To what extent does income predict an individual's risk profile in the UK (2012-2014)

Wright, Joshua

Manchester Metropolitan University

10 August 2017

To what extent does income predict an individual's risk profile in the UK (2012- 2014)

Joshua Wright
Joshwright3382@gmail.com

Manchester Metropolitan University

Department of Accounting, Finance and Economics

Abstract

This study seeks to estimate whether income is predictive of an individual's risk profile. The consensus amongst the existing literature is that income is predictive of an individual's risk profile and the two do have a relationship. This study uses a quantitative approach by estimating a series of statistical models that estimate the relationship between an individual's income and their risk profile using a large UK based longitudinal dataset. The research finds that income is positively related to risk and that for every £1,000 increase in income, an individual's odds of becoming risk seeking increase by 1%. Moreover, the research finds that not only is income predictive of an individual's risk, but so too are; gender, education level, age and self-employment.

Keywords: Individuals, Risk Profiles, Income, UK.

1. Introduction

1.1: Background

Risk plays a pivotal role in the majority of individuals every day decisions. As a consequence, it seems imperative that a certain level of understanding towards individual risk attitudes is required to better understand economics and society as a whole (Dohmen *et al*, 2011). It's widely held that an individual's risk preference can affect a number of things; from how much an individual earns, to how likely they are to gamble, to the likelihood of them getting married (Donkers and Melenberg, 2001). Contrastingly, Botti *et al* (2007) and Baltussen *et al* (2008) suggest there are also a number of aspects which can affect an individual's risk preference; from an individual's income, to their ethnicity, to the number of dependent children they have.

Cook and Whittle (2015), define an individual's risk profile as the extent to which an individual prefers certain rewards compared to uncertain yet larger rewards. Thomas (2015), goes further and defines a risk profile as a measure of the feeling guiding the person who faces a decision with uncertain outcomes, whether about money or status or happiness or anything else of importance.

Given this, it's widely held that there are three main risk profiles for an individual; risk averse, risk neutral and risk tolerant/seeking. Therefore, in contexts with two or more response alternatives, both the probability and size of each alternative presumably influence decisions and shape an individual's risk profile Lane and Cherek (2000). Generally speaking, an individual which favours a highly variable (or low probability) outcome, over a consistent (or high probability) outcome, is defined as risk taking, while the opposite is defined as risk averse. A risk neutral individual is indifferent between a sure thing and a risky bet with an expected payoff equal to the value of the sure thing (Maskin and Riley, 1984).

Its widely held within the growing literature on risk, that income does impact an individual's risk profile Barsky *et al* (1997). However, to what extent, is still very much disputed. The general consensus amongst the literature is that as an individual's income increases, they're more likely to have a risk seeking profile Hopland *et al* (2013). Although research shows an individual's risk profile is associated with their income level, other factors also play a role, mainly; gender, ethnicity, wealth, number of dependent children and age (Baltussen *et al*, 2008).

1.2: Aims & research objectives

The fact empirical literature in this area has been completely dominated by macroeconomists and financial economists with little on income and risk, creates a natural demand for this research (Belzil and Hansen, 2002). Similarly, as virtually all western countries labour income accounts for a much larger share of total income (60-70% of total income) than does investment income, the rationale to research this topic is strengthened (Hartog *et al*, 2002). Therefore, this paper aims to contribute to the area through providing clarity on the relationship between income and an individual's risk profile. In order to do this, the research will use data from the UK Wealth and Assets Survey (WAS) data set (ONS, 2016).

For the purpose of this paper, an individual's risk profile will be based on the question "What would you choose if given the choice between a guaranteed payment of £1,000 and a one in five chance of winning £10,000" from the WAS. From this, an individual will be categorized as either; risk averse or risk seeker- choosing the £1,000 option will classify an individual as risk averse, whereas, gambling for £10,000 will classify them as a risk seeker. Due to the nature of the question, individuals cannot be classified as risk neutral.

