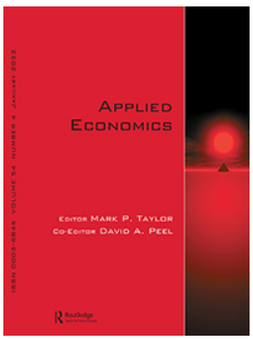

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Do sources of money matter in risk-taking behaviour?

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ABSTRACT
Assuming that money is fungible, income and wealth affect risk aversion. In the present study, we investigate whether the source of money affects risk-related decision-making. We use the percentage of temporary income and sources of income to capture the heterogeneity of risk-taking behaviour. The results indicate the significant and robust role of the temporary portion of income in explaining risk-taking behaviour: a 1% increase in temporary income corresponds to up to a 12.7% increase in risk-taking. Furthermore, having multiple sources of money is associated with greater risk-taking, and the origin of money matters with regards to risk-taking.

KEYWORDS
Risk-taking - risk aversion - financial decision-making - source of income

1. Introduction

Many factors determine peoples' risk-taking behaviour. However, income and wealth are critical parts of any risk-taking and financial decision-making model. The key assumption underlying the analysis of utilities in economic and finance is the fungibility of money. Since Thaler (1985) influential work, mental accounting has received much attention in the consumption and financial decision-making literature, and questions have been raised regarding the validity of fungibility assumptions.

Behavioural economics introduces mental accounting as the way people organize, track, and evaluate their financial activities. Instead of putting all their money into one comprehensive account, people tend to put their money into different categories with respect to the context in which they earned money. Previous literature on mental accounting provides valuable insights into its underlying mechanisms, including account categorization and formation process (Henderson and Peterson 1992; Arkes et al. 1994; Heath and Soll 1996; Cheema and Soman 2006; Hastings and Shapiro 2013, 2018), the effect of frames (Epley and Gneezy 2007; Imas 2016), and the process of opening and closing accounts (Soman and Cheema 2011; Frydman, Hartzmark, and Solomon 2018).

Several studies have suggested that people categorize their funds into different mental accounts according to their source or origin. Thus, the source of the money affects its use. One way to investigate whether individuals treat sources of money differently is to analyse their behaviour when they receive targeted amounts of money (see, for example Epley, Mak, and Idson 2006; Clingingsmith 2019). However, notwithstanding this wealth of evidence, the extent to which sources of household income affect risk-taking behaviour remains unclear,[1] particularly when income accounts are not framed visually or remotely, as has been reported in studies that focus on a targeted amount.

In the present study, we focus on the effect of income sources on risk-taking behaviour. We propose that if income sources cause significant differences in people's behaviours, their effect should also be reflected in the overall risk-taking behaviour. Thus, our research contributes to the literature on

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Money implicates a nexus of attitudes, emotions, and confused knowledge, attributable to the origins of money and the medium in which it is held. (Leiser and Shemesh 2018, 108)

[1]Probably, sources of income also drive risk-taking through anticipation of regret. See Gajewski and Ohadi (2021) for a precise analysis of the link between risk-taking and anticipation of regret.

the determinants of risk-taking by furthering current knowledge about the relationship between the source of income and risk-taking.

We conduct a survey on a large platform to collect data from over 4,000 participants in five countries. People may categorize their funds based on their regularity (both in terms of time and amount) or by associating funds to their origin (O'Curry and Strahilevitz 2001). Therefore, we ask participants to state the percentage of their temporary income and the origin of their income. Mainly, we test whether the temporary portion of income, additional sources of money, and shares of each source of income significantly explain risk-taking behaviour.

Incentivized lottery games are gold standards in behavioural economics to measure risk preferences in financial decision-making and estimate utility parameters. We account for two risk-aversion measurements. The primary variable of our interest measures risk-taking with income following Gneezy and Potters (1997). The other measurement is risk aversion, reflecting the concavity of the utility function (Tanaka, Camerer, and Nguyen 2010).

We find that the source of income matters when people decide to take risk considering their overall income. We do not find any significant results for the effect of income level. However, the sources of income explain participants' risk-taking behaviours, such that the temporary portion of income is an important part of the explanation. We find that increasing temporary income by 1% corresponds to an increase of up to 12.7% in risk-taking, and having more than two sources of money is associated with greater risk-taking. Moreover, possessing sources of money with windfall characteristics significantly increases risk-taking.

2. Related literature and hypotheses development

2.1. Income and risk taking

Wealth and income affect risk-taking. A classic perspective suggests that changes in wealth lead to changes in investment risk-taking in the same direction. This perspective is consistent with the decreasing absolute risk aversion in the expected utility theory (EUT). Therefore, risk aversion that ensues from the concavity of utility functions is reflected in people's wealth and income levels.

However, previous studies have reported mixed results vis-à-vis the relationship between wealth and risk aversion. Using data from the PSID, Brunnermeier and Nagel (2008) find a slight negative relation between risky shares and financial wealth, more consistent with constant relative risk aversion. Later Liu, Yang, and Cai (2016) introduce income shocks and habit as two channels that can explain the variation of risk aversion with wealth. They empirically show that decreasing risk aversion is weaker than that proposed by Brunnermeier and Nagel (2008) after controlling for changes in income. Using individual-level data, Paravisini, Rappoport, and Ravina (2016) find a positive relationship between wealth and risk aversion, particularly after a negative shock to the wealth. Guiso, Sapienza, and Zingales (2018) do not find support for the decrease in risk aversion after crisis owing to changes in wealth. Using an experimental approach in rural India, Binswanger (1980) shows a slight negative but insignificant relationship between wealth and risk aversion. Wik et al. (2004) also find experimental evidence of decreasing absolute risk aversion in Northern Zambia.

Regarding the relationship between risk aversion and income, there is no consensus about the direction of the correlation (Harrison, Lau, and Rutström 2007; Von Gaudecker, Van Soest, and Wengstrom 2011; Bombardini and Trebbi 2012; Hopland, Matsen, and Strøm 2016). Some researchers show that increases in income, like increases in wealth, lead people to engage in more risk-seeking behaviours. For example, in a field experiment, Hopland, Matsen, and Strøm (2016) find that decision makers with high incomes are more willing to accept risks. Wright (2017) confirms this positive correlation, finding that the likelihood of a person becoming risk-seeking increases by 1% for every 1,000 GBP increase in income. Using a survey of Dutch and German households, both Donkers, Melenberg, and Van Soest (2001) and Dohmen et al. (2011) and find a positive relationship between income and risk-taking.

However, other studies show differing or non-significant relationships between income and risk-taking. In a survey of U.S. households, Barsky et al. (1997) find a U-shaped pattern of income/wealth effects on risk aversion, such that risk aversion increased at lower income levels and decreased at higher income levels. To determine the risk preferences of the participants, the authors asked the respondents about their willingness to gamble their lifetime incomes and then related that risk aversion measure to the participants' heterogeneity parameters. The participants could accept or refuse a hypothetical scenario wherein they were offered a new job with a 50% chance of doubling their income and a 50% chance of their income being cut by a third.[2]

With regard to field experiment results, studies have shown no significant relationship between income and risk-taking. Harrison, Lau, and Rutström (2007) find no effect of income category (high or low) on estimated risk attitude in Denmark's population, and Von Gaudecker, Van Soest, and Wengstrom (2011) cannot identify any evident association between income and risk aversion in the Dutch population. Moreover, by assuming constant relative risk aversion, Bombardini and Trebbi (2012) indicate that individual income is not related to risk aversion.

The results of studies on the relationship between risk-taking and level of wealth and income are mixed. This could be because the methods of measuring risk aversion differ in these studies, thereby preventing any straightforward comparison of methods. Some researchers have used television-programme field experiments, whereas others have adopted gain-only or a mix of gain-and-loss lotteries to determine the relationship between risk-taking and income level. With such diverse evidence on the relationship between income and risk aversion, it is reasonable for us to establish whether there is another factor associated with income that drives risk-taking behaviour. Therefore, we formulate the following hypothesis:

Hypothesis 1 (H1) *Source of income explains people's risk-taking behaviour better than level of income.*

2.2. Income accounting and risk taking

Mental accounting refers to the process whereby people categorize, track, and evaluate their financial activities according to certain cognitive labels (Thaler 1999). They create mental accounts by labelling money with respect to the context in which it is earned and allocate each source to different spending accounts.

Authors have employed mental accounting to explain a variety of behaviours ranging from consumption to investment, saving, and borrowing (Hirst, Joyce, and Schadewald 1994; Prelec and Loewenstein 1998). They have tested its effect using primary data in the laboratory and secondary data at the household and market level. Investors can use mental accounting to make better financial decisions and reach their financial goals. In household finance, financial technology (FinTech) apps use mental accounting to help people track their accounts for budgeting and account management (Pretnar, Montgomery, and Olivola 2017).

However, mental accounting violates the principle of fungibility of money. Fungibility is a key assumption in the analyses of utilities in economics and finance. However, in practice, money is not always fungible (Thaler 1990; Zelizer 1997; Sahm, Shapiro, and Slemrod 2010), which leads to a different marginal propensity of consumption in different categories of money. In mental accounting, the sorting of income into different buckets implies that people simply do not treat their liquid wealth equally, and the money they earn is non-homogenous. Therefore, having money in one account may not have the same psychological value as having money in another account.

