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Financial literacy and financial behavior: Do women lag behind?

Antonia Grohmann, Olaf Hübler, Roy Kouwenberg and Lukas Menkhoff

Abstract

This research challenges the stylized fact of a “gender gap” in financial literacy, i.e. the finding that women lag behind men in this respect. Our data which samples middle-class people from Bangkok does not show a gender gap, neither in regards to financial literacy nor regarding various kinds of informed financial decision making. This result is not explained by men’s low financial literacy. It may be partially explained by high income of our target group and it seems likely to be influenced by Thailand’s cultural background, such as the low degree of masculinity.

JEL-Classification: D 14 (personal finance), J 16 (economics of gender), O 16 (financial markets)

Keywords: financial literacy, financial behavior, individual characteristics, gender gap

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1 Introduction

People have to make financial decisions with far reaching consequences in various domains of their life. They decide whether to save, how to invest their assets, whether and which kind of debt they take, which insurance to buy and how to deal with retirement savings. Of course, not every person has to make decision on all these issues, as some may rely on their spouse or get sufficient public pensions etc. However, in the end it seems fair to conclude that most people, in particular those in the middle class, have to make many major financial decisions during their lifetime (Campbell 2006). In some contrast to the importance and frequency of these decisions, many people do not seem to be well equipped to master these challenges. One widespread deficiency, of particular interest to us, is their limited financial literacy.

In their survey on financial literacy, Lusardi and Mitchell (2014), report results on the degree of financial literacy which cover many countries and groups in the world. This broad coverage shows some common patterns. Among these common patterns is the finding that there are “large sex differences in financial literacy” (Lusardi and Mitchell, 2014) with women being at a disadvantage. This finding also applies to studies with a focus on developing countries summarized as “women tend to have less financial literacy” in Xu and Zia (2012). Hence, Bucher-Koenen et al. (2012) coin this common finding a “gender gap” regarding financial literacy.

We challenge this established result in the literature by examining well educated middle class people in an emerging economy. In contrast to many other studies which use “sex” merely as a control variable, so that its coefficient may be correlated with other variables, we examine explicitly whether there is a gender gap in our sample. Surprisingly, we do not find that women lag behind men regarding financial literacy. This holds for several aggregate measures of financial literacy, for the underlying single items and also when controlling for socio-demographic characteristics.

However, it is important to remember, financial literacy is a skill that facilitates good financial decisions but does not guarantee them (Gathergood, 2012, Gustman et al., 2012, van Rooij et al., 2012, Fernandes et al., 2013). In line with some skepticism in the literature regarding financial behavior of women, it seems possible that women make worse financial

decisions than men despite having the same degree of financial literacy. This is an empirical question which is of high importance for welfare considerations. Thus it seems important and again somewhat surprising, that based on our sample and the financial decisions we observe, women do not make worse financial decisions than men. Summarizing both results, we do not find a gender gap: neither regarding financial literacy nor regarding financial behavior.

Obviously, our finding differs from the main literature which raises the question, why do we get this result? We see two kinds of possible explanations: a different study design and a different target group. Regarding the study design we are conventional by purpose, as we show below, so that the reason for the difference is unlikely to be found here. Regarding the target group, however, we differ from most studies which aim for samples which are representative of the adult population. In contrast, we cover relatively homogeneous middle class people, characterized by good education, high income and responsibility for financial decisions. This means that we compare women and men with similar individual characteristics in order to reveal the pure role of gender. Moreover, we base our study in Thailand which has not been covered before. Our result suggests that the gender gap in financial affairs does not result from the sexes as such but rather from the roles that each gender takes in society.

In order to enable an analysis of gender-specific financial literacy, we conduct a specifically designed questionnaire survey. This survey study covers 530 middle-class people from Bangkok and is described in detail in the data section below (Section 2). Crucially, this survey contains information about participants' socio-demographic situation, their biographical background, their financial literacy and financial decisions. This same survey has been used before by Grohmann et al. (2014) for a different purpose, i.e. examining roots of financial literacy; there, information on gender is simply used as a control variable.

We start our analysis with descriptive statistics and find that women and men in our sample are relatively equal regarding their socio-demographic characteristics, although there are still a few pronounced differences between the sexes. Next we describe the degree of financial literacy of women and compare it to men in the sample. There are no statistically significant differences whatever measure of financial literacy we take. This pattern also holds for financial behavior which we analyze by observing six decisions being made. Descriptive statistics suggests that women tend to make even better financial decisions compared to men.

After documenting this pattern, we apply the recently developed statistical LARS-procedure (Efron et al., 2004) to derive an optimal empirical model explaining financial behavior. This procedure considers the wealth of available individual characteristics available in our dataset. First results qualitatively confirm the more conventional procedure of

Grohmann et al. (2014). Extending our approach we analyze the impact of financial literacy and gender for financial behavior in various IV-regressions. The superiority of women over men from the descriptive statistics about financial behavior largely disappears but whatever we do, there is never a gender gap indicating inferior financial decisions by women. We conclude from these results that financial literacy does explain financial behavior but gender does not, at least not in our sample.

In an attempt to reconcile our finding with the normally common gender gap we re-examine other data sets by selecting persons from these data sets as close to our sample as possible. We show using data from Germany, the Netherlands and the U.S. that the characteristics of being more educated, having higher income, urban living and being financially responsible all tend to contribute to higher financial literacy but not necessarily to a smaller gender gap. There is, however, clear evidence from various sources that women and men behave more similarly to each other in Thailand than in other countries, which seems to contribute to the missing gender-difference in financial literacy and financial behavior in our data. We conclude that country characteristics, i.e. probably cultural characteristics, best explain our lack of a gender gap, whereas the contribution by selecting a specific within-country group is smaller.

This paper's focus on the difference between the sexes is quite rare in the large literature on financial literacy. Typically, gender is just a control variable (Fernandes et al. 2013). Only a few papers specifically examine women, such as Lusardi and Mitchell (2008) who find that in particular older women show a severe lack of financial literacy. Bucher-Koenen et al. (2012) stand out as they analyze possible explanations for the gender gap. There does not seem to be a conclusive answer yet as also socio-demographic characteristics do not explain much of the gap. We bring in fresh evidence indicating, first, that the gender gap is not as wide spread as one might believe and, second, that the gender gap may be related to a set of determinants, such as cultural background across countries and sample selection within countries.

This paper is structured with Section 2 describing the sample, Section 3 documenting the degree of financial literacy and financial behavior separately for women and men and Section 4 examining the role of gender for financial behavior in various regression approaches, also considering instruments. Further analyses are provided in Section 5 and Section 6 concludes.

2 Sample collection and characteristics

This section describes the data in general, i.e. the conduct of the survey (2.1), participants' socio-demographic characteristics (2.2) and biographical characteristics (2.3). Characteristics are presented separately for women and men.

2.1 Conduct of the survey

The data used in this paper was collected during a survey in Bangkok at the end of 2012. The sample consists of 530 respondents and was collected using street interviews throughout Bangkok. The survey was conducted by a Bangkok based survey company, using the questionnaire, which was written by the research team. The questionnaire was pre-tested in Bangkok using respondents from the target group and the survey company gave feedback based on previous experience. As we aim to cover people with a number of different levels of wealth, income, employment status and family backgrounds, interviews were conducted in commercial as well as residential areas of Bangkok. Areas were decided on before the start of the survey and each area was covered by a team consisting of three or four enumerators. Interviews, however, were conducted on a one to one basis. Each enumerator had previous survey experience and was trained on this specific questionnaire.

In order to counteract potential problems with this form of surveying, a number of precautions were taken and respondent were pre selected based on four different criteria. Firstly, as this study explicitly aims to study the urban middle class, income had to be over 15,000 baht a month, which is the starting salary for a recent graduate. According to the Thai Office of National Statistics, 29% of Bangkok residents earn this amount or more. Secondly, respondents had to be over 18 and below 60 as to be allowed to make their own financial decisions, but not to have started retirement. Thirdly, respondents had to be resident in Bangkok and fourthly, and most importantly for the purpose of this paper, they had to be responsible for their own or their household's financial decisions. If individuals approached did not fulfill these requirements, interviews were discontinued after the preliminary questions. Roughly 31% of those approached failed initial screening, mostly due to incomes being too low. In addition to the pre-selection, we also aimed for a balanced sample with respect to gender and aimed for diversity regarding age.

