyses, it is furthermore possible to display content-specific competences as partial competences of financial literacy and to reveal specific deficits and strengths. Further studies about financial literacy need to be conducted to construct a valid, theory-based construct in order to achieve transparent and valid results.

References

Andersen, E.B., 1973. A goodness of fit test for the Rasch model. Psychometrika 38 (1), 123–140. Available from: http://dx.doi.org/10.1007/BF02291180 (accessed 10.10.13).

Aprea, C., 2012. In: Tramm, T., Seeber, S., Kremer, H.H. (Eds.), Messung der Befähigung zum Umgang mit Geld und Finanzthemen: Ausgewählte Instrumente und alternative diagnostische, Zugänge, Berufs-und Wirtschaftspädagogik online (bwp@). . Available from: http://www.bwpat.de/ausgabe22/aprea_bwpat22.pdf (accessed 02.10.13).

Ayala, R.J.D., 2009. The Theory and Practice of Item Response Theory. Guilford Press (Methodology in the Social Sciences), New York.

Barry, D., Breuer, K., 2012. In: Hergenröder, C.W. (Ed.), Die Einstellung zu Geld bei Jugendlichen und jungen Erwachsenen – Entwicklung eines Instruments in deutscher Sprache. Discussion paper no. 1202. (Hg.). Gesellschaftliche Teilhabe trotz Schulden, Wiesbaden. Available from: http://wiwi.uni-mainz.de/Dateien/DP_1202.pdf (accessed 30.08.12).

Brown, T.A., 2006. Confirmatory Factor Analysis for Applied Research. Guilford Press (Methodology in the Social Sciences), New York.

Bright, I., Keller, R., 2012. Overview of ING International Survey results on financial competence. ING Bank.

Bucher-Koenen, T., Ziegelmeyer, M., 2011. Who lost most? Financial literacy, cognitive abilities, and the financial crisis. Working Papers Series No. 1299/February 2011 European Central Bank. In: Conference on Household Finance and Consumption.

CEA (European Insurance and Reinsurance Federation), 2007. Financial Awareness Initiatives Promoted by the European Insurance Industry. Available from: http://www.cea.assur.org/cea/download/publ/article259.pdf (accessed 15.04.10).

Chomsky, N., 1965. Aspects of the Theory of Syntax. Massachusetts Institute of Technology, Massachusetts.

Disney, R., Gathergood, J., 2012. Financial Literacy and Consumer Credit Use. Working Paper 12/01. Centre for Finance and Credit Markets (CFCM), Nottingham.

Financial Literacy and Education Commission, 2006. Taking ownership of the future. The National Strategy for Financial Literacy. Available from: http://www.mymoney.gov/pdfs/ownership.pdf (accessed 30.08.10).

Ford, J., Jones, A., 2006. UK report. In: Reifner, U. (Ed.), Financial Literacy in Europe. NOMOS-Verlag, Baden-Baden, pp. 37–92.

FSA (Financial Services Authority), 2004. Building financial capability in the UK. Available from: http://www.fsa.gov.uk/pubs/other/financial_capability_uk.pdf (accessed 30.08.12).

FTE (Foundation for Teaching Economics), 2005. Annual Report. Available from: http://www.fte.org (accessed 30.08.12).

Furnham, A., 1984. Many sides of the coin. The psychology of money usage. Person. Individ. Diff. 5 (5), 501–509.

Galbraith, J.K., 1952. American Capitalism. The Concept of Countervailing Power.

Gerardi, K., Goette, L., Meier, S., 2013. Numerical ability predicts mortgage default. Proc. Natl. Acad. Sci. U. S. A. 110 (28) . Available from: http://www.pnas.org/content/early/2013/06/19/1220568110 (accessed 02.10.13).

Guiso, L., Jappelli, T., 2008. Financial Literacy and Portfolio Diversification. European University Institute, Department of Economics EUI Working Papers, ECO 2008/31.

Hamilton, D., 1999. The pedagogic paradox (or why no didactics in England?). Pedag. Cult. Soc. 7 (1), 135–152.

Hedtke, R., Weber, B., 2008. Wörterbuch Ökonomische Bildung. Wochenschau, Schwalbach.