[2]The exact question asked 'Suppose that you are the only income earner in the family, and you have a good job guaranteed to give you your current (family) income every year for life. You are given the opportunity to take a new and equally good job, with a 50–50 chance it will double your (family) income and a 50–50 chance that it will cut your (family) income by a third. Would you take the new job?' (Barsky et al. 1997)

Although mental accounting considerably differs from the theories and hypotheses of finance and economics pertaining to the fungible properties of money, it helps people save time and thinking costs (Thaler 1999), as well as achieve self-control. Simply labelling the accounts as 'income' (either from employee or family members) and 'expense' can facilitate and enhance their decisions. If a decision turns out to be less favourable than other decisions, people can still make peace with the failure because the decisions are booked in different accounts, and therefore, they will be evaluated differently.[3]

Various mental accounting components have captured researchers' interests. One aspect of mental accounting is the so-called income accounting, wherein funds are labelled depending on their source. Two key aspects of income accounts are the *tags* and the *regularity* (with respect to time and amount) associated with the sources of money. People tend to create income accounts by labelling and categorizing their money according to the origin of their earnings. That is, their sources of money determine the labels of their income accounts (Belk and Wallendorf 1990; Thaler 1999; McGraw, Tetlock, and Kristel 2003). They may obtain money through different sources and channels during their lifetimes and consequently label them differently. Income components can emanate from as many as 33 sources (Accardo, Billot, and Buron 2017), including earned income (regular or temporary), profit income, interest and bond coupons, dividend income, rental income, capital gains, retirement income, and inherited/spousal money. Each source can be associated with an account label for income.

Shefrin and Thaler (1988) suggest three broad categories that constitute people's wealth during their lives: current income, current assets (e.g. savings or housing equity), and future income. People spend differently across the three sources, consuming most from current income and least from future income (Shefrin and Thaler 1988). They also tend to categorize the funds based on their flows and expectations into windfall or non-windfall (Arkes et al. 1994; Thaler 1999; O'Curry and Strahilevitz 2001; Milkman and Beshears 2009).

Different factors determine how people categorize current income. For example, if the size of a gain relative to regular income receipts is small, people tend to categorize it as current income (Thaler 1990). Moreover, regularity of income and the degree to which changes in income are anticipated (O'Curry and Strahilevitz 2001) also affect how people categorize their income. People likely consider tips, commissions, dividends, temporary contracts, and tax refunds as temporary funds, and they are more likely to spend them readily if the amounts are not significant (Thaler 1994; Souleles 1999; Epley, Mak, and Idson 2006; Epley and Gneezy 2007).

Most studies on the implications of income accounting are consumption oriented. In general, they show that people are more likely to spend income from windfalls (no matter how they receive them) than regular income. For example, people are more likely to engage in frivolous consumption when they win money from football pools or have grocery coupons than when they must spend money they earn (Milkman and Beshears 2009), and windfall money, as compensation, may end up in poker machines (Buddelmeyer and Peyton 2014). Using data from the U.S. Consumer Expenditure Survey and household portfolios, Baker, Nagel, and Wurgler (2006) show that investors are more likely to consume from dividends than from capital gains. This finding suggests people are more likely to tag dividends as a sort of temporary income and capital gains as a current asset.

With regard to tax rebates, Agarwal, Liu, and Souleles (2007) find that consumers save some of their rebate money to pay down their debts. However, their spending increases over time, especially when they are liquidity-constrained. Baugh, Ben-David, and Park (2014) also find that households increase their consumption following the receipt of tax refunds. Feldman (2010) uses a natural experiment to investigate how forms of tax rebates as lump-sums or income increments affect retirement savings. The author finds that using small income increments rather than lump-sum tax rebates decreases the probability that a household will contribute to retirement accounts. Such a shift in income tax suggests that the effect of mental accounting is a powerful one, thus

[3]For an exhaustive review of the literature on mental accounting, see Zhang and Sussman (2018).

policymakers ought to consider the framing of tax (Epley, Mak, and Idson 2006; Sahm, Shapiro, and Slemrod 2010).

In recent studies, high-frequency transaction data provided by bank account aggregators have been mined to provide rich insights about how people spend their incomes. In contrast with benchmark theories of economics, they show that consumers do not use combinations of cash management, saving, and borrowing to smooth consumption. For example, Gelman et al. (2014) find that people's spending is highly sensitive to the arrival of expected income. However, part of this excess sensitivity is driven by the timing of regular income and spending, such that people with less liquidity are more likely to exhibit excessive sensitivity. Kueng (2018) confirms such a deviation from consumption smoothing among high-income consumers, reporting that after they receive large, regular payments from the Alaska Fund, investors increase their marginal propensities to consume nondurables and services by up to 50%. Kueng (2018) focuses mainly on regular and salient payments, whereas Olafsson and Pagel (2018a) study spending responses to both regular and irregular income. They find that people respond significantly to paydays, and such responses are homogenous for all income and expenditure categories. These studies suggest that spending responses to income paydays do not depend on the regularity and irregularity of income, and such behaviour is observable across different income levels. However, it is more pronounced among those who are liquidity-constrained.

The timing of income also matters to people's financial well-being (Baugh, Leary, and Wang 2018). Frequency of payments (even from the same source) can lead to the creation of new mental accounts. For example, Zhang (2017) studies the spending behaviour of workers who receive biweekly paychecks every month, except for 2 months in a year, when they receive three paychecks. Even when the workers know that their third paychecks are part of their annual incomes and are the result of the distribution of days in the calendar, they engage in more spending behaviour in the months following the third paycheck, treating them as windfalls. Using transaction data gathered from social security credit card holders in the U.S., Baugh, Leary, and Wang (2018) analyse how variations in the timing of income affect household financial health. For every 1-week increase in the timing mismatch between income and expenditure, households are 18% more likely to have shortfalls. The authors propose the budgeting heuristic and present bias as explanations of their finding.

Following these studies, the flow of income is an aspect that engages people in income accounting. We posit that the temporary nature of income could lead people to categorize their income differently. It is important to note that temporary, irregular, and unanticipated incomes are different to some extent. Irregular income refers to fluctuating income, such as a freelancer's income or seasonal jobs, while unanticipated income is an unexpected fund regarding both time and amount. We define temporary income as non-regular and short-term amounts, such as dividends, bonuses, and short-term contracts.

We hypothesize that:

Hypothesis 2 (H2). *A higher level of temporary income is associated with higher risk-taking.*

As people use income accounting for different sources of money, the source of money becomes an important factor in their risk-taking behaviour. Most mental accounting studies focus on consumption. There is little evidence of how income accounting affects people's risk-taking behaviour. Similar to consumption – wherein people show differing propensities to consume from different sources – the source of money may change the risk premia that people require to accept risk. The classic example of such behaviour is the 'house money' effect, in which people are more likely to accept a risky gamble after winning in an earlier gamble than when they have just lost (Thaler and Johnson 1990). Using a natural experiment, Andersen and Nielsen (2011) find that windfalls in the form of unexpected inheritances positively affect market participation, but the windfalls are more likely to be held in safe assets. This finding suggests that people show different risk-taking behaviours when they receive windfalls (in the form of lottery gains or inheritances) than when they receive their salaries.

According to previous studies on the tags associated with the origin of money, we propose the following hypotheses:

Hypothesis 3 (H3). *Types of income sources affect risk-taking behaviour.*

Hypothesis 4 (H4). *People with multiple sources of income are more willing to take risks.*

3. Data description and measures

3.1. Sample

We collected our sample from a large online platform in which preregistered participants could participate and each be compensated with a fixed amount of 1.5 €. We informed participants that some of them (randomly) would play one of their lottery choices in reality. On average, 2.13% of the participants won additional amounts of 4.4€ for the lotteries they chose from the risk-taking task. We eliminated the participants (approximately 36%) who failed to answer the attention question before finishing the survey, leaving 4,217 of 6,600 participants in five countries (France, Germany, United Kingdom, Italy, and Spain) who completed the survey. This procedure ensured our analysis included only attentive participants. An attention question asked participants to click on a certain choice and then proceed to the next page. In addition to collecting demographic information, such as household income, wealth, and sources of income, we collected data on risk-taking by asking about participants' willingness to pay for a hypothetical, risky prospect. Examples of the survey screens are presented in the Appendix (see Figure 5a).

3.2. Risk aversion

We measured individuals' risk aversion in two ways: with a method proposed by Gneezy and Potters (1997) (GP Lottery) that reflects risk-taking with income, and by using Tanaka, Camerer, and Nguyen (2010) method to capture the curvature of the utility function, as in the prospect theory. We explain these two main variables, which are summarized in Table 1, below.

To test whether the source of income explains risk-taking behaviour, we need a way to infer risk aversion that relates to individual income. Similar to Barsky et al. (1997), we ask the respondents about their willingness to take risks on their incomes. The principle aspect of our question is a measurement of risk aversion that involves gambling on income, which allows us to infer risk aversion related to income. We ask the participants to state the percentages of their incomes they are willing to devote to a hypothetical lottery, as proposed by Gneezy and Potters (1997).

We ask each participant: 'What percentage of your monthly income are you willing to bet on this lottery?' The GP Lottery offers a 50% probability of a gain that is 2.5 times greater than the betting amount and 0 otherwise (Gneezy and Potters 1997).