2.2 Socio-demographic characteristics of women and men

As the survey focuses on the urban middle class in an emerging economy it is unsurprising that our sample is young and well educated. The average age is 34 years and 64%

of our respondents have a bachelor's degree and a further 15% have vocational training. [Table 1](#) shows these and more summary statistics broken down by gender. The table's last column shows p-values for a t-test comparing men and women.

At an average income of just under 26,800 baht a month (i.e. approximately 600 US-dollar), earnings of our sample are considerably higher than the Bangkok average, which was given at 17,000 baht a month by the National Statistics Office in 2011. About half of our respondents are married. The average number of three adults per households is typical for Bangkok as often two or three generations live together. Despite this somewhat traditional behavior, the average number of less than one child per household reflects of course the situation of modern middle-class people.

We complement standard socio-demographic characteristics by two variables which are of interest when analyzing financial literacy as these influence financial behavior (Agarwal and Mazumder, 2013), i.e. numeracy and risk attitude. When we turn to our measure of numeracy, which is compiled by answering four math questions (for details see in the Appendix [Table A1](#)), we get average values at about 3.5. Regarding risk aversion, we rely on a survey based question (see [Table A1](#)). This simple measure of risk attitude asks respondents to place themselves on a scale between zero and ten, with zero meaning "unwilling to take risk" and ten meaning "fully prepared to take risk" This measure has been used in previous studies and has been shown to be closely correlated with experimental measures of risk aversion (Dohmen et al. 2011, Hardeweg et al. 2013). Thus it can be interpreted as a measure of risk tolerance. In order to make interpretation easier we reverse the scale and use a zero to one scale, which thus provides a measure of self-assessed increasing risk aversion between 0 and 1.

Finally, [Table 1](#) reports information about the volume of financial assets held by participants. Since we only required respondents to give their asset value in categories, we created three dummies for value of assets, namely high, medium and low. Women are also more likely to be in the lowest asset group.

As we can see, men and women in our sample are the same on average with respect to most socio-demographic variables, such as age, household composition, education and numeracy. However, there also are marked differences between the sexes: women show more risk aversion and also have lower incomes than men (and more often little assets), despite requiring a minimum income of above 15,000 baht to participate in the survey.

2.3 Biographical characteristics of women and men

Furthermore to standard socio-demographic and financial information, we also collected a number of indicators designed to give biographical information. These indicators have been used in earlier studies as documented in Grohmann et al. (2014). They cover various aspects of education and early experiences with money. They enable us to look in more detail at the differences with respect to family background and early life experiences with money between men and women in the sample. Descriptive statistics, again broken down by men and women are presented in Table 2. Results of t-tests are presented in the right most column.

(1) The first group of biographical characteristics addresses *family background*. When looking at these results father's and mother's education of men and women in our sample is significantly different, meaning that this result stands out among all the variables covered here. The result indicates that women that are part of Bangkok's middle class were born to less educated parents than their male counterparts. In contrast to this strong difference, the self-assessment regarding parents' understanding of financial matters and the economic background being poor are at best borderline significantly different between women and men. In an attempt to capture the aspect of an improved situation of our participants compared to their parents, we define a variable "climber", if the respondent's education level is higher than the previous generations' education level. Again, there is no difference between women and men.

(2) The second group contains variables on *parental teaching*. Parents usually taught their children to budget and encouraged children's saving. The frequency of this behavior is slightly higher regarding boys than girls but the difference in percentage points is not high and also not statistically significant.

(3) Another important biographical characteristic is the education that children got at school. The subject of "economics" is frequently taught as almost 67% of our participants had this subject at school. In this case this occurs slightly more often to women, however, not to a significant degree. Somewhat more men were born in Bangkok than women (marginally significant), although even more women received their highest educational degree in Bangkok.

(4) Finally, *early experiences with money* cover different aspects. Almost all participants had an allowance as children, so we do not consider this variable in our further examination. Slightly more than half had a bank account before the age of 18, equally likely among women and men. The last difference is that men are more likely to have had jobs before the age of 15. As most of our sample is university educated these jobs were clearly part-time work. Again, since middle class men tend to have had more educated parents, this is surprising. Possible

answers to this puzzle are either that men, having grown up in Bangkok, felt poorer and so felt the need to get a part time job, or that boys were more often allowed by parents to work (part-time) than girls.

Overall, most biographical characteristics do not differ much between women and men. What stands out, however, is the clearly higher education of men's parents compared to women's parents.

3 Financial literacy and financial behavior of women and men

In this section we provide first results. We show that women in our sample are not less financially literate than men, irrespective of the financial literacy measure being used (Section 3.1). Moreover, women also do not seem to behave worse than men in their financial decisions; if there is any difference, women tend to make overall better decisions than men (Section 3.2).

3.1 Financial literacy of women and men

The survey includes four questions designed to measure financial literacy. These questions were first used in the US Health and Retirement Survey in 2004 by Lusardi and Mitchell (2007) and by now have become standard items for measuring financial literacy. Hence these three questions have been widely used on a number of different groups from a large number of countries. This enables direct comparisons across countries and social groups. We supplement these three standard questions with a fourth question introduced by Cole et al. (2011). Exact questions can be found in [Table 3](#).

A number of different ways have been used in the literature to form financial literacy scores. Here, we focus on two methods; firstly we simply award one point for each correct answer given, so that all questions are weighted equally. Secondly we use factor analysis and use the first factor as a measure for financial literacy. In addition to dummies that take the value of one for each correct question, we also include variables that are unity if the respondent answers "I don't know" (van Rooij et al. 2011). Furthermore, a variable that counts the number of foreign banks that someone can name, is also included in the factor analysis. We can include this as an additional measure of financial literacy, as we argue that the original questions are too focused on mathematical ability. This argument has also been made by Carpena et al. (2011), who supplement questions on financial numeracy with questions on financial awareness and financial attitude and perceptions. By asking about foreign banks we

are including our own measure on institutional knowledge and are so expanding the concept of financial literacy.

Dummies for each question, along with the two aggregate scores are reported in Table 3, broken down by gender. From the t-test-result we can see that there is no significant difference in the level of financial literacy between men and women. This holds for all six measures of financial literacy being documented in Table 3. The share of correct answers is better than measured for the U.S. but below the share measured in either the Netherlands or Germany (Bucher-Koenen et al., 2012). The main shortcoming of the Bangkok sample is in the response to item 3, which measures diversification, probably because the share of stock owners is below that found in advanced economies.

Finally, Bucher-Koenen et al. (2012) report that in surveys from many countries women tend to report that they do not know the answer on financial literacy items more often than men. We report at the bottom of Table 3 that there is no such difference in our sample. Moreover, the degree to which this response category is used is at the same level used as that used by men in other studies.

3.2 Financial behavior of women and men

When comparing financial behavior between men and women, it becomes clear that women do *not* display worse financial behavior. The survey asks respondents to give information on the amount and structure of savings as well as debt. In particular, we ask what form assets are held in and ask for detailed information on credit card debt. Based on this data we use indicators of more or less informed financial behavior which have been introduced in this specific form by Grohmann et al. (2014). Among these indicators, four refer to the asset side and two to credit card debt:

- The first indicator “*assets other than savings account*” refers to the situation in Thailand that almost everyone has a savings account. Beyond that, however, the use of further kinds of assets decreases dramatically so that about half of the population sticks with just one or several savings accounts (details in [Table 4](#)). There is no gender specific difference. Here we just present descriptive statistics, later on we also control for income and assets which naturally foster the use of other assets than savings accounts.
- The most common other asset is a “*fixed deposit account*”, which in Thailand brings considerable tax benefits. Holding this kind of favorable asset is our second indicator of informed financial behavior. Interestingly, women tend to hold this kind of asset

significantly more often than men, although the difference in absolute numbers with 44% to 38% is not too large.

