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## FINANCIAL LITERACY AND UNDERGRADUATES. A QUESTION OF APTITUDE?

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***Abstract:** Our study tests whether differing profiles of students – measured according to standard socio-demographic characteristics and their financial aptitude - show different levels of financial literacy at the beginning of their university careers. It is widely acknowledged that financial literacy among the young is influenced by socio-demographic characteristics. Levering on the results of studies estimating the influence of genetic factors on financial behavior, we argue that along with demographics and experience there are unobservable variables, such as aptitude, that help explain a student’s financial literacy. We surveyed 366 Business Studies freshmen during their first few weeks at a large Italian university: in other words, our sample is composed of freshmen with no prior educational exposure to financial matters except, in some cases, a high school diploma in commercial studies or a personal interest in financial issues. After controlling for education, gender, work and financial experience, parents’ educational attainment, students of Finance showed a higher level of financial literacy with respect to their peers: thus confirming the role of financial aptitude.*

***Keywords:** financial literacy; students; item response theory; gender differences; aptitudes and behaviours.*

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## **INTRODUCTION**

In recent years, financial literacy has gained the attention of a wide range of organizations, both at the national level - policymakers and financial regulatory authorities - and at the international level, with the OECD leading the way with its International Gateway for Financial Education (IGFE) and the International Network on Financial Education (INFE). Interested groups are concerned that consumers may lack the minimum knowledge of financial concepts necessary to be able to make informed financial decisions in their day-by-day life, namely: budgeting; managing money, credit and debt effectively; assessing needs for insurance and protection; evaluating the different risks and returns involved in savings and investment options; saving for long-term goals. Such lack of financial literacy has been widely acknowledged as an aggravating factor in the recent financial crisis (OECD-INFE, 2009). At the same time, the crisis has exacerbated the risks faced by less financially literate consumers: lacking the sophistication required to absorb financial shocks, they are more vulnerable to financial market fluctuations (Jappelli 2010). In fact, it has been documented that low levels of financial literacy are linked with high levels of personal and household debt (Moore 2003; Lusardi and Tufano 2009; Stango and Zinman 2009); poor health (Joo and Garman 1998) or adverse health choices (Peters et al. 2007); inadequate retirement planning (Hilgert, Hogarth and Beverly 2003; Lusardi and Mitchell 2007); inadequate stock market participation (van Rooij, Lusardi and Alessie 2011); and poorer general life outcomes.

In this respect, widespread financial illiteracy among young people is of particular concern for two main reasons. First, as they enter adulthood, a number of important financial decisions are to be undertaken (such as financing college studies; moving away from home; purchasing their first car; using credit cards;...), for which they might not be adequately prepared. Misguided financial

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decisions in the early part of their lives could have potentially disastrous consequences (huge debt; a poor credit rating; inadequate retirement plans) for their whole life (Schagen and Lines 1996; Lusardi, Mitchell and Curto 2010). Second, a lack of financial literacy seems to impact students' university performance: Kezar and Yang (2010) suggest that a student's academic achievement is negatively affected by financial distress, which, in turn, is a more likely outcome in presence of low levels of financial literacy.

It is widely acknowledged that financial literacy of the young is influenced by socio-demographic characteristics, in particular gender; work and financial experience; parents' behavior and background, such as educational attainment; personal education. Indeed, participation in courses on personal finance or choosing a business major enhances students' financial literacy: individuals receiving a financial education at high school or college tend to show proper financial behavior and attitudes.

Levering on the results of studies estimating the influence of genetic factors on financial behavior (Cesarini et al. 2010; Barnea, Cronqvist and Siegel 2010) we argue that along with demographics and experience there are unobservable variables that might help explain a student's financial literacy score, such as aptitude and psychology. For our purpose, we define aptitude as a component of a competency to do a certain kind of work, in our case, to deal with financial matters. Aptitude is different from attitude: while attitude is a way of looking at an issue or an object, a mental position or way of thinking about an issue (in our case financial matters), the concept of aptitude is akin to natural or acquired talent or ability, inclination, predisposition.

As a matter of fact, aptitude could explain the results of Wagland and Taylor (2009) - divergent from mainstream - for which gender does not impact on the level of financial literacy among

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Australian undergraduate students. Indeed, the authors concentrate their study on a sample of business students, i.e. a homogeneous sample of the young population expected to show a similar personal interest in economic and financial matters. We argue that the decision to undertake a business curriculum of studies could overcome potential gender issues in financial attitudes and behaviors. Moreover, aptitude could also explain why findings on financial education programs have been mixed. Early evaluations (Bayer, Bernheim and Scholz 1996; Bernheim, Garrett and Maki 2001) have suggested that school or workplace financial education initiatives increase a person's financial awareness and propensity to follow recommended financial practices (i.e. save more, plan for the future,..). However, according to more recent studies, it is difficult to find empirical evidence on the positive impact of financial education on financial literacy (Atkinson 2008; De Meza, Irlenbusch and Reyniers 2008). In particular, De Meza et al. (2008) argue that people's financial behavior may primarily depend on their intrinsic psychological attributes rather than information or skills.

To the best of our knowledge, the present study is the first to empirically explore the role of financial aptitude in determining one's financial literacy. To do so, our premise is that "financial aptitude" denotes one's particular inherent interest in financial matters, which can be proxied by the major students choose when enrolling in business school. The Italian case is particularly relevant in this case. In fact, Italian business schools offer different majors and students are required to make a choice at the very beginning of their college experience. These majors tend to be quite different from each other and most of them are designed to specialize students in one specific subject. Therefore, freshmen can choose to major in Marketing, Finance, or Management, for example, on the understanding that any major other than Finance will offer

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hardly any finance-related subjects. Thanks to university prospectuses, students are aware of this and make choices in accordance with their personal interest in financial matters.

In short, our study tests whether differing profiles of students – measured according to standard socio-demographic characteristics and their financial aptitude - show different levels of financial literacy at the beginning of their university careers. We surveyed Business Studies freshmen during their first few weeks at a large Italian state university (Milan-Bicocca): in other words, our sample comprised freshmen without prior educational exposures to financial matters unless they had a high school diploma in commercial studies or had a personal interest in finance.

After controlling for education (high school preparedness in financial matters), gender, work and financial experience, parents' educational attainment, Finance students showed a higher level of financial literacy with respect to their peers: the role of financial aptitude was thus confirmed.

Our study contributes in three different ways to the existing literature on financial literacy.

First, it offers new insights to our understanding of the factors determining financial literacy – i.e. those factors contributing to or detracting from the acquisition of financial knowledge - which in turn are of great usefulness for policymakers engaged in the task of designing effective interventions on financial education. While we are aware that the necessary level of financial literacy is the result of a wide range of factors, we believe that financial education can play a key, wide-ranging role, in different contexts and with different audiences. Financial education inputs will convey different results, depending on the level of learners' aptitude available, but there is reason to believe that they will improve financial literacy, *pace* De Meza, Irlenbusch and Reyniers (2008), who think that the impact from financial education can only be modest when financial aptitude is poor. We stress this point, since we are aware that great talent is not the same as high achievement and that, though having the right knack or talent provides a headstart

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and ongoing advantage, the same talents are of little use without knowledge and motivation. Also, aptitudes have to be trained in order to achieve results. In sum, peak performance occurs when one has the right combination of talents, knowledge and motivation, and if possible, opportunity, courage and luck (Pfeffer, 1998).