This elicitation method provided an easy, straightforward measure of risk preference in a financial decision-making context. We asked the decision makers about the levels of their household incomes and the sources of their incomes before they answered the question. If the decision makers knew their levels of income (X), we further asked them to choose the percentage of X that they wished to invest in a risky option. The share of their income which the participants decided to invest reflected their degrees of risk-taking. In this decision, under the EUT, risk-neutral or risk-seeking investors might invest all their money, whereas risk-averse investors invest less. Therefore, the lower the amounts the participants invested in the lottery, the higher their levels of risk aversion.

Table 1. Risk aversion measures.

	Measurement method	Description
RiskInc (GP Lottery)	The answer of participants to: "What percentage of your monthly income are you willing to bet on this lottery?" The GP Lottery offers a 50% probability of a gain that is 2.5 times greater than the betting amount and 0 otherwise (Gneezy and Potters 1997).	The lower the amounts the participants bet on the lottery, the higher the level of risk aversion.
RA (Risk aversion coefficient)	Measuring curvature of the power value function using the elicitation method proposed by Tanaka, Camerer, and Nguyen (2010) based on three series of paired lotteries.	This measure takes a value between 0.1 and 1.5. A coefficient below one, equal to one, and more than one correspond to risk aversion, risk neutrality, and risk seeking, respectively.

As Figure 1 shows, approximately 85% of the sample chose less than 20% of their incomes, and 22% of participants preferred not to invest a share of their income at all. According to the participants' answers to the question, we constructed a truncated variable, ranging from 0 to 100, with larger values corresponding to greater risk-taking.

To measure risk aversion independently of subjective beliefs, we asked participants to choose from among several risky prospects proposed by Tanaka, Camerer, and Nguyen (2010). This elicitation method consists of three series of paired lotteries that allow elicitation of three prospect theory parameters: risk aversion, probability weighting, and loss aversion. In our experiment, the participants saw one pair of lotteries at a time, rather than a table of lotteries. This condition enforced monotonic switching without creating confusion. After the participants completed the questions, we randomly selected 90 participants to play the lotteries of their choice for real money. We inferred the risk aversion parameter in the utility function according to the switching point in the first and second series of lotteries (see Tanaka, Camerer, and Nguyen 2010 for more details about the method). Figure 1 presents the elicited risk aversion coefficients. As expected, most participants showed a concave utility function that corresponded to risk aversion coefficients ranging from 0.1 to 1.0. The mean estimated utility of the risk aversion coefficient (0.55) was comparable to Tanaka, Camerer, and Nguyen (2010) finding of 0.59.

Figure 1. Distribution of the participants' risk aversion.

3.3. Income and sources of income

To identify the participants' levels and sources of income, we directly asked them to choose the level of their entire household incomes, after tax, from the previous year. We emphasized that this amount could consist of elements such as salary, spouse's salary, rent, and dividends. Participants chose from 12 levels, ranging from less than 10,000€ (monthly: less than 850€) to more than 150,000€ (monthly: more than 12,500€). In the survey, we also asked, 'What percentage of your household income do you consider to be temporary in the previous year (the non-regular amounts, such as dividends, bonuses, short-term contracts)?' Figure 2 shows the number of participants who declare that less than 10% of their income is temporary, approximately 65%, whereas 34% of the participants declare having no temporary income. We also asked participants to categorize their sources of

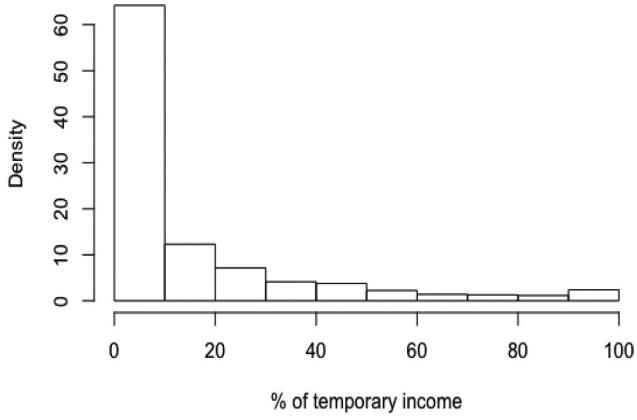

Figure 2 '% of temporary income' reflects participants' answer to the question: 'What percentage of your household income do you consider to be temporary in the previous year?'

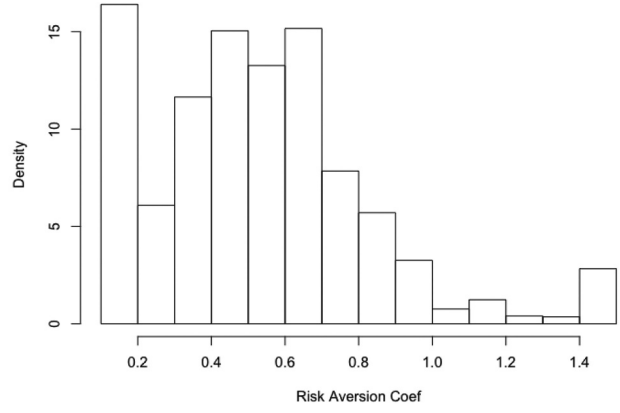

Table 2. Summary of sources of income.

Statistic	Mean	Median	St. Dev.	% of participants with the source
SalaryReg	55.4%	60%	40.9%	72.45
SalaryTemp	4.8%	0%	17.1%	14.61
Spouse	16.1%	0%	26.8%	32.8
Div	1.7%	0%	7.5%	13.45
Rent	1.5%	0%	7.5%	7.39
Gov	6.1%	0%	20.4%	14.04
Retirement	12.3%	0%	29.7%	17.01
LifeIns	0.3%	0%	3.8%	1.52
Inherit	0.6%	0%	5.4%	2.67
Lottery	0.3%	0%	4.4%	2.64
Family aid	0.3%	0%	4.6%	0.54

SalaryReg, SalaryTemp, Spouse, Div, Rent, Gov, Retirement, LifeIns, Inherit, Lottery, and Family aid are variables showing the stated portion of income (in percentage) coming from regular salary payments, temporary salary payments, spousal income, dividend or interest income (e.g. stocks, bonds), rental income, government benefits, retirement income, life insurance settlements, inheritances, gains on lotteries, family financial aid respectively.

Table 3. Summary statistics for variables measured.

Statistic	Mean	Median	St. Dev.
Age (years)	45.7	45	13.5
Education level (1–6)[1]	3.3	3	1.7
Male = 0	0.5	0	0.5
Number of people in the household	2.6	2	1.2
Income level (1–12) [2]	3.8	3	2.2
N of correct answers to financial questions	3.2	3	1.6
Elicited risk aversion coefficient	0.5	0.55	0.3
% of income risked on the GP Lottery	12.0	8	15.9
N of sources of income	1.8	2	1.0
Declaring percentage of temporary income	15.9	9	22.5

[1] Education: 1 = Less than high school degree, 2 = High school graduate, 3 = Some college but no degree, 4 = Associate degree in college (2-year), 5 = Bachelor's degree in college (4-year), 6 = Master's degree or higher [2] 1 = Less than 10,000, 2 = 10,000 to 19,999, 3 = 20,000 to 29,999, 4 = 30,000 to 39,999, 5 = 40,000 to 49,999, 6 = 50,000 to 59,999, 7 = 60,000 to 69,999, 8 = 70,000 to 79,999, 9 = 80,000 to 89,999, 10 = 90,000 to 99,999, 11 = 100,000 to 149,999, 12 = 150,000 or more

income in the last year by choosing from options such as regular salary payments, temporary salary payments, spousal income, dividends and interest (e.g. stocks, bonds), rental income, government benefits, retirement income, life insurance settlements, inheritances, and gains from lotteries. The participants could also specify sources of money that were not on the list. We put such specified sources of money in the categories that seemed most relevant; for example, participants often reported receiving government benefits in various formats, and we categorized this as 'government benefits'. We also removed 33 participants who refused to answer this question. We then asked participants to make their best estimates of the percentages of their household incomes that were obtained from the selected sources. More than half of the participants had at least two sources of income, confirming that sources of income were diverse among households. Tables 2 and 3 report the summary statistics for sources of income and all other variables we measure. Additionally, Table 4 explains the main income variables we use in the present study.

4. Effect of source of income

In this section, we analyse whether differing accounts of income can explain people's risk-taking behaviour. We do so by investigating the effects of the temporary portion of income and source of income on individual risk-taking behaviour.

4.1. Regular versus temporary sources

People may categorize their income as a regular source of money or a temporary one. For example, salary incentives are considered different from regular salaries, and as Shefrin and Thaler (1988) suggest, they are less likely to be consumed. To evaluate the effect of temporary income on risk-taking, we first tested whether there was a significant difference between the risk-taking behaviour of respondents with some temporary income and those without temporary income.

The first set of analyses highlights the impact of temporary sources of income on people's risk-taking behaviour. A Welch's t-test shows that the risk-taking behaviour (GP Lottery) of participants is significantly higher for those who indicate some percentages of temporary income than for those without temporary income ($t = -10.064$; $df = 3141.8$; $p < 2.2e\text{-}16$). The participants without temporary income put, on average, a little over 8% of their income into the GP Lottery, whereas those with some temporary income put in 13.5% of their income, on average. This result suggests that with regard to risk-taking with income, participants with some temporary income are more willing to take risks than those without temporary income. However, this suggestion would be valid only if there were no significant differences between the shape of the utility function of these two groups. Nonetheless, when we consider the curvature parameter of the utility function in Figure 3, there is a slight but significant difference between the two groups,

Table 4. Description of income-related variables used.