- Thirdly, we look at the use of life-“*insurance*” products as a type of specific investment product. This product is notorious in Thailand for its bad returns, so that it cannot really be regarded as a good choice for informed customers. On the other hand such a product offers payouts in case of early death and so is particularly interesting to risk averse people. Since women are in general rather more risk averse than men (e.g. Eckel and Grossman, 2008), buying life insurance seems to be particularly appealing to them, despite low financial returns.
- Beyond single products, we also consider diversification by simply counting the “*number of different assets*” a person owns. As before, obviously one needs to control for wealth. Nevertheless, raw descriptive statistic is surprising because women hold significantly more different assets than men, despite lower income and assets.
- Turning to credit card debt, we ask whether one “*does not know interest on credit*” (card). Even though this a knowledge question, and thus in a sense similar to knowing foreign banks, we ask here about the own interest to be paid and not for abstract knowledge. Answers to this item are the sole case where women respond less informed than men.
- One reason may be the next indicator of informed financial behavior, i.e. whether one finds it “*difficult to pay off credit card*” (debt). Women are a lot less likely to feel that paying off their credit cards to be a burden. It hence follows that women are less likely to incur interest rate costs which may contribute to explaining why they less likely know the interest rate on their credit card.

In summary, we find that women show in three cases more informed behavior than men, according to our indicators. In one case women behave inferior and in two cases equal to men. All this does not show that women would lag behind men regarding the quality of financial behavior.

4 The role of financial literacy and gender for financial behavior

This section builds on Section 3 and advances by going from description to explanation. Section 4.1 describes the empirical approach by which we analyze financial behavior and Section 4.2 shows the result when applying this approach and an IV-approach to various kinds of financial decisions. Section 4.3 further extends the analysis by IV-regressions which are

now separated for women and men in order to get independent effects of financial literacy. Section 4.4 concludes by discussing our results.

4.1 Econometric approach

Research has developed over the last ten years or so, that is designed to increase our understanding of the role of financial literacy. This process can be simplified by reducing it to three main stages: first, papers have detected largely bivariate relations between financial literacy and indicators of informed financial behavior. Second, these relations have been rerun while controlling for larger sets of socio-demographic characteristics, such as income, education, age, gender, etc. Third, over the last years potential endogeneity of RHS variables has been addressed by relying on instrumental variables which are mainly derived from childhood experiences of today's adults (Behrman et al. 2012). All this leads to a wealth of variables which may be relevant when examining the role of financial literacy and raises the question of how to organize these variables.

So far, research either uses a limited number of variables (possibly determined by data availability) or imposes a two-step structure on the data. This structure distinguishes between variables that are seen as controls when the impact of financial literacy is analyzed whereas other variables are used as instruments for financial literacy. There are good economic reasons for imposing such a structure and of course there are statistical tests to see whether conditions for the structure are fulfilled. Nevertheless, given the many potential influences, potential multicollinearity and possible endogeneity, we propose another empirical approach. Different from earlier approaches, this approach is a purely econometric procedure to decide which variables to use for which purpose.

In this paper we aim to explain financial behavior by relying on individual characteristics, in particular available socio-demographic information (Table 1) and biographical information (Table 2), and by considering measures of financial literacy. As no theory can convincingly explain which variables are actually important for financial decisions, we start the econometric analysis with the selection of individual characteristics that are relevant in a statistical sense. For this purpose least angle regression (LARS) is applied (Efron et al., 2004). Among a collection of m available covariates a parsimonious set for the efficient prediction of response variables is selected. Only m steps are required. Each step adds one covariate to the model so that after k steps just k coefficients are nonzero. The procedure starts with all coefficients being equal to zero and finds the one predictor being most correlated with the response variable, say x_1 . The largest step in the direction of this predictor is taken until

some other predictor - say x_2 - has as much correlation with the current residual. LARS proceeds in a direction equiangular between the two predictors, x_1 and x_2 , until a third predictor, x_3 , earns its way into the “most correlated” set. LARS proceeds equiangularly between x_1 , x_2 and x_3 , that is, along the “least angle direction” until a fourth variable x_4 enters, and so on. As usual, the C_p criterion is used as the stopping rule, i.e. no more regressors are incorporated when C_p reaches its smallest value. As C_p is an unbiased estimator of prediction error, the C_p minimization can be regarded as an unbiased estimator of the optimal stopping point.

The result of applying this LARS procedure to our data is presented in [Table 5](#). Here we show the stepwise outcomes of the LARS procedure, where the first variable being included is income, followed by asset variables and then already followed by financial literacy, whereas gender comes considerably later in step 12. Variables are included until step 17, i.e. 16 variables help to improve the estimation. The inclusion of further variables leads, however, to increasing C_p values. Following the LARS procedure these variables will not be included in the estimations.

We present this procedure here using the “number of different assets” as dependent variable. We argue that this variable is more representative for financial behavior than examining decisions about single assets or behavior towards credit card debt. Thus, if one prefers to consistently work throughout the research with one set of variables (as we do), the one from [Table 5](#) seems to be the most appropriate (in robustness checks we calculate specific variable sets per dependent variable without major changes).

4.2 Explaining financial behavior

Having revealed the set of useful variables that help our understanding of financial behavior, we now show regressions for all considered kinds of financial behavior. We use two kinds of approaches: first, we present results using probit or poisson regressions, and second we present results using an instrumental variable-approach.

The first set of regressions follows many earlier studies in incorporating financial literacy, and in our case gender, as explanatory variables together with the larger group of control variables, which we sourced using the LARS method. Results in [Table 6](#) show the coefficients of financial literacy and gender variables whereas the other coefficients are hidden in order to save space. All of the financial literacy coefficients have the expected sign and four out of these six coefficients are statistically significant. Regarding the relationship between gender and informed financial behavior we mostly confirm the descriptive statistics shown

above in Table 4. These results hold, even when controlling for other socio-demographic factors: women do not seem to make worse financial decisions than men. The results are rather to the contrary; as the coefficients on female dummy are statistically significant in four out of six cases and in most of these cases they indicate the sign that goes along with informed decisions.

However, it is possible that financial literacy does not determine the choice and diversity of assets directly but rather causality works the other way around. In this case, the results in Table 6 are biased and inconsistent. We tackle this problem by means of instrumental variable regression. We hence look for variables that are correlated with the causal variable of interest, but uncorrelated with the error term. In other words, we need determinants that ensure the exclusion restriction. For this purpose we exploit the available biographical information (see Table 2). Some of these variables are not only indirectly correlated with the choice of asset types via financial literacy but also via other channels. In this event, the causal effect is not correctly recognized. We have found that allowance during the childhood (ALLOW), bank account before 18 (ACC), parents' understanding of financial matters (FIN) and persons were taught by their parents in budgeting (BUDGET) can be used as identifying instruments as they affect our variables of financial activities only indirectly via financial literacy. Of these variables, ACC, FIN and BUDGET are excluded by the LARS procedure (see Table 6). Dummies for jobs before the age of 15 (JOB) and ALLOW are also suitable for further instruments while economics as subject at school (ECO), saving between the ages of 12 to 16 (SAVE), poor economic background (POOR) and mother's education (EDU_m) also directly correlated with financial activities.

The resulting second step-estimations are presented in [Table 7](#) and cover, as in Table 6 before, only coefficients of the financial literacy variable and the gender variable. Thus, we do not show results of the first-step regression explaining financial literacy and we do not show coefficients of the other 14 (control) variables in the second-step regression. Results in Table 7 can be directly compared to the ones in Table 6. Obviously, financial literacy remains an important variable in explaining financial behavior, although significance changes between indicators of financial behavior. In contrast, gender of a person does not seem to be equally important in understanding financial decisions making. Hence we do not claim – different from what simple descriptive statistics imply – that women show more informed financial behavior than men but that they make equally good financial decisions.

4.3 IV-regressions for women and men

Our last approach in examining the role of gender is simply to split the sample into women and men and applying the above introduced IV to both groups separately. The intention of this procedure is to show that the gender variable also has indirect effects via others characteristics like education or risk aversion on financial activities which cannot be recognized in the regression in Table 6.

Results for the six observed kinds of financial decisions are shown in [Table 8](#). We find that the coefficients on the financial literacy variable are mostly statistically significant and if so, they always have the theoretically expected sign. Table 8 presents the coefficients on the financial literacy variable only in order to save space, coefficients of the other variables are hidden; results of the full specifications are available on request.