Ilves, M., 2007. The interest of the European Commission in promoting financial capability. In: "Financial Education and Better Access to Adequate Financial Services" Conference, 12/13th April.

Kaminski, H., Friebel, S., 2012. Working paper "Finanzielle Allgemeinbildung als Bestandteil der ökonomischen Bildung". Available from: http://www.ioeb.de/sites/default/files/img/Arbeitspapier_Finanzielle%20Allgemeinbildung_Juli_2012.pdf (accessed 11.09.13).

Klafki, W., 1995. Didactic analysis as the core of preparation of instruction (Didaktische Analyse als Kern der Unterrichtsvorbereitung). J. Curric. Stud. 27 (1), 13–30.

Klapper, L.F., Lusardi, A., Panos, G.A., 2012. Financial Literacy and the financial crisis. National Bureau of Economic Research (NBER) Working Paper 17930, Cambridge.

Klieme, E., 2004. Was sind Kompetenzen und wie lassen sie sich messen? Pädagogik 6, 0–13.

Klieme, E., Leutner, D., 2006. Kompetenzmodelle zur Erfassung individueller Lernergebnisse und zur Bilanzierung von Bildungsprozessen. Zeitschrift für Pädagogik, Bd. 52, 876–903.

Kodde, D.A., Palm, F.C., 1986. Wald criteria for jointly testing equality and inequality restrictions. Econometrica 54 (September (5)), 1243–1248. The Econometric Society; Available from: http://www.jstor.org/stable/1912331 (accessed 2.10.13).

Koeppen, K., Hartig, J., Klieme, E., Leutner, D., 2008. Current issues in competence – modeling and assessment. Zeitschrift für Psychologie/J. Psychol. 216 (2), 61–73.

Little, T.D., Cunningham, W.A., Shahar, G., 2002. To parcel or not to parcel: exploring the question, weighing the merits. Struct. Equat. Model. 9 (2), 151–173 (Lawrence Erlbaum Associates, Inc.).

Lusardi, A., 2008. Financial Literacy: An Essential Tool for Informed Consumer Choice? . Available from: http://www.dartmouth.edu/~alusardi/Papers/Lusardi_Informed_Consumer.pdf (accessed 11.09.13).

Lusardi, A., Mitchell, O.S., 2011. Financial literacy around the world: an overview. J. Pension Econ. Financ. 10 (October (4)), 497–508, Published online: 11 October 2011.

Lusardi, A., Mitchell, O.S., 2006. Financial Literacy and Planning: Implications for Retirement Wellbeing. National Bureau of Economic Research (NBER) Working Paper 17078, Cambridge.

Lusardi, A., Tufano, P., 2009. Debt Literacy, Financial Literacy, and Overdebtness. National Bureau of Economic Research (NBER) Working Paper 14808, Cambridge.

Macha, K., Schuhen, M., 2012. Kompetenzmessung in der Domäne Ökonomie. In: Schuhen, M., Wohlgemuth, M., Müller, C. (Eds.), Ökonomische Bildung und Wirtschaftsordnung. Lucius & Lucius, Stuttgart, pp. 125–138.

Muthén, L.K., Muthén, B.O., 1998–2012. Mplus User's Guide, 7th ed. Muthén & Muthén, Los Angeles, CA.

NFCC (National Foundation for Credit Counseling), 2013. The 2013 Consumer Financial Literacy Survey. Harris Interactive Inc. Public Relations Research. Available from: http://www.nfcc.org/newsroom/FinancialLiteracy/files2013/NFCC_NBPCA_2013%20FinancialLiteracy_survey_datasheet_key%20findings_032913.pdf (accessed 10.10.13).

Organization For Economic Cooperation and Development (OECD), 2005. Improving financial literacy. Analysis of issues and policies. OECD Publication, Paris. Available from: http://www.gbv.de/dms/zbw/504755536.pdf (accessed 02.10.13).