Variables	Description
Income (level)	Income shows respondents' household income from the last year in 12 different levels: 1 measures an income level of less than 10,000 (monthly: less than 850) and 12 is the income level of more than 150,000 (monthly: more than 12,500).
% TemporaryInc	%TemporaryInc reflects participants' statement about the percentage of temporary income in the last year.
Nsource	Nsource is a variable that shows the number of sources that constitute the participants' income.
Multisource	Multisource is a dummy variable that is equal to 1 if the number of sources of money that the respondents state is more than one.
Windfall	We define windfall as a dummy variable equal to one if the respondents' state that their income is from at least one of these sources: dividends or interest, gain on lotteries, inheritance, life insurance settlements, or family aid. The main idea of this variable is to group sources that can be recognized more as unexpected funds than expected ones.

with and without temporary income (t = −3.3961; df = 2468.3; p < 0.00). The two-sample Kolmogorov-Smirnov test (D = 0.075173; p = 6.71e-05) affirms that the distributions of the curvature of the utility function in these two groups are not drawn from the same distribution, indicating that, in general, participants with some temporary income are also more likely to be risk-tolerant. Possibly, people with lower concavity or more convexity in their utility functions would opt for less stable or temporary incomes rather than regular incomes and also take higher risks with their incomes (e.g. playing the GP Lottery). Therefore, to determine the effect of the temporary portion of income on risk-taking, we need to account for the difference in the shape of the utility function.

To further analyse the effect of temporary income, we estimated a two-sided Tobit model for risk-taking with the GP Lottery (RiskInc), censored at 0 and 100. People differ in their risk preferences through the curvature of their utility functions. Therefore, to evaluate the effect of temporary income on risk-taking, we controlled for the risk preference indicated by the utility function. Thus, we split the sample into four risk aversion curvature quantiles. This step allowed us to determine the correlation between the temporary portion of income and risk-taking among participants who had rather similar concavity in their utility functions.

In Table 5, we report the marginal effects, evaluated at the mean of the explanatory variable in each quantile of the utility function curvature. The influence of temporary income on risk-taking appears significant for each quantile. Participants with higher percentages of temporary income take higher risks. This result is consistent with those from the previous studies on windfall versus regular income (Milkman and Beshears 2009; Buddelmeyer and Peyton 2014). The results suggest that, on average, a 1% increase in the level of temporary income corresponds to up to a 15.5% change in risk-taking. Although the effect of temporary income seems to be in the same range for all quantiles, the first quantile of the risk aversion

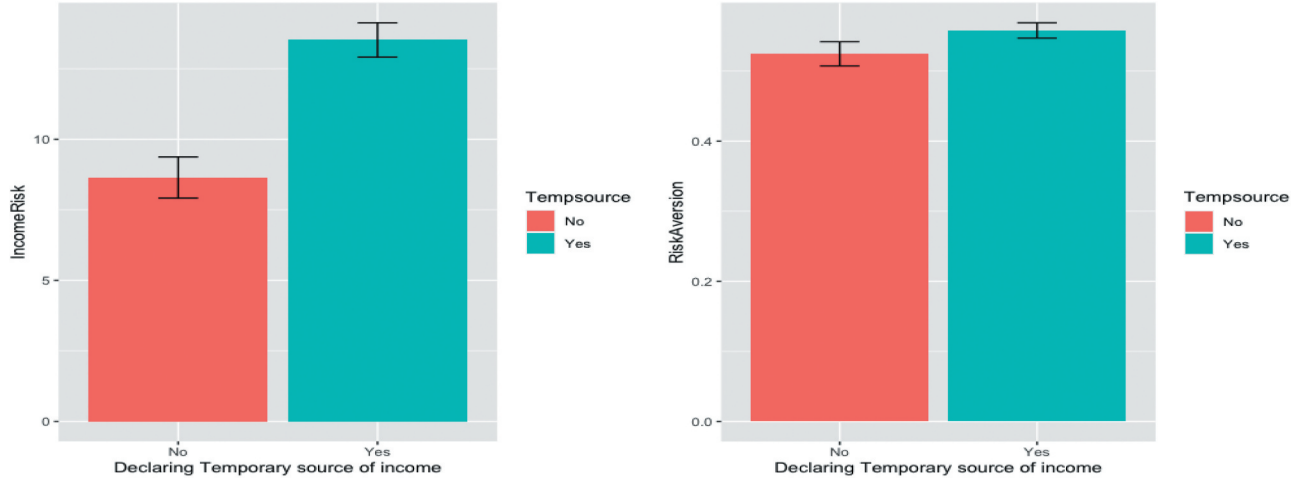

Figure 3. Difference between risk-taking (GP Lottery)(left) and risk aversion (concavity of utility function)(right) with regard to temporary portion of income.

Table 5. Tobit estimates for risk taking in quantiles of utility function curvature: marginal effects, evaluated at the mean of the explanatory variable.

	Dependent variable:			
	RiskInc (GP Lottery)			
	$RA \leq 0.35$	$0.35 < RA \leq 0.55$	$0.55 < RA \leq 0.7$	$RA \geq 0.7$
Income	0.056	− 0.252	− 0.026	− 0.127
	(0.173)	(0.213)	(0.263)	(0.236)
%TemporaryInc	0.105***	0.124***	0.155***	0.109***
	(0.016)	(0.018)	(0.022)	(0.019)
GenderMale	1.976***	2.113**	1.518	1.798**
	(0.718)	(0.815)	(1.028)	(0.980)
Age	− 0.145***	− 0.146***	− 0.152***	− 0.173***
	(0.049)	(0.377)	(0.046)	(0.042)
NHousehold	− 0.018	0.471	0.310	0.063
	(0.308)	(0.377)	(0.442)	(0.417)
Education	− 0.451**	0.203	0.265	− 0.215
	(0.219)	(0.251)	(0.325)	(0.310)
FinLit	0.073	0.050	0.274	− 0.2667
	(0.224)	(0.261)	(0.333)	(0.299)
Marital status	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes
Observations	1,154	1,185	909	936
Log Likelihood	− 3,649.671	− 4,214.179	− 3,377.814	− 3,452.312
Akaike Inf. Crit.	7,335.343	8,464.358	6,791.628	6,940.624
Bayesian Inf. Crit.	7,426.261	8,555.753	6,878.251	7,027.773

Note: *p < 0.1; **p < 0.05; ***p < 0.01

curvature has the lowest marginal effect. We find no significant, apparent link between income and risk-taking, albeit being a man and younger corresponds to greater risk-taking. We do not find a significant effect of financial literacy or education.

The sample includes the responses of 4,184 respondents in five countries: France, Germany, United Kingdom, Italy, and Spain. A two-sided Tobit is used. The second entry (in parentheses) is the standard error of the marginal effect. The explanatory variables include Income (the level of income from 1–12); %TemporaryInc, the percentage of temporary income; GenderMale, a dummy variable set to 0 if the gender is male; Age in years; NHousehold is the number of people in the household, Education as a level of education, 1–6; and FinLit, measured as the number of participants' correct answers to financial questions.

In our sample, there is no significant correlation between level of income and temporary portion of income. However, as a robustness check, we ran several Tobit regressions at different levels of income. The results remain the same, showing a positive relationship between the percentage of temporary income and risk-taking with income. As Table 6 shows, even though the effect of temporary income stays between 0.08 and 0.16 at most income levels, the most notable effect occurs at the two highest income levels, which corresponds to a monthly income of more than 25,800€ (pounds in the United Kingdom). The lowest effect occurs at the fifth income level (monthly income between 3,335€ and 4,165€).

The sample includes the responses of 4,184 respondents in five countries: France, Germany, United Kingdom, Italy, and Spain. A two-sided Tobit is used. The second entry (in parentheses) is the standard error of the marginal effect. The explanatory variables include: Income (level of income from 1–12);, GenderMale (dummy variable set to 0 if the gender is male), Age (in years), NHousehold (the number of people in the household), Education (level of education, 1–6), and FinLit (number of participants' correct answers to financial questions).

Overall, in line with H1, level of income does not seem to explain the participants' relative risk-taking behaviour. Income does not correlate with risk-taking. However, in support of H2, the percentage of temporary income correlates positively with risk-taking. This result is important because unlike in previous studies, we did not ask the participants to take risks with a targeted amount of money (such as a windfall). Instead, we allowed participants to make decisions about their overall incomes without making them think about specific parts of their income. Therefore, our results show that income accounting, in the sense of

a temporary source, affects people's risk-taking behaviour, and this effect is robust across different curvatures of the utility function and income levels. Moreover, the results remain the same after we control for level of liquid assets, including bank accounts, saving accounts, and current value of any financial products.

4.2. Multiple sources of income

People can earn their incomes from different sources, and household income can comprise several sources. In our survey, 1,975 participants declared they had only one source of income, whereas 2,209 participants reported they had had more than one source of income in the last year. Of those participants with multiple sources, 1,322 had two sources, 615 had three sources, and the remainder had several sources of income (4–7).