Second, this study adopts a metric new to the domain of financial literacy, i.e. IRT models. As a matter of fact, while considerable progress has been achieved in the design of surveys aimed at identifying individual levels of financial literacy (OECD-INFE, 2012), the process of data analysis has been less widely explored in existing studies. Both bivariate and multivariate techniques are usually applied; in general, responses to the proposed questions are simply summed up to generate an index (score) of financial literacy, which typically ranges between zero and the maximum number of correct answers. More recent studies have applied factor analysis (van Rooij, Lusardi and Alessie 2011); it is widely acknowledged, however, that more work is needed. To the best of our knowledge, only two studies have explored the viability of adopting IRT models for the assessment of financial literacy (Bongini, Trivellato and Zenga 2012; Knoll and Houtts 2012). IRT models, in particular Rasch models, used to measure variables such as ability, attitudes and personal traits and widely adopted in educational research<sup>1</sup> and psychometrics (see Liu, Wilson and Peak 2008 for an excellent review of the literature), are powerful tools in the domain of financial literacy measurement. The specific feature that has led to these models being used increasingly in many areas of research, is the presence of a metric which takes into account both the level of test difficulty and the respondent's specific abilities.

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<sup>1</sup> For instance, PISA surveys have been adopting Rasch models since 2000

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Third, as the Italian questionnaire draws heavily on the financial literacy test developed by the JumpStart coalition in 2008<sup>2</sup> we can compare financial literacy levels among U.S. and Italian undergraduate students. Of course, such a comparison must be taken with a pinch of salt, given the limited number of students investigated and the fact that the U.S. survey was administered to a casual sample, while our questionnaire was completed by students enrolled in their first year of Business Studies. As we shall see, the percentage of U.S. students who gave the correct answer is higher than the Italians' in eight items out of twelve; one reason might be different patterns of leaving home in the USA and Europe. In the USA, young couples and singles leave home earlier and cannot count on help from welfare institutions (Mulder, Clark and Wagner 2002; Aassve et al 2002). One can therefore assume that they are encouraged to become financially literate in order to be able to deal with running a home. Another reason why U.S. students might be more knowledgeable has to do with the loan systems of financing higher education in that country.

The paper is organized as follows. Section 2 reviews the relevant literature. Section 3 describes our testable hypothesis, while Section 4 defines the survey instrument, the sample and the applied methodology. Survey results are presented in Section 5 while Section 6 presents the main factors affecting students' financial literacy. Section 7 concludes.

## **LITERATURE REVIEW**

There are two strands in the literature which are relevant to our paper. First, we briefly recapitulate the empirical literature on the determinants of financial literacy among college

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<sup>2</sup> In 2008 the JumpStart Coalition conducted its first national survey designed to measure the financial literacy of college students

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students. Second, we illustrate the measurement strategies used in such analyses and introduce the background literature on Rasch models.

### College Students and Financial Literacy

In general, the degree of financial literacy is predicted by demographic factors: in particular, it increases with education and income and this also proves true in the case of university students.

The financial literacy of college students has recently attracted a growing number of studies, especially in those countries (as the US, UK and Australia) where, on the one side, students borrow heavily to finance their higher education through student loans and, on the other, the use of credit cards is widespread. Since starting adult working life with a huge burden of debt may jeopardize future developments, several studies have focused on what conditions are associated with higher levels of debt (Lyons 2008) and with an appropriate or “wise” use of credit cards (Cull and Whitton 2010). The issue has received less attention in continental Europe, where parents are the main source of finance and young people live at home longer. However, a first wave of research is being done with interesting results, providing insight both as regards the domain of measurement issues and our understanding of the determinants of financial literacy (Becchetti, Caiazza and Coviello 2010; Bongini, Trivellato and Zenga 2012; Milioli, Poletti and Ronchini 2011; Oanea and Dornean 2013; Tagliavini and Ronchini 2011; Rodrigues et al. 2012). These studies have similar findings, i.e., that the level of financial literacy of college students seems wanting and is associated with gender, ethnicity, education, work experience, social origins, interaction with peers and peer behavior.

Gender differences in financial knowledge have been documented in the US: studies suggest that, on average, female college students are less financially knowledgeable than their male

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counterparts (Danes and Hira 1987; Markovich and DeVaney 1997; Chen and Volpe 2002; Borden et al. 2008; Lusardi, Mitchell and Curto 2010). Chen and Volpe (2002) find that college women generally have less enthusiasm for, lower confidence in and less willingness to learn about personal finance topics than men. Similarly, Ford and Kent (2010) find higher intimidation and lower market awareness among collegiate females. Manton et al. (2006) signal that college women tend to select “don’t know” response more frequently than men, especially on more numerically-oriented subjects. Outside the US, on the other hand, recent surveys do not confirm gender differences: Wagland and Taylor (2009), surveying business students at the University of Western Sydney (UWS) suggested that gender was not a significant factor among Australian collegiate; analogously, Koshal et al. (2008) reported that gender differences were not significant among a sample of Indian MBA Students. As far as financial behavior is concerned, there is mixed support for gender differences in financial practices. Hayhoe et al (2000) find that female students were more likely to have a written budget, plan their spending, keep bills and receipts and save regularly; on the contrary, females are more likely to engage in risky behavior (Lyons, 2004) or to engage in problematic financial behaviors (Worthy, Jonkman and Blinn-Pike, 2010).

As to the influence of social origin, a number of studies analyzed the influence of parents’ background (such as schooling attainment) and behavior (such as saving habits) on the acquisition of financial knowledge of the young. Mandell (2008) reported that financially literate high school students were disproportionately more likely to have parents with college degrees. Furthermore, Lusardi, Mitchell and Curto (2010)<sup>3</sup> found that parents represent an important channel through which young adults acquire financial knowledge. Specifically, those whose

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<sup>3</sup> The study included indicators of family wealth and financial sophistication, such as whether parents owned a home, had retirement savings, were banked, owned stocks or mutual funds.

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mothers had a college education or whose parents had stocks or retirement savings were more financially literate. Limiting our focus to college students, the study by Cude et al. (2006) highlights that students reported their parents' influence on their money management behavior: parents play a major role in the financial socialization of their children and this process occurs at an early stage, a finding confirmed in a study by Gutter, Garrison and Copur (2010) who showed that financial literacy is significantly influenced by social learning, namely by parents behavior and by the interaction with peers.

The students' field of study seems to have an influence on financial literacy. A number of studies have reported an association between academic major (or getting training in personal finance) and financial literacy. Findings suggest that students undertaking business studies perform better than other students (Chen and Volpe 1998; 2002; Beal and Delpachitra 2003; Bernheim, Garrett and Maki 2001; Bernheim and Garrett 2003; Fox, Bartholomae and Lee 2005). Moreover, Chinen and Endo (2012) find that the concentration of numeracy among business majors is relevant in influencing financial literacy: students enrolled in numerical business majors (such as Finance) achieved better scores than students enrolled in less-numerical business majors (such as Marketing or Human Resources). Borden et al. (2008) examined the influence of a financial education seminar (Credit Wise Cats) on financial attitudes, behavior and knowledge of college students: findings suggest that the seminar effectively increased students' financial knowledge and responsible attitudes toward credit and their intentions of engaging in more responsible financial behavior in the future. But the evidence is mixed: Cull and Whitton (2011) found that business students performed no better than average when answering a question on compound interest.