In more detail, we report twelve coefficients, six for women and men each, of which eight are statistically significant. Significance holds for 5 out of 6 cases for men but only in 3 out of 6 for women. Looking at the six specific financial decisions, financial literacy in the case of women does lead to better financial behavior for the decisions on “fixed deposits”, “insurance” and “difficult to pay-off credit card”, whereas there is no significant effect regarding the decisions on “further financial assets”, “not knowing interest rate” and “diversification”. Reassuringly, however, we also do not get theoretically absurd results which overall confirms the quality of data and approach taken.

What do we learn from this result? Considering that women in our sample are not superior to men in various characteristics that are known to positively influence financial decisions – such as education, income or risk tolerance – it is interesting that financial literacy also cannot explain their tentatively better financial decisions. The impact of financial literacy is, if at all, rather weaker than for men, reinforcing the earlier suspicion that it is not just financial literacy driving women’s reasonable financial behavior.

5 Discussion of results

Summarizing our results so far, we find that women are as good at making financial decisions as men are throughout various kinds of decisions. In line with this result we also find that women do not lag behind men regarding their degree of financial literacy. As this finding is at odds with the gender gap often found for financial literacy and financial behavior, this raises the question: why is there no gender gap in our case? We here discuss this using four approaches to address this question and add a few more robustness checks: i.e. sample splits within our data set (5.1), selecting groups similar to ours from other data sets (5.2), evidence

from cross-country observations (5.3), comparing Thai urban and rural samples (5.4) and further robustness checks (5.5).

5.1 Further splits of our sample

Our sample is different from the literature, because the sample is not representative for the adult population but selective on purpose. Our sample covers financially responsible middle-class people in Bangkok, the economic center of Thailand. Thus, people in our sample are, relative to Thailand or even Bangkok, well educated and economically well off. Relative to the rest of the world, our population is young and, compared to many other surveys, all respondents are responsible for financial decisions in their household. All of these characteristics may contribute to reducing the gender gap in financial literacy and behavior. Thus we turn our attention to these differences and address them one by one.

Regarding *education*, *income* and *age*, earlier studies do not really show much difference between groups that are distinguished along these lines, such as poorly vs. well educated etc. (Bucher-Koenen et al., 2012). Nevertheless, we split our sample in the three mentioned dimensions to see whether this makes a difference in our sample. We find that none of these splits does reveal a systematic and significant influence (available on request).

Finally, regarding the characteristic of *financial responsibility*, one can plausibly assume that it is relevant for the degree of financial literacy. Reasons for such a relation may be self-selection of people with interest and ability into taking financial responsibility. However, even without such self-selection one can reasonably assume that financial literacy may be partially trained through exposure to financial issues. Taken together, a sample of financially responsible persons should be expected to show more financial literacy than those, who have otherwise the same characteristics but hold no financial responsibility. Surprisingly, Bucher-Koenen et al. (2012) do not confirm this expectation in an explorative setting. Unfortunately, we cannot test this aspect with our data.

5.2 Selecting groups from other countries' data sets

Thus we change the empirical approach in order to generate additional evidence which will help us understand the lack of a gender gap: instead of examining characteristics within our sample, we take other samples from Germany, the U.S. and the Netherlands and aim for a selection of people which is close to ours. Then we analyze whether such a selection contributes to reducing the measured gender gap. A first step into this direction is already implicitly provided by Bucher-Koehnen et al. (2012) who note that the gender gap regarding

the degree of financial literacy in the German SAVE data set is roughly reduced by half when controlling for socio-demographic characteristics. This is certainly interesting because our sample is more homogeneous than theirs, which probably contributes to the fact that socio-demographic characteristics do not play a major role for us.

In order to examine these effects more systematically across three additional data bases, we aim for largely identical regressions explaining the degree of financial literacy. The exogenous variables in these regressions include gender, age, education, income and risk aversion. We find useful variables for these items in all three data sets being considered. In detail, age is taken up also as squared term, education is considered as a dummy variable distinguishing advanced from basic education (the definition varies according to data base), income is considered in logs and as we aim to study people with higher incomes the exact cut-offs vary between countries; finally risk aversion controlled for but measured differently, depending on data set. Results show that gender remains basically unaffected by any effort to shape the underlying sample for the U.S. and the Netherlands, but the gender gap turns insignificant for the case of Germany:

- *United States.* For the U.S. we take the ALP data set. It covers more than 3,200 persons in the full sample and shows a clear and highly significant gender gap at the disadvantage of women ([Table A2](#)). When we reduce the sample to make it more similar to our Thai data by reducing age and increasing minimum income, the gender gap remains unaffected. A maximum age of 60 years equals the Thai case but a reduction to even 50 years is necessary to get a similar average age as in the Thai case.
- *Netherlands.* For the Netherlands we rely on the LISS data base with more than 1,800 persons. Similar to the U.S. case, there is a significant gender gap which does not disappear at all by cutting down the sample in order to make it similar to our Thai sample ([Table A3](#)).
- *Germany.* Finally, we consider the German SAVE database of the year 2007 because that wave contains more cases (2,900) than the more recent wave from 2009. Here we see that the increase of minimum income contributes to reducing the gender gap ([Table A4](#)). In the most cut down samples this gap even turns insignificant. However, the negative sign remains throughout. The relative gap in financial literacy score is reduced from about 10% higher scores for men when we take the full sample to 5% and even 2%, respectively, when we consider incomes above 2,500 Euro per household only.

- *Thailand.* For better comparability we also show in [Table A5](#), specification (1), a regression in line with the three others just discussed. The gender coefficient in our Bangkok sample is insignificant.

Overall, we see that the regressions always show well-known relationships with better financial literacy, i.e. higher age, better education and higher income, whereas the relationship with risk aversion is unclear. Interestingly, the gender gap becomes smaller (and insignificant) for higher income groups in Germany but not in the U.S. or the Netherlands. We conclude that the socio-demographic characteristics of our sample from Bangkok can only partially explain the missing gender gap, if at all.

5.3 Evidence from cross-country observations

The notion of the gender gap in financial literacy as a stylized fact mainly results from nationally representative studies. Although these national studies may differ in some aspects, they are household surveys of similar design. Thus it seems revealing that they largely agree that women show lower financial literacy than men.

The literature contains two other cases, except ours, where women and men show financial literacy to an equal degree, i.e. Russia and East Germany (see Lusardi and Mitchell, 2014). One commonality between Russia and East Germany is that there is gender equality, but this is at a very low level of financial literacy, which nullifies the advantage of equality from women's perspective. Interestingly, our case is different in the sense that the degree of financial literacy is not low when compared to for example, the U.S.. It looks like we have a different type of phenomenon, raising the question whether there is an aspect in which Russia, East Germany and Thailand may be similar to each other, or whether Thailand differs from many other countries in other respects.

One may speculate that specific cultures or societal norms, which emphasize equality between the sexes, work against the gender gap. Indeed, we show three pieces of evidence indicating that Thailand seems to differ from most other countries in this respect and which may explain why we do not find a gender gap regarding financial literacy:

- First, a less masculine society may be related to more equal roles in family and work-life, including a more equal responsibility for financial affairs and practice of financial affairs. Taking the Hofstede (1980, 2001) index of the masculinity of a society, we see that Thailand does indeed score low with a value of 34 on a range between 0 and 100. The U.S. and Germany score higher with 62 and 66 respectively, and both show a clear gender gap in financial literacy.

- Second, the dimension of masculinity has been linked before by Beckmann et al. (2008) to the degree by which financial asset management is occupied by women. They find that – compared to the U.S., Germany and Japan – the share of female asset managers is particularly high in Thailand and that these women are also well represented in leading positions in asset management firms. This piece of evidence indicates that women may play a larger role in professional financial affairs in Thailand than elsewhere.
- Third, the equal financial literacy score of women and men is accompanied by equality regarding our simple numeracy score. This result for our group of adults is strongly supported by OECD cross-country studies revealing pupils' abilities in mathematics, reading and science (OECD, 2013). In almost all countries girls are better at reading than boys, but perform worse at mathematics and science. Thailand is one of two countries out of about 30, where girls do better than boys in all dimensions during the surveys in 2003 and 2012. Jappelli (2010) shows in a cross country study of financial literacy that higher PISA scores are linked to higher financial literacy in the country. This indicates that our finding is substantiated by broader stylized facts of the education system, namely that girls are at least as good as boys in skills which are often dominated by boys in other countries.