Such a diversity of income sources may lead to different types of risk-taking behaviours. We hypothesize that people with one source of household income exhibit different risk-taking behaviours from those with multiple sources of household income. The Welch's t-test shows that the risk-taking behaviour of the participants who indicate only one source of income is marginally higher than that of participants who have had multiple sources ($t = 1.8477$; $df = 3963.8$; $p = 0.0647$, see Figure 4). When we compare the curvature of the utility function for those with one source of income against those with multiple sources, we find no significant difference in the risk aversion coefficient ($t = 1.4826$; $df = 3984.6$; $p = 0.1383$), suggesting no significant difference between the curvature of the utility functions for people with one versus more than one source of income. However, these preliminary tests do not consider the impact of essential covariates, such as gender and age.

To investigate whether the effect of having multiple sources of income is significant after controlling for variables that explain risk-taking behaviour, we regress risk-taking with income using a two-sided Tobit regression. Table 7 presents the results. The first column shows no significant effect for the dummy variable, Multisource. The previously observed significant difference (Figure 4) in risk-taking between those with one source of money and those with more than one source disappears when we consider other control variables, such as level of income and demographics. However, when we use the number of sources as the independent variable, it correlates significantly with risk-taking. The main effect of this variable can be attributed to participants with three or more income sources. Thus, it appears that single-source households do not exhibit more risk-taking behaviour when they have an additional source of money. However, having income from more than two sources significantly increases people's risk-taking.

Another explanation of the variation in income risk-taking is source of money. One aspect of income accounting is that people tend to label sources of money differently and consequently treat them differently. Acknowledging this point, we reminded the participants to state which portion of their incomes came from regular salary payments, temporary salary payments, spousal income, dividend or interest income (e.g. stocks, bonds), rental income, government benefits, retirement income, life insurance settlements, inheritances, gains on lotteries, and others. We particularly asked them to indicate the percentage of each of these sources in the overall composition of their household incomes. According to the participants' responses, we defined a dummy variable, Windfall, to assess how the nature of a source of income explained risk-taking. The Windfall variable is a dummy that reflects an unexpected source of money. It is equal to 1 if the respondent has income from one of the sources, including dividends or interest, a gain on lotteries, inheritance, life insurance settlement, or family.

The results in Table 7 support previous findings about windfall money. Column (3) shows that having windfall money is associated with higher risk-taking with income.

The sample includes the response of 4,184 respondents in five countries: France, Germany, United Kingdom, Italy, and Spain. A two-sided Tobit is used. The second entry (in parentheses) is the standard error of the marginal effect. The explanatory variables include Income (level of income, 1–12), Multisource (dummy variable equals 1 if the number of sources of money is more than one), Nsource (number of sources of

Table 6. Tobit estimates for risk taking at 10 levels of income: marginal effects, evaluated at the mean of the explanatory variable.

	Dependent variable:									
	RiskInc (GP Lottery)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
%TemporaryInc	0.087***	0.122***	0.124***	0.158***	0.060**	0.171***	0.102**	0.165***	0.285***	0.324***
	(0.026)	(0.022)	(0.018)	(0.024)	(0.031)	(0.064)	(0.060)	(0.072)	(0.107)	(0.164)
Gender	1.77	3.714***	2.810***	1.553	− 1.740	1.284	2.080	− 1.517	01.276	2.402
	(1.735)	(1.083)	(0.846)	(1.004)	(1.101)	(1.628)	(1.930)	(1.991)	(2.653)	(4.478)
Age	− 0.366***	− 0.171***	− 0.195***	− 0.044	− 0.157***	− 0.137*	− 0.024	− 0.040	− 0.210**	− 0.738***
	(0.073)	(0.045)	(0.037)	(0.043)	(0.047)	(0.085)	(0.091)	(0.095)	(0.131)	(0.383)
NHousehold	0.135	0.150	0.086	0.727	0.051	− 0.432	0.293	1.280	2.031	− 1.960
	(0.697)	(0.471)	(0.374)	(0.464)	(0.513)	(0.688)	(0.739)	(0.961)	(1.294)	(1.900)
Education	− 0.400	0.248	− 0.339	0.154	− 0.467	0.394	0.221	0.433	0.428	0.408
	(0.568)	(0.356)	(0.269)	(0.444)	(0.337)	(0.482)	(0.582)	(0.641)	(0.809)	(1.245)
FinLit	− 0.386	− 0.501	0.500*	− 0.004	0.207	0.618	− 0.327	1.351*	− 0.335	− 0.655
	(0.525)	(0.322)	(0.273)	(0.449)	(0.356)	(0.572)	(0.607)	(0.698)	(0.884)	(1.527)
Marital status	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	439	799	968	812	482	270	160	95	94	80
Log Likelihood	− 1,541.738	− 2,849.362	− 3,299.160	− 2,906.575	− 1,655.768	− 961.019	− 539.752	− 307.721	− 326.333	− 275.818
Akaike Inf. Crit.	3,117.476	5,732.723	6,632.320	5,847.151	3,345.536	1,956.038	1,113.504	647.442	684.665	583.636
Bayesian Inf. Crit.	3,186.913	5,812.340	6,715.199	5,927.042	3,416.561	2,017.211	1,165.781	688.304	725.358	621.748

Note: *p < 0.1; **p < 0.05; ***p < 0.01

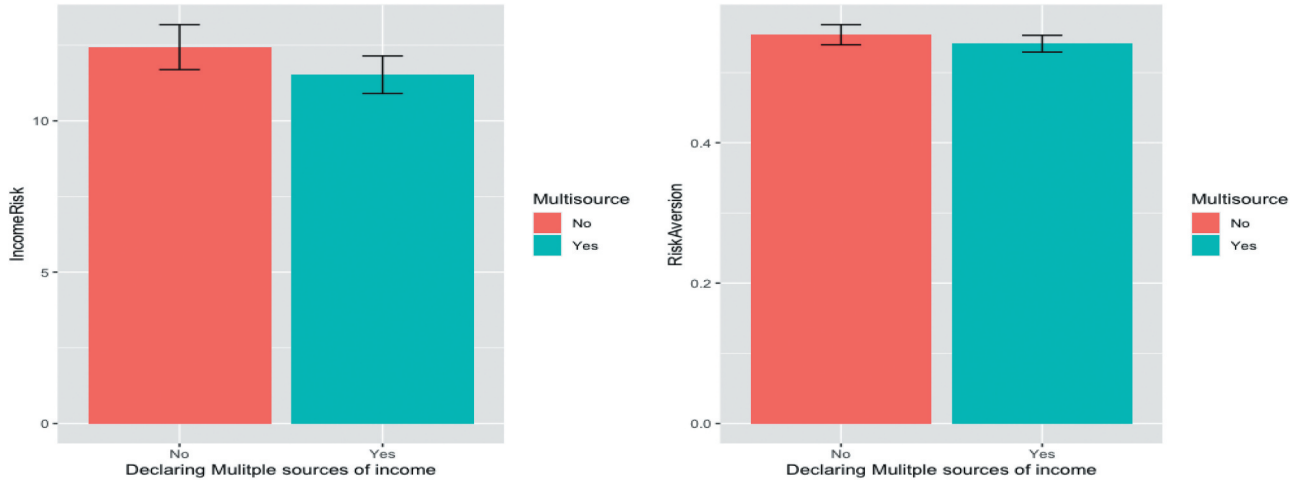

Figure 4. Difference between risk-taking (GP Lottery) (left) and risk aversion (concavity of utility function) (right) with regard to the number of sources of money.

income), Windfall (dummy variable equal to 1 if the respondent has income from dividends or interest, gain on lotteries, inheritance, life insurance settlements, or family aid), GenderMale (dummy variable set to 0 if the gender is male), Age (in years), NHousehold (the number of people in the household), Education (level of education, 1–6), and FinLit (number of participants' correct answers to financial questions).

In an additional analysis, we analysed each source separately to assess the relationship between individual sources of money and risk-taking. Table 8 (Columns 1–11) presents the results. It shows a significantly negative relationship between risk-taking and regular salary payments, such that households with higher portions of their incomes as regular salary are less likely to take risks. On average, a 1% increase in salary with regular payment characteristics corresponds to only a 1% point decrease in income risk-taking.

Meanwhile, we find a significantly positive relationship between income risk-taking and sources of income, including temporary salary payments, dividend or interest income, rental income, life insurance settlements, and gains on lotteries. The largest effect is associated with life insurance settlements: on average, a 1% increase in a life insurance settlement corresponds to a 17.4% increase in income risk-taking. We find no significant correlation for the following sources: spousal income, government benefits, inheritances, or family aid. Overall, these results support previous results with regard to windfall money, as listed in Table 7. Demographic variables, including gender and age, remain robust in all specifications: being a man and being younger are associated with greater risk-taking.

Table 7. Tobit estimates for risk taking: marginal effects, evaluated at the mean of the explanatory variable.