Finally, regarding experiences, Chen and Volpe (2002) for the US and Beal and Delpachitra

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(2003) for Australian collegiate suggest that work experience significantly improves students' financial literacy. Goldsmith and Goldsmith (1997) and, more recently, Ford and Kent (2010) highlight how individuals with more practical experience with financial markets may perceive financial matters as less intimidating.

### Financial Literacy and Non-observable Traits

Besides the reviewed analysis of sociological variables associated with financial literacy, we are recently witnessing a scientific interest in non-observable variables and traits, e.g cognitive abilities, psychological traits and aptitudes. In the case of university students, Norvilitset al. (2006) found several factors related to college student debt: as well as financial literacy and the number of credit cards, some psychological variables were identified, such as attitudes toward possessions and spending. With respect to the adult population, Paolacci and Legrenzi (2012) found financial literacy associated with cognitive abilities among a group of adults, after controlling for age and gender.

Other factors, which might be at the origin of diversified degrees of financial literacy, can be found in genetic traits. Empirical evidence is provided by pieces of research on portfolio allocation: studying investing behavior of twins, Barnea, Cronqvist and Siegel (2010) found a genetic component explaining asset allocation, namely a genetic variation in risk preferences. In the same vein Cesarini et al. (2010), analyzing the choice of the Swedish population during a peculiar change in the national pension scheme conclude that approximately 25% of the variation of portfolio risk was due to genetic variation. Both pieces of research therefore leave open the possibility that some people, including college students, have some sort of aptitude (or innate ability, competence, or talent, whatever the name) for financial matters.

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After the review of factors associated with financial literacy, in the next paragraph we consider the issue of which strategies and techniques are used to measure financial literacy.

### Strategies for Measuring Financial Literacy

Methods used to measure financial literacy vary according to the conceptual definitions used, which may encompass different sets of knowledge, skills and behaviors covering a wide variety of financial topics such as budgeting; managing money, credit and debt effectively; assessing the needs for insurance and protection; evaluating the different risks and returns involved in savings and investment options; saving for long-term goals; understanding the capital market system and financial institutions. Houston (2010) and Remund (2010) are excellent literature reviews helping to frame the issue of the conceptual definition of what financial literacy is or should be. As Knoll and Houts (2012) correctly point out, there is a lack of a widely disseminated measure of financial literacy, developed through rigorous psychometric analyses.

As a matter of fact, without an agreed-upon definition, financial literacy has been measured dissimilarly across researchers and studies. Indeed, the construct has been operationalized in different ways, either covering a wide variety of financial topics, including debt, insurance, spending, investments and retirement savings, budgeting, inflation, or focusing on only one single aspect; analogously, the number of questions used to assess financial literacy levels also varied widely, ranging from 3 to 45 total items. Across studies, both performance tests – multiple-choice questionnaires – and self-report methods have been employed to measure financial literacy. Performance tests are mainly knowledge-based while self-reports tend to assess perceived knowledge. More recently, tests are designed to gauge both objective knowledge and perceived knowledge. We follow this trend and include both objective and

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subjective instruments, adding to the multiple-choice questions used in the 2008 JumpStart Coalition Survey of College Students a number of self-assessment questions. In sum, we do not focus on the problem of conceptualizing financial literacy and borrow the definition used by JumpStart Coalition for Personal Financial Literacy, that is “*financial literacy is the ability to use knowledge and skills to manage one's financial resources effectively for lifetime financial security*”.

More neglected by existing studies is the process of data analysis. In general, responses to the proposed questions are simply summed up to generate an index (score) of financial literacy, which typically ranges between zero and the maximum number of correct answers; then, both bivariate and multivariate techniques are usually applied to relate such scores to a set of explanatory variables (socio-demographic and other variables, such as investment or debt attitudes, for instance). More recently, van Rooji, Lusardi and Alessie (2011) constructed two indices of financial literacy, an index for basic literacy and one for advanced literacy, based on factor analysis.

To the best of our knowledge, only two studies have attempted to improve financial literacy research by introducing a psychometrically developed index of financial literacy: Bongini, Trivellato and Zenga (2012) and Knoll and Houts (2012). The primary statistical method adopted by both these studies is item response theory (IRT), a collection of statistical models that provide quantitative values describing how each item (e.g. question) performs in the population. IRT enables researchers to take into account certain properties of the questions themselves in order to assess individuals' level of financial literacy. The first study examined financial literacy among Italian college students using Rasch analysis and found it useful to adopt this technique for measuring financial literacy: the set of information provided is not just a crude figure indicating

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whether or not the population has passed the test, but actually showed the specific areas where deficiencies more often occur: among these, the group showing the highest knowledge deficit can be identified. The second study, a meta-analysis of three US national surveys, constructed a psychometrically sound 20-items financial knowledge scale. Adopting IRT, Knoll and Houts use individuals' answers to inform which questions to include in the scale in the first place, rather than simply confirming relationships between these answers and other financially relevant outcomes post hoc. The authors noted that a widespread use of their index and the continued use of modern psychometric techniques would allow for the comparison of financial knowledge, measured consistently and reliably, across studies, populations, and programs.

## OUR TESTABLE HYPOTHESIS

Based on the existing literature, the following hypotheses were generated.

### Hypothesis 1 (gender)

**Male college students are more financially literate than female students.** The literature review of American research shows that female students are less knowledgeable of and less confident in financial issues. This evidence is not confirmed by studies carried out in Australia and India. Research results about money attitudes and financial literacy of Italian teenagers and university students found gender differences (Rinaldi and Todesco 2012; Milioli, Poletti and Ronchini; Becchetti, Caiazza and Coviello). We would therefore expect that among Business Studies freshmen at Milan-Bicocca University men would be more financially literate than women.

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### Hypothesis 2 (Financial and Work Experience)

**College students who have (had) a job or have (had) financial experience will have higher financial literacy scores.**

These days, in virtually all higher education systems and institutions, a good deal of students work part-time and often full-time (Riggert et al., 2006). The tacit financial knowledge they usually acquire in the workplace may give them a competitive edge when answering our survey. The same applies to those students who acquired financial experience by means of being a consumer of financial products or services<sup>4</sup>.

### Hypothesis 3 (Type of Educational Attainment)

**College students who graduate from technical or vocational high schools (non-academic track) will have higher financial literacy scores.**

While we have reason to believe that Licei (academic track high schools) provide Italian pupils with commendable skills as far as logic and analytic reasoning are concerned, technical and vocational high schools (non-academic track) mostly provide applied learning, some of them especially in accounting. Therefore, we expect that students with non-academic high school diploma, recalling their recently learned applied technical expertise, will do better on financial issues.

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<sup>4</sup> In our analysis financial experience is proxied by yes/no answers to a number of questions: a) Do you possess a checking account/savings account?; b) Do you possess a debit/credit card? c) Do you possess a car/motor insurance?; d) Have you ever made investments in bonds, stocks, mutual funds?

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#### Hypothesis 4 (Social Origins)

**Collegiate students with higher social origins - higher parental education and level of occupation – will have higher financial literacy scores.**

There is a general consensus that youngsters' financial literacy is influenced by their social origins. We therefore expect that students with upper social and economic background register a comparative advantage versus their counterparts from lower social background, as far as financial literacy is concerned.

#### Hypothesis 5 (Nationality)

**Foreign college students will show a level of financial literacy comparable to the Italian one.**

We lack details about the demographics of non-Italian students who took part in our survey, namely if they were already living in Italy before enrolling (e.g. children of immigrants, either upper or lower class); or if they were “degree-mobile” i.e. students who came to Italy with the purpose of graduating; or if they were “credit mobile”, the most popular example being Erasmus exchange students. Nevertheless, considering anecdotal evidence on their high academic motivation, we expect virtually no difference in financial literacy scores in comparison with Italian students.