5.4 Comparing urban and rural people

If indeed cultural characteristics regarding the dimension “masculinity versus femininity” are an important influence on the gender gap, the gap should be similar within a country across various groups. We confirm this hypothesis by comparing our results to financial literacy in the rural population of Northeast Thailand.

Information about financial literacy in rural Thailand is based on a panel survey which is described, for example, in Hardeweg et al. (2013). The most recent wave in 2013 includes the three basic Lusardi and Mitchell-items on financial literacy in the modified form as suggested by Cole et al. (2011). For the rural areas of the province Buri Ram, 745 households are covered and so form a representative sample for this province. The outcome of the financial literacy score is 1.56 for women and 1.61 for men, the difference being far from any statistical significance. The absolute values are supported as the “diversification” question is relatively simple and adjusted to the rural population which would not know much about stock investments. Regarding the two questions on “interest rates” and “inflation” the rural scores are below the urban ones, as expected for a less educated population. Finally, there is also no

gender gap when we control for conventional socio-demographic characteristics as be seen from the specifications (2) to (4) in Table A5.

This equality in financial literacy seems remarkable as the rural participants do not share the experiences of the urban middle-class which lives in a rapidly growing and changing environment where traditional gender roles are questioned. It would seem unsurprising if this urban middle-class behaves very different from people living in more remote, poorer areas. However, there is no big difference between the urban and rural samples, indicating that the cultural background dominates socio-demographic characteristics.

5.5 Further robustness tests

Among further robustness test we examine possible non-linear relations between financial literacy and financial behavior. Such non-linearities may be of interest in particular for the appropriate design of policy measures.

As a first descriptive presentation, we distinguish between five degrees of financial literacy and show for a specific form of investment – i.e. holding of assets other than saving account – that female and male decisions for this option differ in dependence on financial literacy (see Appendix [Figure A1](#)). Interestingly, the relationship is different for women and men: for women the relationship is more linear whereas for men it looks like the highest degree of financial literacy is the crucial level, which makes the difference for holding this advantageous account.

In order to see whether this difference also translates to other financial decisions, we create a new count variable (FIAC) which informs in how many cases a person has taken the more advantageous decision. This variable takes values between 0 and 5. We determine whether the number of selected financial activities (FIAC) depends on financial literacy when the latter is classified (FLsum). We regress FIAC on four dummies (FLsum1, ... , FLsum4), where FLsum indicates how many of four financial literacy questions an individual has correctly answered (see Table 3). This approach enables us to show whether a nonlinear relationship exists and whether the effects are statistically significant in comparison to the base category that no question was correctly answered. We split the total sample by gender and present results of OLS and poisson estimates. Results are given in [Table A6](#) and show the same kind of non-linearity for men as found before for the decision to hold a fixed deposit account.

Finally, we also investigate the relationship between financial literacy and the number of financial assets (NoASS), which is not a dummy as before but a count variable. Financial

literacy is measured here by factor scores (see Section 3.1). In this case, a two-way fractional-polynomial prediction plot can be used (Royston and Altman, 1994). The resulting curve, shown in [Figure A2](#), with the confidence interval of the mean, again indicates stronger non-linearity for men than for women.

6 Conclusions

The gender gap in financial literacy is a common finding in this line of research (e.g., Lusardi and Mitchell, 2014). Many country studies have produced the finding that the degree of financial literacy among women is lower than among men and this finding holds no matter whether being controlled for socio-demographic characteristics or not. There have been only two exceptions to this, found in Russia and East Germany. However, both cases are characterized by a low level of financial literacy by both sexes, probably because people did not care much about financial affairs in the financially repressed economies they grew up in.

Compared to this strand of research, we get a new and surprising finding. In our sample of 530 middle-class people from Bangkok, we do not find the conventional gender gap. Instead, women show the same high level of financial literacy as men, whatever specific measurement of financial literacy we choose. Moreover, this result is strengthened by the finding that women also show the same degree of informed financial behavior as men when we analyze their decision making. As our procedure is quite conventional for this literature and as we confirm typical relationships between financial literacy and other variables, we regard the data as credible. Therefore, our surprising finding is most probably due to characteristics of our sample; which leads to the question of which ones are responsible?

First, we emphasize that our sample is relatively homogeneous by purpose in order to test whether indeed gender itself makes a difference, rather than other attributes typically associated with women and men. Our sample is particularly homogeneous regarding education, income, age, urban background and financial responsibility. According to our results, gender does not seem to be the origin of the gender gap.

Second, we aim to understand whether the specific socio-demographic characteristics of our sample may drive this result. We thus take samples from other countries and test whether making them similar to ours potentially reduces the gender gap: whereas this does not occur in the U.S. and Dutch data, it occurs to some extent in German data when limiting the investigation to higher income groups.

Third, we consider cultural factors by examining whether Thailand differs socially compared to other countries. Indeed, the degree of masculinity is relatively low which may

support a strong role of women and thus their high degree of financial literacy. More specifically, women occupy a large share among financial asset managers and Thai girls are better in mathematics than boys. Both facts are rare in cross-country comparisons and support the notion of a strong role of women in financial affairs.

Fourth, we examine the potential role of a modern urban environment by comparing the gender gap in our Bangkok sample with the gender gap in a sample of rural households in Thailand. Somewhat surprisingly, the rural population does not show a gender gap, indicating that not just Bangkok's middle-class women but Thai women in general have the same level of financial literacy as men.

Overall, this is the first study finding equal financial literacy of women and men in a sample with high financial literacy. This missing gender gap also transfers from financial literacy to financial behavior and also seems to hold in rural Thailand. This indicates that cultural background may play a large role for our finding, whereas the relevance of individual socio-demographic characteristics seems to be relatively secondary.

References

- Agarwal, Sumit and Bhashkar Mazumder (2013), Cognitive Abilities and Household Financial Decision Making, *American Economic Journal: Applied Economics*, 5, 193-207.
- Beckmann, Daniela, Lukas Menkhoff and Megumi Suto (2008), Does Culture Influence Asset Managers' Views and Behavior? *Journal of Economic Behavior and Organization*, 67, 624-643.
- Behrman, Jere R., Olivia S. Mitchell, Cindy K. Soo and David Bravo (2012), How Financial Literacy Affects Household Wealth Accumulation, *American Economic Review Papers and Proceedings*, 102:3, 300-304.
- Bucher-Koehnen, Tabea, Annamaria Lusardi, Rob Alessie and Maarten van Rooij (2012), How Financially Literate are Women? Some New Perspectives on the Gender Gap, Netspar Panel Paper 31, Tilburg.
- Campbell, John Y. (2006), Household Finance, *Journal of Finance*, 61, 1553-1604.
- Carpna, Fenella, Shawn Cole, Jeremy Shapiro and Bilal Zia (2011), Unpacking the Causal Chain of Financial Literacy, World Bank Policy Research Paper 5798.
- Cole, Shawn, Thomas Sampson and Bilal Zia (2011), Prices or Knowledge? What Drives Demand for Financial Services in Emerging Markets? *Journal of Finance*, 66, 1933-1967.
- Dohmen, Thomas, Armin Falk, David Huffman, Uwe Sunde, Jürgen Schupp, and Gert G. Wagner (2011), Individual Risk Attitudes: Measurement, Determinants and Behavioral Consequences, *Journal of the European Economic Association*, 9, 522-50.
- Eckel, Catherine C., and Philip J. Grossman (2008), Men, Women and Risk Aversion: Experimental Evidence, In: *Handbook of Experimental Results*, Charles Plott, and Vernon Smith (eds.), Elsevier, New York.