	Dependent variable:		
		RiskInc	
	(1)	(2)	(3)
Income	− 0.120	− 0.163	− 0.171
	(0.112)	(0.114)	(0.113)
Multisource = 1	0.514		
	(0.551)		
Nsource		0.485**	
		(0.228)	
Windfall			2.071***
			(0.446)
GenderMale	2.188***	2.169***	2.071***
	(0.445)	(0.445)	(0.446)
Age	− 0.192***	− 0.193***	− 0.194***
	(0.019)	(0.019)	(0.019)
NHousehold	0.240	0.210	0.233
	(0.195)	(0.445)	(0.195)
Education	− 0.176	− 0.286	− 0.200
	(0.138)	(0.139)	(0.139)
FinLit	− 0.150	− 0.169	− 0.174
	(0.141)	(0.141)	(0.140)
Marital status	Yes	Yes	Yes
Country	Yes	Yes	Yes
Observations	4,184	4,184	4,184
Log Likelihood	− 14,845.860	− 14,844.040	− 14,841.530
Akaike Inf. Crit.	29,727.710	29,724.080	29,719.060
Bayesian Inf. Crit.	29,841.810	29,838.190	29,833.160

Note: *p < 0.1; **p < 0.05; ***p < 0.01

The sample includes the responses of 4,184 respondents in five countries: France, Germany, United Kingdom, Italy, and Spain. A two-sided Tobit is used. The second entry in parentheses is the standard error of the marginal effect. The explanatory variables include Income (level of income, 1–12), GenderMale (dummy variable set to 0 if the gender is male), Age (in years), NHousehold (the number of people in the household), Education (level of education, 1–6), and FinLit (number of participants' correct answers to financial questions). SalaryReg, Salary Temp, Spouse, Div, Rent, Gov, Retirement, LifeIns, Inherit, Lottery, and Family are variables showing the stated portion of income coming from regular salary payments, temporary salary payments, spousal income, dividend or interest income (e.g. stocks, bonds), rental income, government benefits, retirement income, life insurance settlements, inheritances, and gains on lotteries, respectively.

As a robustness check and to ensure that the results pertaining to sources of money were not driven by the heterogeneity of the utility function curvature among the participants, we regressed the curvature of the utility function using ordinary least squares regressions to determine the correlation between this variable and sources of income. We found no correlation with any of the sources of income. Appendix A1 in the Appendix presents the results. Overall, our analysis supports H3 and H4, with regard to the number and origin of money as explanations of people's risk-taking behaviour.

5. Discussion and conclusion

Income is an important factor in the literature on risk-taking behaviour. Previous studies have mainly focused on the effect of income level on risk-taking. They have not accounted for the effect of income accounting as a cognitive operation. In this article, we study how the source of income explains the heterogeneity of risk aversion. The results provide additional insights into the effect of the source of income on risk-taking. We have analysed how the temporary portion of income and source of income explain people's risk-taking behaviour.

Our results show that the effect of the temporary portion of income is robust across different levels of income and curvatures of the utility function. These findings suggest the temporary portion of income can shape how people change the premia they require to accept risk. The robust and positive relationship between the temporary portion of income and risk-taking indicates that source of income (among other factors) is important towards explaining people's financial risk-taking behaviour.

Moreover, our results highlight the importance of income accounting when people consider their incomes as a whole. Although we do not directly measure people's differing propensities to risk with temporary and regular income, we, nevertheless, conclude that such a robust temporary income effect shows that overall, people tend to treat their regular and temporary incomes differently with regard to risk-taking. Such a temporary income effect on risk-taking confirms previous findings about the effect of windfall money (Baker, Nagel, and Wurgler 2006; Milkman and Beshears 2009; Feldman 2010; Buddelmeyer and Peyton 2014; Baugh, Ben-David, and Park 2014), such that people tend to spend dividends, tax rebates, and wins on gambles more readily.

We address two possible explanations that could refute our results. First, it is possible that people with higher temporary portions of income show greater risk-taking behaviour because they have initially higher levels of risk tolerance. However, we rule out this explanation by considering the curvature of the utility function, which captures a measure of risk aversion that shows that the effect of the temporary portion of income is persistent across differing quantiles of the risk aversion coefficient. Alternatively, those with higher incomes are more likely to have various and more temporary sources of money in addition to regular sources. Therefore, their higher risk-taking levels are the result of having higher incomes. However, we also address this point by analysing the effect of temporary income at 10 different levels of income. The results remain robust. Thus, the temporary portion of income has a significant effect on risk-taking behaviour. This temporary income effect is especially pronounced among the richest sector of the population, whereas for the rest of the population, it remains in the same range. That is, income

Table 8. Tobit estimates for risk taking: marginal effects, evaluated at the mean of the explanatory variable.

	Dependent variable:										
	RiskInc (GP Lottery)										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Income	− 0.0866	− 0.091	− 0.106	− 0.160	− 0.131	− 0.127	− 0.120	− 0.153	− 0.105	− 0.107	− 0.110
	(0.112)	(0.112)	(0.112)	(0.112)	(0.112)	(0.113)	(0.112)	(0.137)	(0.111)	(0.117)	(0.112)
SalaryReg	− 0.010*										
	(0.005)										
SalaryTemp		0.025**									
		(0.018)									
Spouse			− 0.000								
			(0.008)								
Div				0.113***							
				(0.040)							
Rent					0.058**						
					(0.027)						
Gov						− 0.011					
						(0.010)					
Retirement							− 0.010				
							(0.012)				
LifeIns								0.174***			
								(0.067)			
Inherit									0.055		
									(0.038)		
Lottery										0.134***	
										(0.045)	
Family											− 0.037
											(0.045)
GenderMale	2.256***	2.179***	2.177***	2.063***	2.177***	2.179***	2.175***	2.243***	2.185***	2.158***	2.18***
	(0.447)	(0.445)	(0.451)	(0.445)	(0.445)	(0.445)	(0.445)	(0.545)	(0.445)	(0.445)	(0.445)
Age	− 0.200***	− 0.189***	− 0.192***	− 0.192***	− 0.193***	− 0.191***	− 0.182***	0.188***	− 0.193***	− 0.190***	− 0.193***
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.021)	(0.020)	(0.019)	(0.019)	(0.019)
NHousehold	0.242	0.251	0.248	0.273	0.249	0.252	0.245	0.273	0.229	0.255	0.246
	(0.286)	(0.195)	(0.195)	(0.195)	(0.195)	(0.195)	(0.195)	(0.240)	(0.195)	(0.195)	(0.195)
Education	− 0.164	− 0.171	− 0.170	− 0.175	− 0.171	− 0.177	− 0.169	− 0.172	− 0.163	−0.163	− 0.167
	(0.138)	(0.138)	(0.138)	(0.138)	(0.139)	(0.139)	(0.138)	(0.138)	(0.138)	(0.138)	(0.138)
FinLit	− 0.137	− 0.137	− 0.148	− 0.137	− 0.133	− 0.131	− 0.192	− 0.213	− 0.132	− 0.126	− 0.133
	(0.140)	(0.140)	(0.140)	(0.140)	(0.140)	(0.140)	(0.140)	(0.171)	(0.140)	(0.140)	(0.140)
Marital status	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,184	4,184	4,184	4,184	4,184	4,184	4,184	4,184	4,184	4,184	4,184
Log Likelihood	− 14,844.540	− 14,844.120	− 14,846.290	− 14,837.870	− 14,844.060	− 14,845.730	− 14,845.470	− 17,988.360	− 14,845.270	− 14,842.600	− 14,845.950
Akaike Inf. Crit.	29,725.090	29,724.240	29,728.580	29,711.740	29,724.120	29,727.450	29,726.950	36,012.710	29,726.550	29,719.200	29,727.890
Bayesian Inf. Crit.	29,839.190	29,838.340	29,842.680	29,825.840	29,838.230	29,841.560	29,841.050	36,126.820	29,840.650	29,826.970	29,842.000

Note: *p < 0.1; **p < 0.05; ***p < 0.01

accounting appears more noticeable among people with higher incomes. This may be because of heightened attention: people with higher incomes and more cash may be more attentive to their accounts (Olafsson and Pagel, 2018b). Further research could establish whether there is a meaningful relationship between attention and mental accounting.

Our results suggest that single-source households do not become more risk-taking when they have an additional source of income. Having income from more than two sources has a significant effect on people's risk-taking behaviour, but it also matters whence the money comes. As expected, our analysis demonstrates a negative correlation between risk-taking behaviour and salary that is paid regularly. However, the effect on risk-taking behaviour is much lower than the positive effect of other sources, including temporary salary payments, dividend or interest income (e.g. stocks, bonds), rental income, life insurance settlements, and gains on lotteries. This finding suggests that additional money from these sources has a considerable effect on risk-taking behaviour, in line with our previous results related to the effect of temporary percentages of income. Although we were not able to observe the actual characterization of these sources, we can categorize them as temporary portions of income.

In contrast with Andersen and Nielsen (2011), who show that people are more likely to hold unexpected inheritances in safe assets, we do not find a significant negative correlation between risk-taking and inherited money. Moreover, we find no significant effect of spousal income, government benefits, or family aid. These results seem to indicate that risk-taking behaviours by people with such sources of money are more heterogeneous than they are among people with other sources. However, the diversity of feelings associated with these sources of money may be the most likely explanation for this finding (Levav and McGraw 2009). As we did not observe those feelings in the present study, this can prove to be a fruitful avenue for future research.

Income accounting offers a good explanation of how various sources of money correlate with risk-taking behaviour. We observe that this cognitive operation is valid at an aggregate level and is an important determinant of people's income risk-taking.

Although we expected to observe a positive relationship between income level and risk-taking, our results provide no evidence of such a relationship both with the GP Lottery and the curvature measure of the utility function. This result is not in line with previous studies such as (Shaw 1996; Donkers, Melenberg, and Van Soest 2001; Hopland, Matsen, and Strøm 2016; Wright 2017). However, it confirms the results of other studies who have found no correlation between income and risk aversion (Barsky et al. 1997; Harrison, Lau, and Rutström 2007; Von Gaudecker, Van Soest, and Wengstrom 2011; Bombardini and Trebbi 2012). This apparent lack of correlation can be attributed to the endogeneity of income variables. Nevertheless, as we do not seek to establish causality, this observation does not invalidate our inference about the effect of source of income.