#### Hypothesis 6 (Aptitude)

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**College students who choose Finance as their major will score higher in financial literacy.**

This hypothesis rests on the evidence that, together with rational elements (job availability and social image) some non-observable traits, such as aptitude, influence the choice of a University major in the field of Business Studies (Kumar and Kumar 2013). Empirical evidence of the role of psychological and genetic traits found in the literature lend support to our decision to treat the choice a Finance major as the proxy. Therefore, we expect students who choose Finance as their major to perform better as far as financial literacy is concerned.

## SURVEY INSTRUMENT, SAMPLE AND METHODOLOGY

### Survey Instrument and Sample

For our analysis, financial literacy was measured using both multiple choice items and self-assessment items (see Table 1).

The survey instrument consisted of 39 questions, 13 of which selected from the Jump\$Start Coalition test of financial literacy. The multiple choice test used in the 2008 Jump\$Start Coalition Survey of College Students, and aimed at assessing the financial literacy of Young American Adults, was translated and adapted to the Italian context. According to the Jump\$Start Coalition, such questions can be grouped into three specific areas: a) money management; b) saving and investing; c) spending and credit. They are meant to express the concepts underlying basic financial transactions, financial planning, day-to-day financial decision-making or functioning of the banking system up to more complex issues, such as risk and returns of different asset classes or retirement planning. Each question had four endings and a fifth one which allowed the student

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to answer “Don’t know”<sup>5</sup>. In addition to multiple-choice questions measuring objective financial knowledge, we also added 8 questions referring to students’ self-assessment of their financial knowledge on a four-point scale from none to very good.

Furthermore, the survey instrument included three sections covering: a) demographic variables (e.g. gender, nationality, age, educational attainment); b) family characteristics (e.g. parents’ educational attainment; parents’ occupational position); c) 8 questions related to students’ past experience with financial instruments, such as the use of payment instruments or insurance instruments, incurrence of debt, and ability to program cash flows.

The survey was conducted on a non-random sample of 400 undergraduate students at the University of Milan Bicocca, who were taking a Bachelor’s degree in Business Studies and attending their first semester at college<sup>6</sup>. The test was administered during class time and students had no prior warning of being tested on financial topics.

In general, even in their first year, Business Studies students score better in financial literacy tests than other college students (Chen and Volpe 2002; Beal and Delpachitra 2003; Chinen and Endo 2012). However, differences may arise among business students depending on the major of choice, e.g. Management, Finance, Marketing, or Economics. In fact, when business schools offer different majors (like in Italy) students have to make a choice on enrolment. In particular, at the University of Milan-Bicocca, these majors tend to be quite different from each other being designed to specialize students in one specific subject area. Therefore, freshmen can choose to major in Marketing, Finance, or Management, on the understanding that any major except from Finance will offer hardly any finance-related subjects. Besides Finance is the major with the

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<sup>5</sup> At this stage of the analysis we do not use such information; however, we agree with Manton et al. (2006) and will attempt to determine what students admit not knowing as a further step of the study.

<sup>6</sup> The rationale for this choice was that business students are expected to improve their financial knowledge as they complete further years of study.

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higher numerical content in the Business School. Since we assume that students are aware of this and make choices which reflect a personal interest in financial matters, we would expect the choice of major (with the Finance major being a proxy for more financially literate students) to be significant in predicting differences among Business students and helping our results gain a broader insight into the explicative factors underlying financial literacy levels.

After discarding for missing values, we ended up with 366 observations, with a balanced distribution between male and female, mostly aged 19, predominantly Italian living at home (more than 80%) as reported in Table 2.

#### Methodology: the Latent Trait Models

The issue of how to measure literacy has attracted increasing attention in education research in the last two decades. One important aim in measurement is to build tests with high validity and reliability. The two most popular frameworks in educational measurement are the classical test theory (CTT) and item response theory (IRT) (Hambleton and Jones 1993). In general CTT has dominated the area of standardized testing for its weak assumptions and its easy interpretation. Despite these features, CTT has been criticized since the score in a test is not an absolute characteristic of a respondent: in fact it depends on the content of the test; moreover the difficulty of the items may vary depending on the sample of respondents who take a specific test. It is therefore difficult to compare respondents' results between different tests. For these reasons, IRT was originally developed in order to overcome the problems with CTT. The specific feature that makes these models increasingly popular in many areas of research, is the presence of a metric which considers both the test's difficulty and the respondent' specific abilities. IRT aims to measure one or more ordinal/quantitative latent variables on a metric level of measurement.

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The IRT framework encompasses a group of models, and the applicability of each model in a particular situation depends on the nature of the test items and the viability of different theoretical assumptions about the test items. For test items that are dichotomously scored, there are three IRT models, known as three-, two- and one-parameter IRT models. The one-parameter IRT model, also called Rasch models (Rasch, 1960), has some desirable mathematical properties which are not shared by the other two models. Rasch models are used to quantify aspects such as ability and personal traits and have been widely adopted in educational research and psychometrics leading to interesting results (Bond and Fox, 2007). For instance, PISA surveys have been adopting Rasch models since 2000 (Liu, Wilson and Paek, 2008). Moreover person properties or item characteristics can be included in Rasch models to explain person or item effects (De Boeck and Wilson 2004) obtaining Explanatory Item Response Models. Until very recently, the analysis of financial literacy has only relied on CTT: to the best of our knowledge, there are two studies which have used IRT (Knoll and Houts 2012; Bongini, Trivellato and Zenga 2012).

According to Rasch models, a student's response to a binary item (i.e., right/wrong, true/false, agree/disagree) is determined by the individual's level of knowledge (ability/trait) of financial literacy ( $\theta_p$ ) and by the level of financial literacy (difficulty) expressed by the  $i$ -th item ( $\beta_i$ ). One way of expressing Rasch models is in terms of the probability that an individual with a particular trait will correctly answer an item that has a particular difficulty:

$$P(X_{pi} = 1 | \theta_p, \beta_i) = \frac{e^{(\theta_p - \beta_i)}}{1 + e^{(\theta_p - \beta_i)}} \quad (1)$$

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where:

- $X_{pi}$  refers to response (**X**) made by the  $p$ -th student to the  $i$ -th item ( $X_{pi} = 1$  refers to a “correct” response or an endorsement of the item);
- $\theta_p$  refers to the level of knowledge (ability) of financial literacy of the  $p$ -th student;
- $\beta_i$  level of financial literacy (difficulty) of the  $i$ -th item;

Following from (1), Rasch models defines the score (number of items responded correctly) of a particular student as a probability function of his/her ability and item difficulty. The student ability can then be interpreted as the logistic ratio of the correct responses against wrong responses. If a student scores 50% correct responses, his/her ability is set to zero on the logistic scale, i.e. the student's ability is zero logits. If a student scores more than 50% of items correctly, the ability is positive in terms of logits. In the same way, the item difficulty can be interpreted as the logistic ratio of the number of students who did not give correct responses against those who responded correctly. For items where 50% of the students responded correctly, the item difficulty is set to zero on the logistic scale. For easy items, i.e. those which more than 50% of the students answered correctly, the item difficulty is negative in terms of logits.