- Efron, Bradley, Trevor Hastie, Iain Johnstone, and Robert Tibshirani (2004), Least Angle Regression, *Annals of Statistics*, 32, 407-451.
- Fernandes, Daniel, John G. Lynch Jr. and Richard G. Netemeyer (2013), Financial Literacy, Financial Education and Downstream Financial Behaviors, *Management Science*, forthcoming.
- Gathergood, John (2012), Self-Control, Financial Literacy and Consumer Over-Indebtedness, *Journal of Economic Psychology*, 33, 590-602.
- Grohmann, Antonia, Roy Kouwenberg and Lukas Menkhoff (2014), Roots of Financial Literacy, Working Paper Leibniz University Hannover.
- Gustman, Alan L., Thomas L. Steinmeier and Nahid Tabatabai (2012), Financial Knowledge and Financial Literacy at the Household Level, *American Economic Review Papers and Proceedings*, 102:3, 309-313.
- Hardeweg, Bernd, Lukas Menkhoff and Hermann Waibel (2013), Experimentally Validated Survey Evidence on Individual Risk Attitudes in Rural Thailand, *Economic Development and Cultural Change*, 61, 859-888.
- Hofstede, Geert (1980), *Culture's Consequences: International Differences in Work-Related Values*, Sage Publications, Beverly Hills, CA.
- Hofstede, Geert (2001), *Culture's Consequences: Comparing Values, Behaviors, Institutions, and Organizations Across Nations*, Sage Publications, Thousand Oaks, CA.
- Jappelli, Tullio (2010), Economic Literacy: An International Comparison, *Economic Journal*, 120, F429-F451.
- Lusardi, Annamaria and Olivia S. Mitchell (2007), Baby Boomer Retirement Security: The Roles of Planning, Financial Literacy, and Housing Wealth, *Journal of Monetary Economics*, 54, 205-224.
- Lusardi, Annamaria and Olivia S. Mitchell (2008), Planning and Financial Literacy: How Do Women Fare? *American Economic Review Papers and Proceedings*, 98:2, 413-417.
- Lusardi, Annamaria and Olivia S. Mitchell (2014), The Economic Importance of Financial Literacy: Theory and Evidence, *Journal of Economic Literature*, forthcoming.
- OECD (2013), *PISA 2012 Results: What Students Know and Can Do, Student Performance in Mathematics, Reading and Science (Volume I)*, Paris.
- Royston, Patrick and Douglas G. Altman (1994), Regression Using Fractional Polynomial of Continuous Covariates: Parsimonious Parametric Modelling, *Applied Statistics*, 43, 429-467
- Van Rooij, Maarten, Annamaria Lusardi and Rob Alessie (2011), Financial Literacy and Stock Market Participation, *Journal of Financial Economics*, 101, 449-472.
- Van Rooij, Maarten C.J., Annamaria Lusardi and Rob J.M. Alessie (2012), Financial Literacy, Retirement Planning and Household Wealth, *Economic Journal*, 122, 449-478.
- Xu, Lisa and Bilal Zia (2012), Financial Literacy around the World, An Overview of the Evidence with Practical Suggestions for the Way Forward, World Bank Policy Research Working Paper 6107.

Table 1: Descriptive Statistics, Socio-Demographic Variables, Broken Down by Gender

	acronym	women		men		t-test
		mean	s.d.	mean	s.d.	p-value
Age (in years)	AGE	34.36	(9.22)	34.78	(9.74)	0.31
Education ¹	EDU	3.44	(1.00)	3.50	(0.89)	0.25
Income (in Baht)	Y	25935	(1332)	27591	(1191)	0.18
Log of income	lnY	3.10	(0.49)	3.17	(0.49)	0.04
Married (yes=1, others=0)	MAR	0.46	(0.50)	0.47	(0.50)	0.44
Number of children in HH	CHILD	0.89	(1.07)	0.77	(1.00)	0.10
Number of adults in HH	ADULT	3.03	(1.68)	3.91	(1.50)	0.20
Numeracy ²	MATH	3.55	(0.87)	3.57	(0.89)	0.42
Risk aversion	RISK	0.48	(0.23)	0.43	(0.22)	0.01
Low Assets	ASS_l	0.54	(0.50)	0.47	(0.50)	0.07
Medium Assets	ASS_m	0.20	(0.03)	0.23	(0.03)	0.15
High Assets	ASS_h	0.09	(0.29)	0.09	(0.28)	0.45
Total Debt in baht	DEBT_tot	78348	(23803)	126877	(28972)	0.10
Total Debt in baht (conditional on having debt)		199342	(58200)	350974	(73770)	0.05

Notes: ¹ Education in categories 0 meaning no education, 1 primary school, 2 secondary school, 3 vocational training, 4 bachelor, 5 master, 6 PhD; ² Numeracy is a score between 0 and 4 (definition of items etc. is described in Appendix Table A1).

Table 2: Descriptive Statistics of Biography Information, Broken Down by Gender

	acronym	women		men		t-test
		mean	s.d.	mean	s.d.	p-value
<i>Family Background</i>						
Father has vocational training or higher	EDU_f	0.23	(0.03)	0.33	(0.03)	0.01
Mother has vocational training or higher	EDU_m	0.18	(0.03)	0.25	(0.03)	0.04
Financial understanding of parents (1 -6)	FIN	4.31	(1.59)	4.46	(1.48)	0.14
Considers economic background to be poor	POOR	0.25	(0.43)	0.30	(0.46)	0.10
Climber	CLIMB	0.72	(0.45)	0.68	(0.47)	0.13
<i>Parental Education</i>						
Parents taught to budget (0-1)	BUDGET	0.81	(0.39)	0.84	(0.36)	0.19
Parents encouraged saving (0-1)	SAVE	0.84	(0.36)	0.88	(0.33)	0.14
<i>Education at School</i>						
Had economics at school	ECO	0.69	(0.47)	0.65	(0.48)	0.19
Was born in Bangkok	BBKK	0.60	(0.49)	0.67	(0.47)	0.06
Highest educational degree in BKK	EDU_BKK	0.88	(0.33)	0.86	(0.35)	0.29
<i>Early Experiences with Money</i>						
Had allowance as a child	ALLOW	1.00	(0.06)	0.99	(0.10)	0.18
Had a bank account before 18	ACC	0.57	(0.50)	0.58	(0.49)	0.37
Had a job before 15	JOB	0.44	(0.50)	0.50	(0.50)	0.09

Notes: Tables shows data on early life experiences, broken down by gender. Climber is unity if highest educational attainment is higher than that of one's father.

Table 3: Descriptive Statistics of Financial Literacy Variables, Broken Down by Gender

The financial literacy questions are repeated below. The first three questions are multiple choice and responses “I don’t know” and “I refuse to answer” are available in addition to the listed options.

1. Interest rate:

If you borrow 10 000 Baht, at an interest rate of 2% a month, after 3 months how much do you owe? a) Less than 10 200 Baht b) More than 10 200 Baht c) Exactly 10 200 Baht

2. Inflation:

If you have 10 000 Baht in an account, the interest rate on the account is 1% per year, and the price of goods and services rises by 2% per year, after one year can you buy:

a) Less than today b) More than today c) Exactly the same as today

3. Diversification:

Buying a single company’s stock is safer than buying a stock mutual fund.

a) True b) False

4. Borrowing Choice

Suppose you need to borrow 50 000 Baht. Two people offer you a loan, the first loan you have to pay back 60 000 Baht in one month, with the second loan you have to pay back 50 000 Baht plus 15% in one month. Which loan is the better option?

(a) The first loan b) The second loan

5. Institutional knowledge:

Name foreign banks. Open answers

	acronym	women		men		t-test
		mean	s.d.	mean	s.d.	p-value
Question 1	FL1	0.78	(0.41)	0.80	(0.40)	0.33
Question 2	FL2	0.63	(0.48)	0.62	(0.49)	0.55
Question 3	FL3	0.25	(0.43)	0.23	(0.42)	0.28
Question 4	FL4	0.72	(0.45)	0.75	(0.44)	0.27
Question 5	FBname	2.19	(0.07)	2.27	(0.07)	0.21
Financial Literacy <i>Score out of 3</i>	FL3score	1.66	(0.05)	1.65	(0.05)	0.44
Financial Literacy <i>Score out of 4</i>	FL_sum	2.39	(0.07)	2.38	(0.07)	0.44
Financial Literacy <i>Combination score</i>	FLnew	2.23	(1.05)	2.20	(0.97)	0.35
Financial Literacy <i>Factor score</i>	FL	0.01	(1.02)	-0.01	(0.99)	0.41
Number of times said “I don’t know”	FL_DK_sum	0.71	(0.05)	0.73	(0.05)	0.40

Table 4: Descriptive Statistics on Financial Behavior, Broken Down by Gender

	acronym	women		men		t-test
		mean	s.d.	mean	s.d.	p-value
Fixed deposit	DEPO	0.44	(0.50)	0.38	(0.49)	0.09
Insurance	INSUR	0.17	(0.38)	0.15	(0.36)	0.23
Assets other than savings account	ASS	0.54	(0.50)	0.49	(0.50)	0.12
Number of different assets	NoASS	0.82	(0.98)	0.69	(0.86)	0.06
Does not know interest in credit card	INT_rate	0.65	(0.48)	0.51	(0.50)	0.03
Finds it difficult to pay off credit card	PAY_off	0.08	(0.27)	0.21	(0.41)	0.01

Notes: Number of different assets counts the number of assets, apart from a savings account that the respondent holds. Assets other than savings account is a dummy that is unity if the respondent holds an asset other than a savings account. All other indicators are dummies that are one if the respondent holds certain asset.