Regarding the other variables that affect risk-taking behaviour, our results confirm past findings of the robust effect of gender and age. However, they do not provide evidence of an influence of financial literacy and education, as other studies (Desmoulins-Lebeault and Meunier 2018) have shown. Perhaps, answering our questions about the lottery did not require specific financial literacy or numeracy knowledge.

Our results have implications for wealth managers and banking advisors. Although, the technical expertise of advisors is important in assembling a portfolio of assets that matches the risk tolerance of their clients, it also is important to consider the source of income when deciding how to invest clients' money in the cognitively and emotionally appropriate places. Our paper contributes to the literature on the determinants of risk-taking by

investigating the role of the source of money in explaining risk-taking behaviour at the household level.

In the present study, we investigate the effect of income accounting on risk-taking. Our results suggest that sources of income have important roles in explaining people's risk-taking behaviour. Thus, our research highlights the importance of income accounting, particularly with regard to temporary income, for predicting risk-taking. Although there are limitations related to data collection through surveys, we believe that our results provide insights into the strength and direction of the effect of the source of income. Thus, these results have considerable potential to improve knowledge about the determinants of financial risk-taking and encourage wealth managers to consider sources of income when they advise clients.

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Appendix

The sample includes the responses of 4,184 respondents in five countries: France, Germany, United Kingdom, Italy, and Spain. Ab ordinary least squares regressions is used. The second entry (in parentheses) is the standard error of the marginal effect. The explanatory variables include Income (level of income, 1–2), GenderMale (dummy variable set to 0 if the gender is male), Age (in years), NHousehold (the number of people in the household), Education (level of education, 1–6), and FinLit (number of participants' correct answers to financial questions). SalaryReg, Salary Temp, Spouse, Div, Rent, Gov, Retirement, LifeIns, Inherit, Lottery, and Family are variables showing the stated portion of income coming from regular salary payments, temporary salary payments, spousal income, dividend or interest income (e.g. stocks, bonds), rental income, government benefits, retirement income, life insurance settlements, inheritances, and gains on lotteries, respectively.

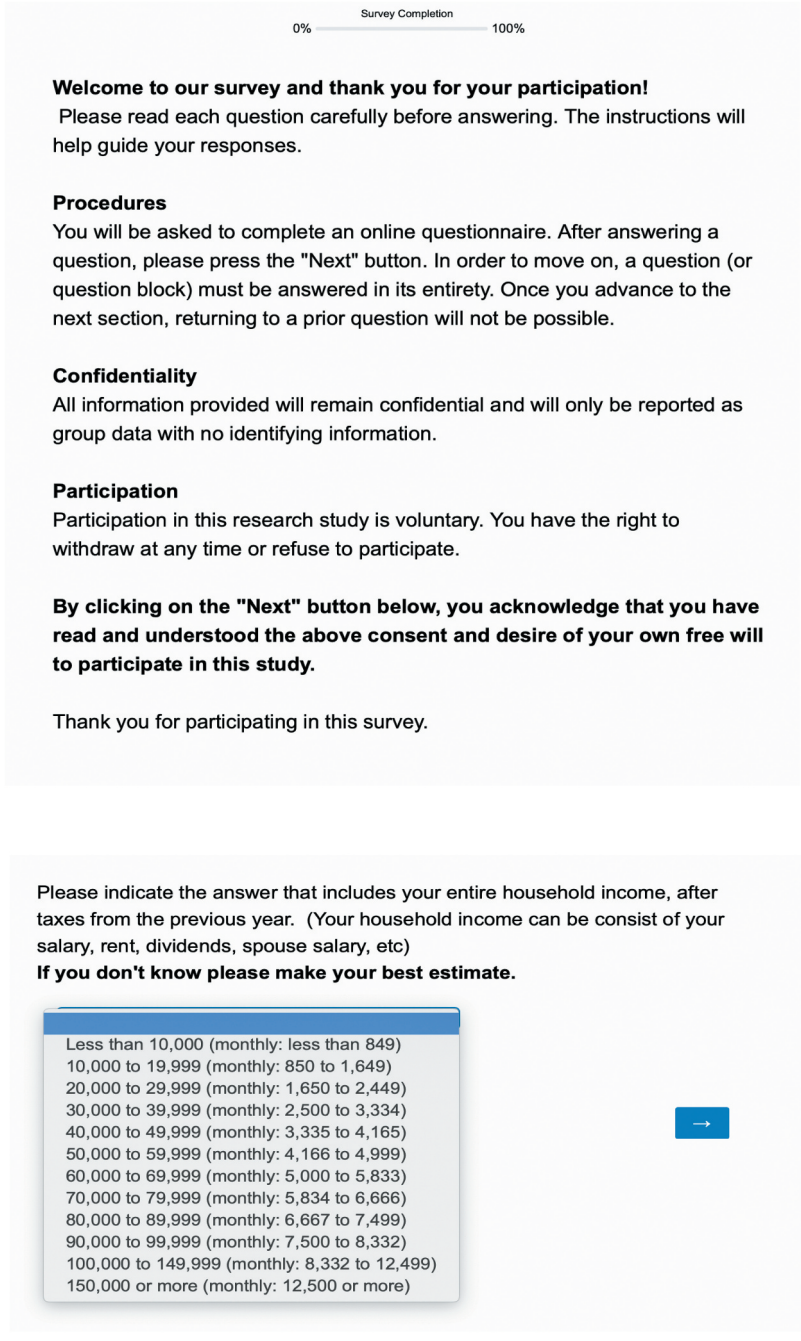


Figure 5a. Screenshots of some of the survey questions.

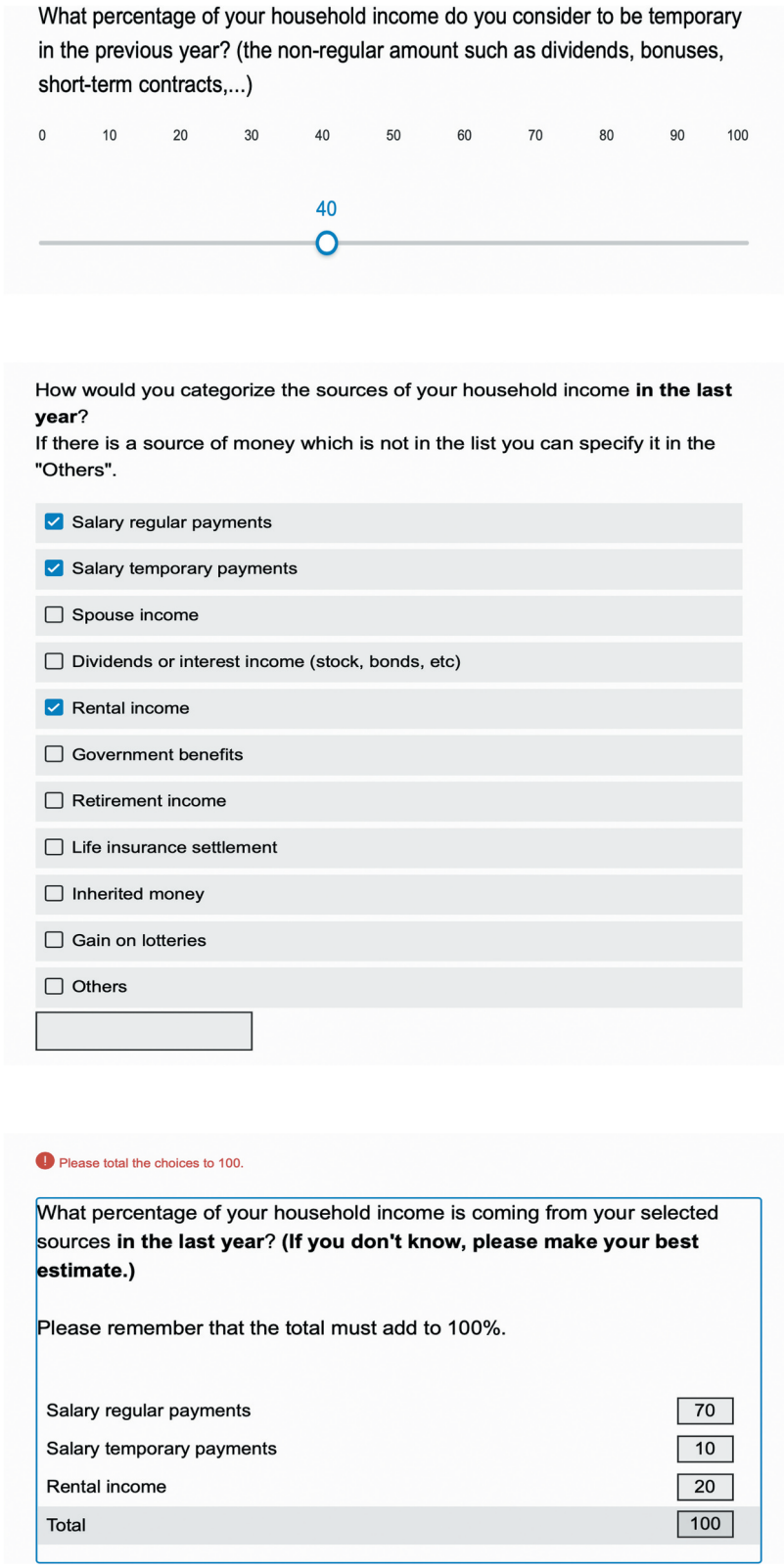


Figure 5b. Screenshots of some of the survey questions.