At the same time (1) assumes that the probability of a given student answering an item correctly is a logistic function of the difference between the  $p$ -th person's level of knowledge of financial literacy and the level of financial literacy expressed by the  $i$ -th item, that is:

$$\eta_{pi} = \ln \frac{P(X_{pi}=1|\theta_p,\beta_i)}{1-P(X_{pi}=1|\theta_p,\beta_i)} = \theta_p - \beta_i \quad (2)$$

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A typical representation of the difference between the two locations,  $(\theta_p - \beta_i)$ , is an ‘item map’ where the item difficulties can be placed like points along a line and the person’s ability as a point along the same line.

Generally speaking, the Rasch model converts raw scores into linear and reproducible measurement. The Rasch model’s hypotheses are unidimensionality<sup>7</sup> and local independence<sup>8</sup>. Moreover the Rasch model possesses the properties of sufficiency, separability<sup>9</sup>, specific objectivity<sup>10</sup> and invariance<sup>11</sup> of parameter estimates (Bond and Fox,2007). When the invariance property is not guaranteed, it is useful to evaluate the differences among the items that might depend on their belonging to a specific group (such as gender or race). Differential item functioning (DIF) is a method that can uncover whether certain subgroups have an advantage or disadvantage in educational and psychological testing. Therefore, a variety of statistical methods have been suggested for detecting DIF in the Rasch model. Most of these methods are designed to compare pre-specified focal and reference groups, such as males and females (Paek and Wilson 2011).

In order to explain differences among students with respect to financial literacy, person properties or characteristics can be included in Rasch models (1) as predictors obtaining the latent regression Rasch model. Such a model, described by Zwinderman (1991) is particularly helpful when sub-populations can be identified in the sample.

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<sup>7</sup> Rasch models require a single construct to be the underlying item for a latent continuum.

<sup>8</sup> The items of a questionnaire are statistically independent of each subpopulation of respondents whose members are homogeneous with respect to the latent trait measured.

<sup>9</sup> The mathematical form of the Rasch model provides for the separation of item and person parameters with the consequence that the total score for the items or persons is a sufficient statistic for the item or person parameters.

<sup>10</sup> The property of specific objectivity means that the relative location of pairs of persons and pairs of items on the underlying continuum are sample-independent.

<sup>11</sup> The maintenance of the identity of a variable from one occasion to the next.

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The model differs from Rasch models in that  $\theta_p$  is replaced with a linear regression equation in equation (1):

$$\theta_p = \sum_{j=1}^J \vartheta_j Z_{pj} + \varepsilon_p$$

so that:

$$\eta_{pi} = \sum_{j=1}^J \vartheta_j Z_{pj} + \varepsilon_p - \beta_i$$

(3)

where  $Z_{pj}$  is the value of the student  $p$  on student property (covariate)  $j$  ( $j=1, \dots, J$ ),  $\vartheta_j$  is the regression weight of the student property  $j$ ,  $\varepsilon_p$  is the effect remaining after the effect of the person properties is accounted for (with  $\sigma_p \sim N(0, \epsilon_p^2)$ ).

The Linear Logistic Test Model (LLTM) was introduced by Fisher (1973) and it is a Rasch model that includes parameters for the impact of test variables on item difficulty. In this model item properties are used to explain the difference between items in terms of the effect they have on  $\eta_{pi}$ , that is:

$$\eta_{pi} = \theta_p - \sum_{j=1}^k w_{ij} \alpha_j$$

(4)

where  $\alpha_j$  is the difficult parameter for the item property  $j$  ( $j=1..k$ ) and  $w_{ij}$  is the value<sup>12</sup> of the item  $i$  on the property  $j$ .

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<sup>12</sup> Usually  $w_{ij} = 1$  if the item  $i$  has the item property  $j$  and  $w_{ij} = 0$  otherwise.

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Combining (3) and (4) yields a latent regression LLTM (Zwinderman 1997):

$$\eta_{pi} = \sum_{j=1}^J \vartheta_j Z_{pj} + \varepsilon_p - \sum_{j=1}^k w_{ij} \alpha_j$$

that includes the person contribution and item contribution. The person contribution is explained in terms of person properties, while the item contribution is explained in terms of item properties.

In our analysis, we first built measures of tested financial knowledge and of self-assessed financial knowledge. We subsequently show the results of the explanatory item response models<sup>13</sup>.

## SURVEY MAIN RESULTS: DESCRIPTIVE ANALYSIS

Table 3 reports the thirteen four-option multiple-choice questions and gives the percentage of correct answers for each question, both among our sample of Italian students and among the JumpStart Coalition sample of freshmen.

In spite of important differences in sampling and research design between our survey and the U.S. one, the data in Table 3 provide interesting information and hints. As the issue of financial literacy has a longer tradition in USA than in Italy, we expected a lower mean score for Italian students: as a matter of fact there was a six percentage-point difference in average scores (53.9% vs 60.4%). Mean scores range from a minimum of 10.5% to a maximum of 90.7% in Italy and from 18.0% to 89.3% in USA. On average, Italian students scored better on money management,

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<sup>13</sup> Parameters estimations and other data manipulation were obtained using R software (lme4 package), as in De Boeck et al. 2011.

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while they did worse in savings and investments (mean score 45.6% vs 53.1%) and in the area of spending and credit (mean score 69.5% vs. 84.3%). Owing to the lack of empirical comparative evidence, what follows is a tentative interpretation in terms of expected/plausible vs. unexpected/counterintuitive results.

The money management (MM) questions tested concepts like financial goals and plans (X1), understanding insurance (X10) and state pension schemes (X13). With the exception of the question about the primary purpose of life insurance, Italian college students rated poorly on the MM items: only 27% of respondents knew how state pensions works while a meager 36% knew the effects of inflation. With respect to their U.S. peers, we highlight a somewhat counterintuitive result on item X10 (greatest need for life insurance): more than 4 out of 5 Italians vs 3 out of 5 in U.S. give the right answer while the opposite might have been expected considering the differences in welfare state provision.

Of the seven questions on savings and investments, the question most frequently answered correctly was on budgeting to save (X5), with 90.7% correctly passing a sort of numeracy test. However, the percentage of correct answers fell considerably when it came to questions on risk, return and liquidity (X2, 71.5%), on protecting purchasing power from inflation (X3, 51.7%), on compound interest (X7, 43.9%), the value of liquidity (X4, 32.7%) and the working of deposit insurance (X9, 18.3%). Finally, only about 10.6% of students were able to identify correctly the historical returns of different asset classes (X6). With respect to their US peers, Italian students' scores are lower in five out of seven questions, namely:

1. X2, which asks where the safe place for college money is, an issue Italians are not familiar with given the low cost of higher education;

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2. X4, which focuses on the form of investment that provides the least benefit in emergencies: the much lower Italian score tells a familiar story of young adults less well-acquainted with the experience of buying a house than their American counterparts;
  3. X6 (on investments with the highest likely growth over 18 years) which indicates that Italians are less well-acquainted with stocks and shares;
  4. X7 (the amount of money for retirement according to two different strategies) highlighting that the concept of compound interest is much less clear to Italian freshmen than to their American counterparts;
  5. X9 (on deposit insurance), an expected outcome given the low level of knowledge on this issue among consumers until the very recent sovereign crisis.