Table 5: Selection of Covariates by Least Angle Regression

Step	Cp	R-square	action	step	Cp	R-square	action
1	436.808	0.0000		13	35.236	0.5091	+ SAVE
2	235.256	0.2424	+ lnY	14	36.677	0.5098	+ POOR
3	166.812	0.3263	+ ASS_h	15	24.619	0.5265	+ ASS_ms
4	108.913	0.3976	+ ASS_l	16	25.104	0.5283	+ MATH
5	96.769	0.4144	+ FL	17	23.823*	0.5322	+ CHILD
6	79.112	0.4378	+ EDU_h	18	24.958	0.5333	+ EDU_f
7	71.291	0.4495	+ AGE	19	25.061	0.5355	+ ACC
8	68.109	0.4581	+ ECO	20	26.771	0.5359	+ JOB
9	56.281	0.4745	+ RISK	21	27.856	0.5370	+ BUDGET
10	46.327	0.4888	+ EDU_m	22	29.110	0.5379	+ FEM*RISK
11	41.857	0.4965	+ ADULT	23	29.396	0.5399	+ FIN
12	38.572	0.5028	+ FEMALE	24	25.000	0.5475	+ AGEsq

Notes: Mallows Cp, R² and Actions along the sequence of the NoASS model are presented in the table. In the following all variables from step 2 to 17 are incorporated as regressors into the estimates. * indicates the smallest value for Cp. The acronyms are explained in Tables 1-4. BUDGET is a dummy (=1, if the parents have thought how to budget), FEM*RISK is the interaction variable between FEMALE and RISK. AGEsq is AGE².

Table 6: Probit and Poisson Estimates of Financial Activities Related to Financial Literacy (FL) and Gender

	(1) ASS	(2) DEPO	(3) INSUR	(4) INT_rate	(5) PAY_off	(6) NoASS
Financial literacy	0.219** (0.087)	0.130 (0.085)	-0.225** (0.109)	-0.423** (0.177)	-0.305 (0.205)	0.208*** (0.073)
Female	0.356** (0.152)	0.292** (0.140)	0.169 (0.179)	0.383 (0.252)	-0.736** (0.309)	0.314*** (0.091)
Pseudo-R ²	0.33	0.22	0.37	0.14	0.21	0.24
Observations	433	435	435	135	133	433

Notes: The table reports coefficients and robust standard errors in parentheses. The NoASS function presents poisson estimates

* p<0.1, ** p<0.05, *** p<0.01

Table 7: IV Probit and Poisson Estimates of Financial Activities Related to Financial Literacy (FL) and Gender

	(1) ASS	(2) DEPO	(3) INSUR	(4) INT_rat e	(5) PAY_off	(6) NoASS
Financial literacy	1.072*** (0.378)	1.122*** (0.204)	-1.247*** (0.057)	0.073 (2.541)	-1.321*** (0.419)	0.793 (0.538)
Female	0.134 (0.276)	0.051 (0.203)	0.176* (0.105)	0.331 (0.392)	-0.436 (0.362)	0.260** (0.109)
Observations	413	415	415	128	126	413

Notes: The table reports coefficients and robust standard errors in parentheses. The NoASS function presents GMM poisson estimates. All others are IV probit estimates. The financial literacy (FL) is measured by a factor analysis of four financial questions correct dummies, don't know dummies and the name foreign banks score (9 variables). Factor scores of the first factor are extracted; scale: mean 0, stddev 1 (relative to others); ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively. Control variables - explained in Tables 1-5 - are MATH, RISK, EDU_h, AGE, CHILD, ADULT, lnY, ASS_l, ASS_h, ASS_ms, ECO, SAVE, POOR, EDU_m. Identifying instruments are ALLOW, ACC, FIN and BUDGET.

* p<0.1, ** p<0.05, *** p<0.01

Table 8: IV Probit and GMM Poisson Estimates of Financial Behavior Related to Financial Literacy (FL) for Women

	(1)	(2)	(3)	(4)	(5)	(6)
	ASS	DEPO	INSUR	INT_rate	PAY_off	NoASS
Financial literacy	-1.031 (0.849)	1.251*** (0.349)	-1.294*** (0.081)	0.006 (1.754)	-1.478*** (0.198)	0.547 (0.424)
Observations	194	195	195	61	36	194

Table 8: Continuation - for Men

	(1)	(2)	(3)	(4)	(5)	(6)
	ASS	DEPO	INSUR	INT_rate	PAY_off	NoASS
Financial Literacy	1.240*** (0.180)	1.222*** (0.127)	-1.226*** (0.087)	-1.918*** (0.179)	-1.907*** (0.471)	-0.561 (0.589)
Observations	219	220	220	67	67	219

Notes: The table reports coefficients and robust standard errors in parentheses. The NoASS function presents IV poisson estimates. All others are IV probit estimates. ***,** and * denote significance at the 1%, 5% and 10% levels, respectively. Control variables - explained in Tables 1-5 - are MATH, RISK, EDU_h, AGE, CHILD, ADULT, lnY, ASS_1, ASS_h, ASS_ms, ECO, SAVE, POOR, EDU_m. Identifying instruments are ALLOW, ACC, FIN and BUDGET.

Table A1: Numeracy and Risk Questions**Numeracy Questions:**

1. What is $35+82$?
2. If you have four friends and would like to give each of your friends four sweets, how many sweets do you need?
3. What is 10% of 400?
4. Suppose you want to buy a bag of rice that costs 370 Baht. You only have one 1000 Baht note. How much change will you get?

Risk Question:

Are you a person who is prepared to take risk, or do you avoid taking risk?

Please choose a number on a scale from 0 (meaning unwilling to take risk) to 10 (meaning fully prepared to take risk)

	female		male		t-test p-value
	mean	sd	mean	sd	
Risk aversion	0.478	(0.23)	0.434	(0.22)	0.013
Numeracy	3.553	(0.87)	3.567	(0.89)	0.426

Table A2: Financial Literacy and Gender in the U.S.

	(1) Financial Literacy All	(2) Financial Literacy Age <= 60 Inc. >= 55,000	(3) Financial Literacy Age <= 60 Inc. >= 71,250	(4) Financial Literacy Age <= 50 Inc. >= 55,000	(5) Financial Literacy Age <= 50 Inc. >= 71,250
Female	-0.223*** [7.979]	-0.286*** [7.323]	-0.279*** [6.355]	-0.338*** [6.388]	-0.330*** [5.001]
Risk aversion	0.079** [2.293]	0.089* [1.683]	0.066 [1.049]	-0.021 [-0.295]	-0.083 [-0.902]
Age	0.019** [2.344]	0.051*** [2.801]	0.059** [2.558]	0.042 [1.156]	0.068 [1.427]
Age Squared	-0.000 [-0.608]	-0.000** [-2.171]	-0.001** [-2.095]	-0.000 [-0.682]	-0.001 [-1.076]
College education dummy	0.369*** [12.125]	0.343*** [7.984]	0.371*** [7.198]	0.414*** [6.982]	0.469*** [5.989]
Log of Income	0.231*** [13.649]	0.231*** [5.885]	0.150*** [3.358]	0.267*** [4.756]	0.226*** [3.263]
Constant	-1.271*** [-5.654]	-1.852*** [-3.459]	-1.061 [-1.526]	-2.138** [-2.507]	-2.136* [-1.892]
R ²	0.24	0.16	0.16	0.17	0.18
Adj-R ²	0.23	0.15	0.15	0.16	0.17
Observations	3212	1292	848	778	477