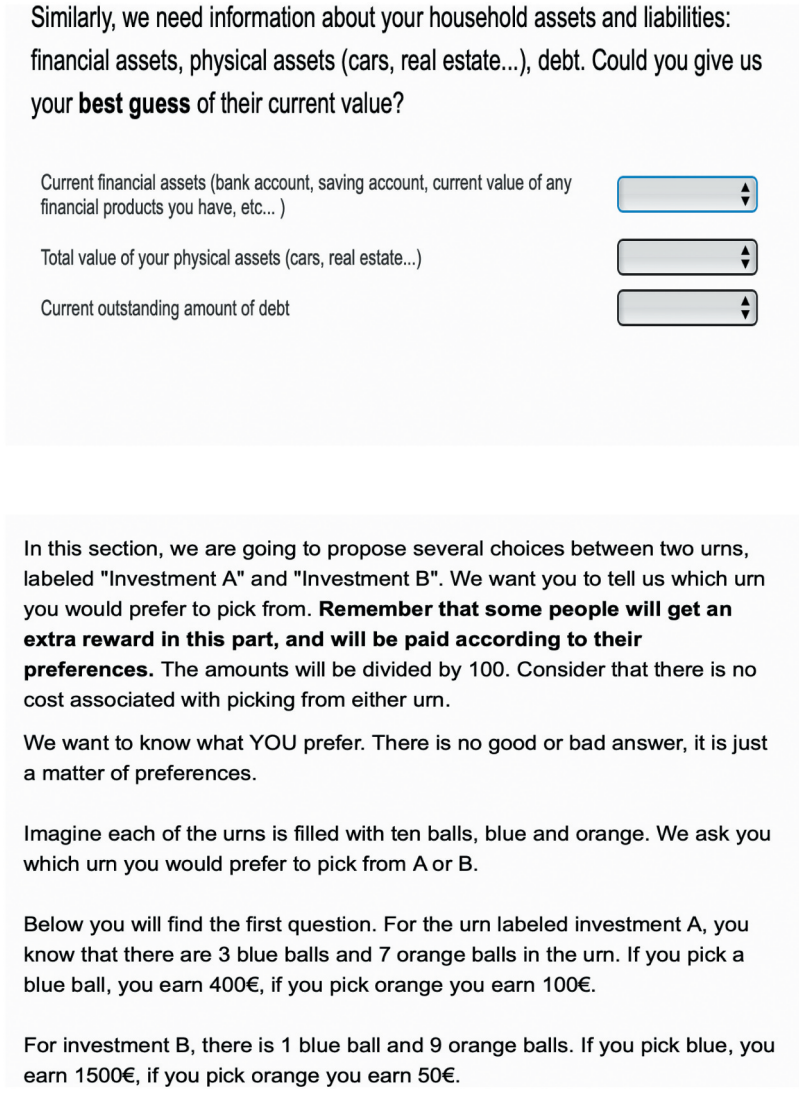
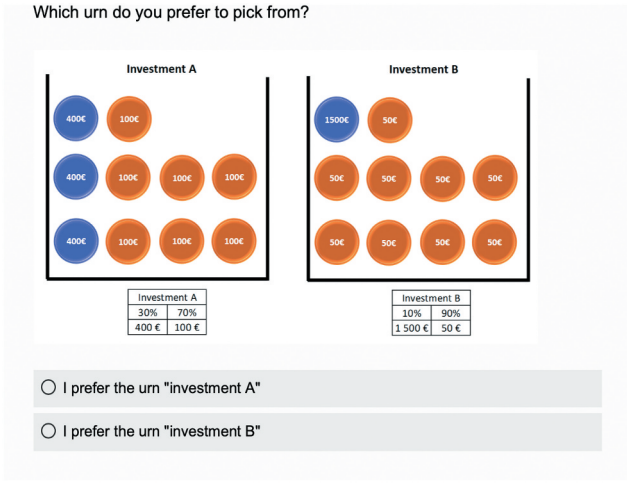
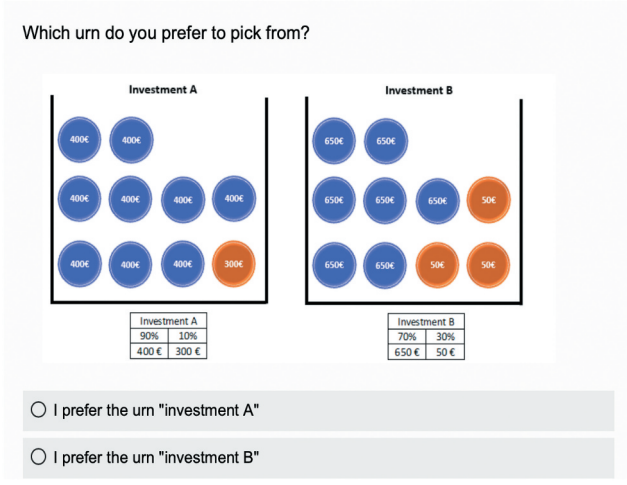


Figure 5c. Screenshots of some of the survey questions.





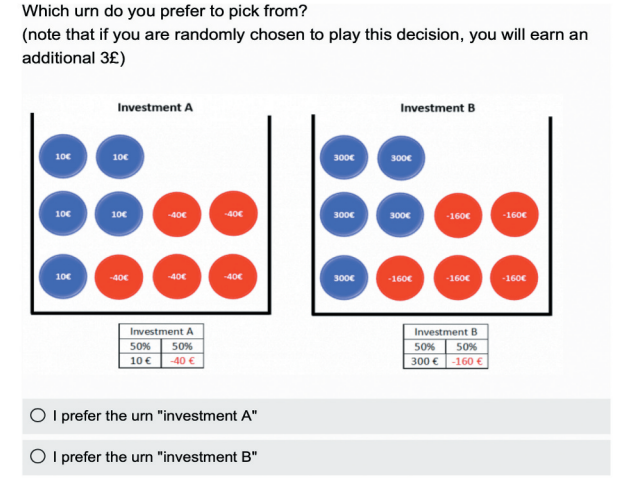


Figure 5d. Screenshots of some of the survey questions.

Table A1: Correlations with dimensions of risk aversion (concavity of utility function).

	Dependent variable: RiskAv										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Income	0.001	0.001	0.001	0.001	0.001	0.0003	0.0004	0.001	0.001	− 0.001	0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)
SalaryReg	0.0001										
	(0.0001)										
SalaryTemp		− 0.00005									
		(0.0003)									
Spouse				0.0002							
			(0.0002)								
Div				0.00004							
				(0.001)							
Rent					− 0.0002						
					(0.001)						
Gov						− 0.0002					
						(0.0002)					
Retirement							− 0.0002				
							(0.0002)				
LifeIns								− 0.0004			
								(0.001)			
Inherit									− 0.0001		
									(0.001)		
Lottery										0.001	
										(0.001)	
Family											0.0002
											(0.001)
GenderMale	0.026***	0.027***	0.028***	0.027***	0.027***	0.027***	0.026***	0.027***	0.027***	0.027***	0.027***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Age	− 0.002***	− 0.002***	− 0.002***	− 0.002***	− 0.002***	− 0.002***	− 0.002***	− 0.002***	− 0.002***	− 0.002***	− 0.002***
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0005)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
NHousehold	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Education	− 0.007**	− 0.007**	− 0.007**	− 0.007**	− 0.007**	− 0.008**	− 0.007**	− 0.007**	− 0.007**	− 0.007**	− 0.007**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
FinLit	− 0.005	− 0.005	− 0.005	− 0.005	− 0.005	− 0.005	− 0.005	− 0.005	− 0.005	− 0.006**	− 0.005
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Marital status	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.664***	0.670***	0.668***	0.670***	0.669***	0.673***	0.663***	0.670***	0.669***	0.649***	0.669***
	(0.037)	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)	(0.034)	(0.035)
Observations	4,184	4,184	4,184	4,184	4,184	4,184	4,184	4,184	4,184	4,184	4,184
R^2	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.010	0.011
Adjusted R^2	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.006	0.007
Residual Std. Error	0.305 (df = 4167)	0.305 (df = 4167)	0.305 (df = 4167)	0.305 (df = 4167)	0.305 (df = 4167)	0.305 (df = 4167)	0.305 (df = 4167)	0.305 (df = 4167)	0.305 (df = 4167)	0.305 (df = 4168)	0.305 (df = 4167)
F Statistic	2.812*** (df = 16; 4167)	2.795*** (df = 16; 4167)	2.833*** (df = 16; 4167)	2.793*** (df = 16; 4167)	2.800*** (df = 16; 4167)	2.844*** (df = 16; 4167)	2.910*** (df = 16; 4167)	2.799*** (df = 16; 4167)	2.794*** (df = 16; 4167)	2.667*** (df = 15; 4168)	2.795*** (df = 16; 4167)

Note: *p < 0.1; **p < 0.05; ***p < 0.01