Italian students fare better than Americans' on two issues: item X3 (purchasing power protection against inflation) and item X5 (budgeting in order to accumulate a certain amount of money). Both results could be envisaged in advance considering that as to item X3, inflation dynamics are something Italians have been familiar with for decades and therefore youngsters have certainly heard about the issue in family discussions. As to item X5 a better performance by Italian freshmen was plausible as the average level of student numeracy is deemed higher in Italy than in US.

Among the spending and credit questions, the one most often answered correctly was on transaction instruments (X11, 88.8%); despite this, item X8 – on how ATM cards work - was answered wrong by a much higher percentage of respondents (66.1%): students can recognize what financial instruments can be used for spending purposes, but are less aware of their costs and operative characteristics. Finally, more than 53.7% of respondents answered the question

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about credit history correctly, which is quite a surprising achievement given the low spread of debt among young Italian students. With respect to their US peers, we underline the largest difference between the mean scores (15 percentage points): Italian students are less knowledgeable about the functioning of ATMs and the use of credit history in loan decisions: this result is most probably a consequence of a lower level of direct interaction with the banking system.

The second group of items is related to perceived knowledge (Table 1.b). Students were asked to rate on a four-point scale their level of knowledge about specific financial topics, related to our three areas of savings and investments, spending and credit, and money management. Students' insight into their own financial knowledge reveals poor self-assessment abilities: the ratings showed a poor acquaintance with the proposed topics, with the sole exception of risk and return, where 73% of respondents rated their competence on the specific item as high or very high. Perceived knowledge is the lowest in topics like "payoff" and "revolving payment". This result is not surprising, given that the former deals with one of those typical terms that business students only encounter during their course of study; as regards the latter, low levels of competence are due to a more limited use of credit cards as means of borrowing in Italy.

Finally, table 4 reports the proportion of respondents who gained nil to thirteen correct answers in each of the knowledge questions: no respondent was able to answer all thirteen questions correctly; two respondents gave the wrong answer to all thirteen. The mean value of correct responses was 6.80 with a standard deviation of 1.943; the distribution of correct answers was skewed to the left (median is equal to 7), i.e. more than 50% of our sample ended up with a percentage of correct answers higher than the average score.

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## DETERMINANTS OF FINANCIAL LITERACY

A multivariate analysis enabled us to assess which factors were linked to financial literacy, after controlling for item relevance.

We constructed and tested explanatory item response models using as items both the 13 multiple-choice items and the 8 self-assessment items. Such items were classified according to their properties. The person properties used in our analysis are Major (1=Finance, 0=Otherwise), Gender (1=Male, 0=Otherwise), Nationality (1=Foreign, 0=Otherwise), High School background (1=Liceo, 0=Otherwise), Parents' Social background (1=Medium and Low, 0=Otherwise), Parents' schooling (1=College degree or higher, 0=Otherwise), Work experience (1=Yes, 0=Otherwise) and Financial experience (1=Yes, 0=Otherwise). The items properties were type of knowledge (1=Tested, 0=Otherwise) and specific financial area (1=Saving and Investing, 0=Otherwise).

In order to check the fit of the Rasch model, we used the Bootstrap goodness-of-fit test using Pearson's  $\chi^2$  statistic, based on 200 data-sets. The p-value (0.267) of this statistics led us to accept the null hypothesis that the Rasch model fits the data.

Table 5 reports the results of the Rasch model to test its adequacy. The estimated *person variance* is 0.4857 on the logit scale and, as shown in formula (2), the odds increase by a factor 1.63 when  $\theta$  increases by one standard deviation. Taking as the base case a person with a probability of 0.50 of responding correctly on an item, then someone with a  $\theta$ -value (i.e. one standard deviation higher than 0.50) has a probability of responding correctly equal to 0.80.

The estimated *item parameters* vary from -2.613 to 2.435 on the logit scale with an average value of 0.241. Given the equation (2), lower values of the item parameters imply higher probabilities of answering correctly or endorsing. Not surprisingly, Items D1, D4 and X6

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emerged as the most difficult while items X5 and X11 were the easiest. In particular the value 2.435 related to item D1 means that the model estimates that only a mere 8.76% of students know the meaning of the term “payoff” whereas the value -2.613 for item X5 implies that the model estimates a percentage of 92.67% of students giving a correct answer. At a first glance, our respondents exhibited poorer perceived knowledge while they showed higher abilities on the multiple choice items.

Figure 1 reports the Item-Person Map, in which both types of information can be evaluated simultaneously: the observations on the left-hand side are students ability values whereas those on the right-hand side are item parameter values<sup>14</sup>.

Since the Rasch model fits the data, we went on to estimate the other explanatory item response models. Table 6 shows the goodness-of-fit indices (AIC, BIC, Deviance) for the explanatory item response models in order to compare their goodness of fit<sup>15</sup>. It can be noted that the latent regression Rasch model has a better fit than the other models, moreover, the log likelihood ratio test for nested models shows there was a significant difference between the Rasch and latent regression Rasch models<sup>16</sup>.

We therefore present and discuss the estimates for latent regression Rasch model (Table 7).

Several findings emerge from our estimates.

It was hypothesized that college students who chose Finance as their major (*hypothesis 6*), were male (*hypothesis 1*), had work or financial experience (*hypothesis 2*), had graduated from technical high schools (*hypothesis 3*) and came from families with higher educational attainment

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<sup>14</sup> The students on the upper left are said to be “better” or “smarter” than the items on the lower right, which means that those easier items are not difficult enough to challenge highly proficient students. On the other hand, the items on the upper right outsmart students on the lower left, which implies that these tough items are beyond their ability level.

<sup>15</sup> Lower values of the goodness-of-fit indices indicates a better fit.

<sup>16</sup>  $\chi^2(10) = 169.838, p < 0.0001$

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or higher levels of occupation (*hypothesis 4*) would score better in our financial literacy test (subjective and objective), whether they be Italian or foreign (*hypothesis 5*).

With exception of the results related to nationality, all our hypotheses were fully or partially supported.

First, female students were substantially less financially literate than their male counterparts. Male students, with an estimated effect equal to 0.164, were 1.18 times more financially literate than women. Our sample of freshmen displayed different financial literacy levels according to their gender, even after controlling for item characteristics and other socio-demographic factors. Our evidence confirms in the American literature, where gender is an important predictor of financial literacy.

Second, financial literacy is positively associated with financial experience: students with financial experience are 1.22 times more financially literate. The same does not hold true with respect to work experience: though the sign is as expected, the coefficient is not statistically significant. The former result is generally acknowledged in the literature and Italian students are no exception: acquiring direct financial experience by being a consumer of financial products or services helps to improve one's awareness of the basic functioning of the financial system, thereby improving one's financial literacy. With respect to work experience, our results do not confirm our expectations and the evidence in other countries. This could be explained by the fact that our sample consisted of full-time students most probably employed in occasional jobs where the work experience does not necessarily involve financial experience.

Third, there was a strong negative relationship between a non-technical high school diploma and financial literacy: the former are 1.53 times less financially skilled than technical high school pupils. Graduating in technical high schools (non-academic track) provided students with applied

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learning, even in financial subjects, which are instead totally absent in academic-track high schools. Our study confirms a widespread result of the empirical literature, which reports a positive association between training in finance and financial literacy.

Fourth, as regards parents' role in influencing their children financial literacy, our study confirms the relevance of parents' higher education: students coming from families with a higher educational attainment are 1.27 times more financially skilled than other students. The same does not hold true for parents' type of occupation, which seems to be non-influential.