Notes: All respondents are responsible for the household's financial decisions. * p<0.1, ** p<0.05, *** p<0.01

Table A3: Financial Literacy and Gender in the Netherlands

	(1)	(2)	(3)	(4)	(5)
	Financial Literacy All	Financial Literacy Age <= 60 Inc. >= 2400	Financial Literacy Age <= 60 Inc. >= 2800	Financial Literacy Age <= 50 Inc. >= 2400	Financial Literacy Age <= 50 Inc. >= 2800
Female	-0.379*** [8.024]	-0.603*** [4.750]	-0.498*** [3.498]	-0.505*** [3.360]	-0.449*** [2.705]
Risk Aversion	0.244*** [6.267]	0.106 [0.994]	0.132 [1.020]	0.164 [1.156]	0.194 [1.132]
Age	0.013* [1.700]	-0.067 [-1.181]	-0.099 [-1.506]	-0.150 [-1.241]	-0.155 [-1.090]
Age Squared	-0.096 [-1.290]	0.614 [0.958]	0.936 [1.274]	1.747 [1.141]	1.682 [0.932]
Education more than high school	0.408*** [8.329]	0.328** [2.249]	0.173 [1.025]	0.323 [1.614]	0.331 [1.382]
Log of Income	0.029*** [2.617]	0.221 [0.998]	0.050 [0.235]	0.356 [1.099]	0.193 [0.565]
Constant	0.598*** [3.721]	1.261 [0.615]	3.738* [1.692]	1.672 [0.547]	3.437 [0.975]
R ²	0.13	0.12	0.09	0.09	0.10
Adj-R ²	0.13	0.11	0.06	0.06	0.05
Observations	1840	294	212	189	138

Notes: All respondents are responsible for the household's financial decisions. * p<0.1, ** p<0.05, *** p<0.01

Table A4: Financial Literacy and Gender in Germany

	(1)	(2)	(3)	(4)	(5)
	Financial Literacy All	Financial Literacy Age<60 Income>=2000	Financial Literacy Age<60 Income>=2500	Financial Literacy Age<50 Income>=2000	Financial Literacy Age<50 Income>=2500
Female	-0.119*** [0.023]	-0.118*** [0.040]	-0.051 [0.046]	-0.108** [0.049]	-0.019 [0.058]
Age	0.007 [0.005]	0.012 [0.022]	0.014 [0.028]	0.079* [0.046]	0.104* [0.060]
Age Squared	-0.000* [0.000]	-0.000 [0.000]	-0.000 [0.000]	-0.001* [0.001]	-0.001* [0.001]
Log Income	0.149*** [0.019]	0.241*** [0.064]	0.238*** [0.081]	0.188** [0.082]	0.172 [0.108]
Higher Education	0.154*** [0.031]	0.098** [0.047]	0.098* [0.051]	0.212*** [0.058]	0.208*** [0.065]
Fin. Risk Tolerance	0.012*** [0.005]	0.009 [0.008]	0.022** [0.009]	-0.000 [0.010]	0.014 [0.011]
Constant	0.347** [0.167]	-0.478 [0.663]	-0.570 [0.863]	-1.299 [1.080]	-1.744 [1.463]
R ²	0.06	0.05	0.04	0.06	0.06
Observations	2921	812	595	544	384

Notes: The table reports OLS regression results with robust standard errors in brackets. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively. Column 1 shows results for the full sample. Columns 2, 3, 4 and 5 only show results for those responsible for financial affairs either alone or together with their partner.

* p<0.1, ** p<0.05, *** p<0.01

Table A5: Financial Literacy and Gender in Urban and Rural Thailand

	Financial Literacy Bangkok All	Financial Literacy Buri Ram All	Financial Literacy Buri Ram Age<=60	Financial Literacy Buri Ram Age<=50
Female	0.118 [0.077]	-0.049 [0.073]	-0.038 [0.094]	0.100 [0.128]
Age	-0.0251 [0.0311]	0.022 [0.019]	-0.003 [0.040]	0.073 [0.072]
Age squared	0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]	-0.001 [0.001]
Log of income	0.537*** [0.097]			
Household assets		0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]
Higher education	0.222** [0.0856]			
Years of Education		0.035** [0.014]	0.027* [0.016]	0.032 [0.019]
Risk Aversion	-1.481*** [0.175]	-0.293** [0.123]	-0.321** [0.156]	-0.333 [0.208]
Constant	-4.205 [1.115]	1.195** [0.564]	1.891** [0.920]	0.489 [1.374]
R ²	0.22	0.05	0.02	0.04
Observations	530	697	448	269

Notes: The table reports regression results with standard errors in brackets. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

* p<0.1, ** p<0.05, *** p<0.01

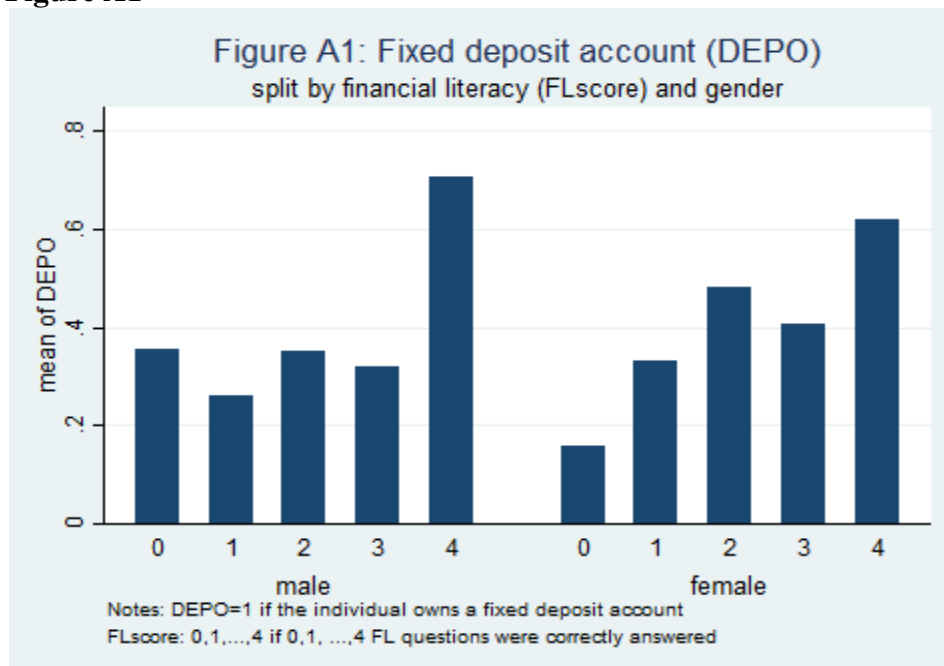
Figure A1

Table A6: OLS and Poisson Estimates of the Number of Financial Activities (FIAC) Related to Financial Literacy (FL), Split by Gender

	(1) OLS women	(2) OLS men	(3) Poisson women	(4) Poisson men
FLsum1	0.000 (0.620)	0.667 (0.750)	0.000 (0.391)	0.288 (0.433)
FLsum2	0.231 (0.558)	0.920 (0.626)	0.074 (0.351)	0.378 (0.372)
FLsum3	0.433 (0.554)	0.969 (0.616)	0.135 (0.348)	0.395 (0.368)
FLsum4	1.000* (0.591)	2.409*** (0.632)	0.288 (0.363)	0.791** (0.368)
_cons	3.000*** (0.528)	2.000*** (0.581)	1.099*** (0.333)	0.693** (0.354)
R ²	0.10	0.28		
Observations	79	89	79	89

Notes: The table reports coefficients and robust standard errors in parentheses. The financial literacy (FL) is measured by dummies FLdumk, where k=1,...,4. FLdumk=1 if k of 4 questions were correctly answered. Base category is FLdum0, if none of the four questions was correctly answered. FIAC is a count variable, calculated as the sum of the dummies ASS, DEPO, INSUR, INT_rate and PAY_off - definitions see Table 4. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Figure A2