Organization For Economic Cooperation and Development (OECD), 2013. Pisa 2012 Assessment and Analytical Framework. Mathematics, Reading, Science, Problem Solving and Financail Literacy. OECD Publishing. Available from: http://www.dx.doi.org/10.1787/9789264190511-en (accessed 02.10.13).
Pommerich, M., Segall, D.O., 2008. Local dependence in an operational CAT: diagnosis and implications. J. Educ. Meas. 45, 201–223.
du Plessis, S., du Plessis, S., 2009. A new and direct test of the 'gender bias' in multiple-choice questions. In: Stellenbosch Economic Working Papers: 23/09.
Reifner, U., 2006. EU general report. In: Reifner, U. (Ed.), Financial Literacy in Europe. NOMOS-Verlag, Baden-Baden.
Reinecke, J., 2005. Strukturgleichungsmodelle in den Sozialwissenschaften. Oldenbourg, München.
Rodriguez, M.C., 1997. The art & science of item writing: a meta-analysis of multiple-choice item formal effects. In: Annual meeting of the American Educational Research Association, Chicago.
Sälzer, C., 2013. Financial Literacy als Teil der Grundbildung in PISA. Unterricht Wirtschaft+Politik – Finanzielle Kompetenzen 2013 (3) .
Sälzer, C., Prenzel, M., 2014. Financial Literacy im Rahmen der PISA-Studie. In: Retzmann, T. (Ed.), Ökonomische Allgemeinbildung in der Sekundarstufe I und Primarstuf. Konzepte, Analysen, Studien u. empirische Befunde. 1. Aufl. Wochenschau Verlag, Schwalbach am Taunus, pp. 15–31.
Schlösser, H.J., Neubauer, M., Tzanova, P., 2011. Finanzielle Bildung. Aus Politik und Zeitgeschichte 12 (March), 21–27.
Schürkmann, S., Schuhen, M., 2013. Kompetenzmessung im Bereich financial literacy Ergebnisse zum Umgang mit Online-Rechnern aus der FILS-Studie. Zeitschrift für ökonomische Bildung (1), 73–89.
Schuhen, M., Macha, K., 2011. Assessing economic competencies. In: Southern Economic Association Conference Proceedings. p. 2011.
Scouller, K., 1998. The influence of assessment method on students' learning approaches: multiple choice question examination versus assignment. High. Educ. 35 (June (4)), 453–472.
Sireci, S.G., Thissen, D., Wainer, H., 1991. On the reliability of testlet-based tests. J. Educ. Meas. 28, 237–247.
Tang, T.L.P., 1992. The meaning of money revisited. J. Organiz. Behav. 13, 197–202.
Ullmann, J.B., Bentler, P.M., 2012. Structual equation modeling. In: Weiner, I.B. (Ed.), Handbook of Psychology. 2nd ed. John Wiley & Sons, Inc, chapter 23, pp. 661–690.
Vitt, L.A., 2000. Personal finance and the rush to competence. Financial literacy education in the US. Institute for Socio-Financial Studies. Available from: http://www.isfs.org/documents-pdfs/rep-finliteracy.pdf (accessed 11.09.13).
Wainer, H., Bradlow, E.T., Wang, X. (Eds.), 2007. Testlet Response Theory and Its Applications.. Cambridge University Press, New York.
Wang, J., Wang, X., 2012. Structural equation modeling with Mplus. Applications using Mplus. Wiley (Wiley series in probability and statistics), Chichester, West Sussex.
Weber, B., 2008. Finanzielle Bildung. In: Hedtke, R., Weber, B. (Eds.), Wörterbuch Ökonomische Bildung. Wochenschau, Schwalbach, 2008, pp. 126–127.
Weinert, F.E., 1999. Concepts of Competence. Max Planck Institute for Psychological Research, Munich.
Weinert, F.E., 2001. Vergleichende Leistungsmessung in Schulen – eine umstrittene Selbstverständlichkeit. In: Weinert, F.E. (Ed.), Leistungsmessungen in Schulen. Beltz Verlag, Weinheim, pp. 17–31.
Winther, E., Achtenhagen, F., 2012. Assessment of workplace learning – using virtual worplaces. In: Siva, R., Tomé, E. (Eds.), Human resource development research and practice across Europe – the future HRD – 2020 and beyond, challenges and opportunities. Universidade Lusiada, Vila Nova de Famalicao, pp. 792–807.
Yamauchi, K.T., Templer, D.I., 1982. The development of a money attitude scale. J. Personal. Assess. 46.5, 522–528.