Fifth, our non-Italian students are at a disadvantage when it comes to financial literacy. The hypothesis according to which foreign nationals were on the same foot as Italians was not corroborated. One likely interpretation might be that as foreigners they were at odds in understanding the instruments, which was written in Italian. (I don't understand this – it seems illogical).

Finally, our main hypothesis that unobservable traits are relevant in explaining one's financial literacy performance, even after controlling for socio-demographic and family characteristics – was confirmed. The estimated effect of the major was 0.772 on the logit scale, which implies that Finance students are 2.16 times more financially skilled than students enrolled in other majors. Our proxy for “financial aptitude” was indeed a predictor of financial literacy, with Finance students (whether they be male or female) scoring better. Previous studies have documented that students undertaking business studies performed better in financial literacy tests, probably due to greater interest in broad economic matters, which encompasses financial topics, a greater level of directed reading and more attentive listening to economic/financial issues on the media. We go further, showing that, even among business freshmen, the specific choice of majoring in Finance is linked to financial literacy. Insofar as such a choice is driven by a specific attentiveness as

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regards financial matters, our results suggest that financial literacy is associated with one's aptitude in financial issues. We would like to draw the reader's attention to the fact that our sample is particularly suited to test such a hypothesis. In fact, in Milan-Bicocca University any Business Studies major other than Finance includes hardly any finance-related courses; we thus interpret the decision to enroll in the Finance major as a proof of a specific interest or turn for financial matters. Not only socio-demographic characteristics but also personal preferences have to be considered when examining factors affecting one's financial literacy.

## CONCLUSIONS

Our paper investigates whether financial aptitude, along with standard socio-demographic characteristics, is an important factor explaining university students' financial literacy at the beginning of their university careers. For this reason, first-year Business students were targeted. In spite of some shortcomings (non-random sample, first year students enrolled in only one institution, limited number of cases) our research obtained the following results.

It emerged that the financial literacy of our sample of freshmen was not very high, though not much lower than that of their U.S. counterparts.

Our findings confirm the results of previous research undertaken since the 1990s in America and Australia into the socio-economic variables associated with financial literacy. Not surprisingly, we found that in Italy too, financial literacy depends on gender, family background, previous high school experience, financial experience, and nationality.

We explored the hypothesis according to which personal non-observable traits (genetic or other) were at work in influencing the financial literacy of first year college students. Being short of proper, validated indicators, we chose the variable: "choice of the academic major" as a proxy

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for what we figure out to be an “aptitude for financial matters”. Needless to say, there is obviously a need for further research into the concept of aptitude and on the appropriate indicators which might meaningfully represent it. Notwithstanding such shortcomings, we found that financial aptitude” was a predictor of financial literacy, with Finance students (whether male or female) scoring better than their peers.

Looking at this result, the reader should bear in mind that the role of personal aptitude might be of particular relevance when planning and implementing financial education policies and programs. Early in this paper we recalled that, while financial education initiatives - both in schools and workplaces - are reasonably expected to enhance financial awareness and the propensity to adopt good financial practices (e.g. budgeting or joining a pension scheme as soon as possible), a genuine incremental impact of financial literacy does not necessarily follow. Our results corroborate the idea according to which people's financial behavior may depend more on intrinsic personal attributes than on information or knowledge. Should this be confirmed by future research, one should be less optimistic about the outcomes of financial education programs.

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## TABLES AND FIGURES

Table 1.a Multiple Choice Items (\*indicates correct answer)

Item	Question	Correct answers (%) <sup>17</sup>	Area
X1	Inflation can cause difficulty in many ways. Which group would have the greatest problem during periods of high inflation that last several years? a.) Older, working couples saving for retirement. b.) Older people living on fixed retirement income.* c.) Young couples with no children who both work. d.) Young working couples with children. e.) Not enough information to be able to answer	36.1 (42.0)	Money Management
X2	Rebecca has saved \$12,000 for her college expenses by working part-time. Her plan is to start college next year and she needs all of the money she saved. Which of the following is the safest place for her college money? a.) Locked in her closet at home. b.) Stocks. c.) Corporate bonds. d.) A bank savings account.* e.) Not enough information to be able to answer	71.5 (88.4)	Savings and Investments
X3	Which of the following types of investment would best protect the purchasing power of a family's savings in the event of a sudden increase in inflation? a.) A 10-year bond issued by a corporation. b.) A certificate of deposit at a bank. c.) A twenty-five year corporate bond. d.) A house financed with a fixed-rate mortgage.* e.) Not enough information to be able to answer	51.7 (38.2)	Savings and Investments
X4	Many people put aside money to take care of unexpected expenses. If Juan and Elva have money put aside for emergencies, in which of the following forms would it be of LEAST benefit to them if they needed it right away? a.) Invested in a down payment on the house.* b.) Checking account. c.) Stocks. d.) Savings account. e.) Not enough information to be able to answer	32.7 (59.8)	Savings and Investments
X5	David just found a job with a take-home pay of \$2,000 per month. He must pay \$900 for rent and \$150 for groceries each month. He also spends \$250 per month on transportation. If he budgets \$100 each month for clothing, \$200 for restaurants and \$250 for everything else, how long will it take him to accumulate savings of \$600. a.) 3 months. b.) 4 months.* c.) 1 month. d.) 2 months. e.) Not enough information to be able to answer	90.7 (76.9)	Savings and Investments
X6	Sara and Joshua just had a baby. They received money as baby gifts and want to put it away for the baby's education. Which of the following tends to have the highest growth over periods of time as long as 18 years? a.) A checking account. b.) Stocks.* c.) A U.S. Govt. savings bond. d.) A savings account. e.) Not enough information to be able to answer	10.5 (18.0)	Savings and Investments
X7	Rob and Mary are the same age. At age 25 Mary began saving \$2,000 a year while Rob saved nothing. At age 50, Rob realized that he needed money for retirement and started saving \$4,000 per year while Mary kept saving her \$2,000. Now they are both 75 years old. Who has the most money in his or her retirement account? a.) They would each have the same amount because they put away exactly the same b.) Rob, because he saved more each year c.) Mary, because she has put away more money d.) Mary, because her money has grown for a longer time at compound interest*	43.9 (57.1)	Savings and Investments

<sup>17</sup> In parenthesis % of correct answers by US college students

	e.) Not enough information to be able to answer		
X8	Which of the following statements is NOT correct about most ATM (Automated Teller Machine) cards? a.) You can generally get cash 24 hours-a-day. b.) You can generally obtain information concerning your bank balance at an ATM machine. c.) You can get cash anywhere in the world with no fee.* d.) You must have a bank account to have an ATM Card. e.) Not enough information to be able to answer	66.1 (87.4)	Spending and credit
X9	Savings programs are protected by the Fondo Interbancario di Tutela. Which of the following is guaranteed protection? a.) Commercial papers b.) A checking account at the bank.* c.) A bond issued by a bank d.) A Treasury Bond. e.) Not enough information to be able to answer	18.3 (33.5)	Savings and Investments
X10	If each of the following persons had the same amount of take home pay, who would need the greatest amount of life insurance? a.) An elderly retired man, with a wife who is also retired. b.) A young married man without children. c.) A young single woman with two young children.* d.) A young single woman without children e.) Not enough information to be able to answer	82.7 (57.4)	Money Management
X11	Which of the following instruments is NOT typically associated with spending? a.) Debit card. b.) Certificate of deposit.* c.) Cash. d.) Credit card. e.) Not enough information to be able to answer	88.8 (89.3)	Spending And credit
X12	Which of the following statements is true? a.) Banks and other lenders share the credit history of their borrowers with each other and are likely to know of any loan payments that you have missed.* b.) People have so many loans it is very unlikely that one bank will know your history with another bank c.) Your bad loan payment record with one bank will not be considered if you apply to another bank for a loan. d.) If you missed a payment more than 2 years ago, it cannot be considered in a loan decision. e.) Not enough information to be able to answer	53.7 (76.3)	Spending And credit
X13 <sup>18</sup>	John started his career in banking in 1995 and he earns € 2.000 per month. If he retires when he is 65 years old, what will be the likely amount of his public pension, in % of his last salary? a.) 30%-35% b.) 80-100% c.) 50% d.) 60% * e.) Not enough information to be able to answer	27.1 (n.a.)	Money Management

Table 1.b Self-assessment Items

code	How do you rate the degree of your knowledge: 1) very good; 2) good; 3) poor; 4) none	self-assesment (% of 1 & 2)	Area
D1	Payoff	11.0	Savings and Investments
D2	Expected return	32.4	Savings and Investments
D3	Retirement funds	42.7	Savings and Investments
D4	Revolving payment	11.7	Spending and credit
D5	Compound rate	34.9	Savings and Investments
D6	Portfolio diversification	34.9	Savings and Investments
D7	Risk and return	72.7	Savings and Investments
D8	Money supply	33.7	Money Managements

<sup>18</sup> Item X13 was specifically designed as to analyze the level of knowledge on the functioning of the pension schemes among young Italian

Table 2. Sample distribution (n=366)

<b>Variable</b>	<b>%</b>	<b>Variable</b>	<b>%</b>
<b>Gender</b>		<b>Major</b>	
Male	51.0	Finance	40.7
Female	49.0	Other majors	59.3
<b>Nationality</b>		<b>Schooling</b>	
Italian	86.9	Academic track (liceo)	46.4
Other	13.1	Non academic track (technical institutes)	53.6
<b>Living</b>		<b>Parents' schooling (highest level of the two)</b>	
With parents	85.0	College degree or higher	19.7
On their own	16.0	Up to high school diploma	80.3
<b>Financial experience</b>		<b>Parents' Social level</b>	
Yes	64.5	High	21.0
No	35.5	Medium-Low	79.0
<b>Work experience</b>			
Yes	55.5		
No	44.5		

Table 3. Distribution of correct answers for multiple choice items: mean percentage for each item, groups of items, all samples<sup>19</sup> (Grand Mean).

Financial area	Italy	USA
<b><i>Money Management</i></b>		
X1	36.1	42.0
X10	82.7	57.4
X13	27.1	n.a
<i>Mean</i>	<u>59.4</u>	<u>49.7</u>
<b><i>Saving and Investments</i></b>		
X2	71.5	88.4
X3	51.7	38.2
X4	32.7	59.8
X5	90.7	76.9
X6	10.5	18.0
X7	43.9	57.1
X9	18.3	33.5
<i>Mean</i>	45.6	53.1
<b><i>Spending and Credit</i></b>		
X8	66.1	87.4
X11	88.8	89.3
X12	53.7	76.3
<i>Mean</i>	69.5	84.3
<b><i>Grand mean</i></b>	<b>53.9</b>	<b>60.4</b>

<sup>19</sup> Italy, 2012; USA 2006

Table 4. Distribution of correct answers for multiple choice items.

N. of correct answers	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Frequency	1	2	1	13	27	46	68	74	57	50	22	4	1	0
%	0.27	0.55	0.27	3.55	7.38	12.57	18.58	20.22	15.57	13.66	6.01	1.09	0.27	0
n=366 Mean: 6.800 Standard deviation: 1.943														

Table 5. Estimates for the Rasch model.

Parameters	Rasch Models				
	Estimate	Std Error	z-Value	Pr(> z )	
X1	+0.572	0.118	-4.862	<0.001	***
X2	-1.067	0.127	+8.407	<0.001	***
X3	-0.072	0.114	+0.630	0.529	
X4	+0.838	0.122	-6.889	<0.001	***
X5	-2.613	0.203	+12.896	<0.001	***
X6	+2.309	0.180	-12.840	<0.001	***
X7	+0.295	0.115	-2.560	0.010	*
X8	-0.701	0.120	+5.862	<0.001	***
X9	+1.623	0.144	-11.255	<0.001	***
X10	-1.785	0.152	+11.769	<0.001	***
X11	-2.404	0.187	+12.853	<0.001	***
X12	-0.194	0.115	+1.693	0.090	.
X13	+1.009	0.125	-8.058	<0.001	***
D1	+2.435	0.188	-12.925	<0.001	***
D2	+0.880	0.122	-7.185	<0.001	***
D3	+0.344	0.115	-2.982	0.003	**
D4	+2.339	0.182	-12.866	<0.001	***
D5	+0.730	0.120	-6.088	<0.001	***
D6	+0.797	0.121	-6.591	<0.001	***
D7	-1.067	0.127	+8.407	<0.001	***
D8	+0.811	0.121	-6.690	<0.001	***

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Table 6. – Goodness of fit

Model	Deviance	AIC	BIC
Rasch	8182.268	8226.106	8379.106
Latent Regression Rasch	8097.349	8163.349	8292.136
LLTM	8313.438	8317.438	8325.243
Latent Regression LLTM	8223.754	8249.754	8300.488

Table 7. Estimates for the latent regression Rasch model.

Parameters	Latent regression Rasch				
	Estimate	Std Error	z-Value	Pr(> z )	
X1	+1.006	0.449	-2.240	0.025	*
X2	-1.638	0.165	+9.903	<0.001	***
X3	-0.644	0.156	+4.128	<0.001	***
X4	+0.266	0.161	-1.651	0.099	.
X5	-3.186	0.229	+13.941	<0.001	***
X6	+1.737	0.208	-8.335	<0.001	***
X7	+0.277	0.156	+1.771	0.077	.
X8	-1.273	0.160	+7.959	<0.001	***
X9	+1.051	0.179	-5.878	<0.001	***
X10	-2.357	0.1859	+12.733	<0.001	***
X11	-2.977	0.215	+13.850	<0.001	***
X12	-0.766	0.156	+4.903	<0.001	***
X13	+0.437	0.164	-2.664	0.008	**
D1	+1.863	0.216	-8.633	<0.001	***
D2	+0.308	0.162	-1.903	0.0578	.
D3	-0.228	0.157	+1.452	0.1468	
D4	+1.768	0.210	-8.411	<0.001	***
D5	+0.158	0.160	-0.986	0.3248	
D6	+0.225	0.161	-1.401	0.1618	
D7	-1.638	0.165	+9.903	<0.001	***
D8	+0.239	0.161	-1.486	0.1378	
Finance	0.772	0.452	-1.708	0.087	.
Family Home	-0.145	0.127	-1.138	0.255	
Male	0.164	0.093	+1.757	0.079	.
Liceo	-0.429	0.091	-4.71	<0.001	***
Note:High	0.067	0.099	+0.676	0.499	
Italian Nationality	0.326	0.137	+2.384	0.017	*
Parents' degree: College degree or higher	0.241	0.114	+2.109	0.035	*
Parents' Social Ground: Medium-Low	-0.008	0.421	-0.019	0.985	
Having a Job	0.114	0.088	+1.305	0.192	
Having a bank account	0.198	0.094	+2.098	0.036	*

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Figure 1. Person/Item map for Rasch model.