The main objectives of the research are, firstly, to better understand the relationship between income and individuals risk profiles in the UK. Secondly, to critically assess the extent to which income predicts risk levels in the UK. Finally, to briefly examine some of the other main factors which impact an individual's risk profile.

2. Literature review

2.1: Risk: influences, effects and measurement issues

To the average person, the definition of risk is "the probability of something bad happening", but more theoretically speaking, risk tends to be a highly personal process of decision making, with it being based on an individual's frame of reference developed over life, among other factors (Brown, 2014). Both risk and uncertainty play a role in almost every important economic decision. As a consequence, Dohmen *et al* (2011), state that a better understanding of individual attitudes towards risk is closely linked to the goal of understanding and predicting economic behaviour. With that, Hanna *et al* (2001) state there are at least four methods of measuring risk tolerance: asking about investment choices, asking a combination of investment and subjective questions, assessing actual behaviour, and asking hypothetical questions with carefully specified scenarios. From other literature reviewed in this research paper, it can be accepted that these are four of the main methods to measure individuals risk (Hartog and Jonker, 2002), (Flachaire and Hollard, 2008) and (Beetsma *et al*., 1997).

In particular, the method- measures using hypothetical scenarios constructed based on economic models is used by Barsky *et al* (1997). This study found that measured risk tolerance is positively related to risky behaviours, including smoking, drinking, failing to have insurance, and holding stocks rather than Treasury bills. Although they identify what risk tolerance is positively related to, they find tremendous variability in the behaviours, so only a small fraction of their variance is explained by risk tolerance. Barsky *et al* (1997) continue by expressing that most of the differences between individuals that are unexplained, is common in psychological literature.

The survey used by Barsky *et al* (1997) obtains the risk profile method through asking respondents about their willingness to gamble on life-time income.[1] The respondent can either answer yes or no and from this a series of follow up questions are asked. This allows the author to generate a risk profile for the individual. Barsky *et al* (1997) continue by highlighting just some of the problems surrounding measuring risk through hypothetical scenarios- the fact they can often assume that the level of income is the only factor an individual value in relation to work.

Take the economic idea of compensating differentials for instance. This examines the

[1] The exact question used is "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?"

additional amount of income it would take for an individual in order for them to move jobs to a more undesirable job, in relation to other jobs (Villanueva, 2007). However, this doesn't take into account other factors which may influence an individual's decision to accept/reject a job and merely focuses on income as the main driving force. This could partly explain why other techniques such as human behaviour analysis through the use of gameshows has been adopted in other literature. This is touched on later in the literature review.

However, this doesn't stop the use of survey questions in other research. Hartog and Jonker (2002) use a survey in which they ask individuals for the amount they are willing to pay for participation in a specified lottery which has a 10% chance of winning. From this Hartog and Jonker (1997) find that women are more risk averse than men and that schooling level reduces risk aversion. However, they fail to explain why this is the case (Beetsma and Schotman, 1998).

Hopland *et al* (2013) also find only a weak, statistically insignificant effect of gender on risk attitudes and no effect of age. This is unusual given the large literature which surrounds the impact an individual's age and gender has on risk aversion. Take Dohmen *et al* (2009) which find that age, gender, and parental background all have an economically significant impact on individual's willingness to take risks. Their findings are based on asking individuals about their willingness to take risks "in general". They also use other questions about risk attitudes in specific contexts and again find similar results. Dohmen *et al* (2009) control for both income and wealth with their reasoning being that higher levels of these two elements may increase the willingness to take risks because they cushion the impact of bad realizations. Hence within their findings they don't discuss the impact income has on risk aversion.

There are other complications associated with measuring risk attitudes. Survey questions can come with problems around sensitivity to framing, elicitation bias, preference reversal and the gap between willingness-to-pay and willingness-to-accept (Hartog *et al*., 2002). Kachelmeier and Shehtata (1992) emphasise the sensitivity to framing issue. Their experiment focuses on Chinese students being presented with basic lotteries in which they find large differences between how much individuals are willing to pay for a lottery and for how much they are willing to sell the same lottery. This suggests that revealed risk preferences depend on the way problems are framed (Beetsma *et al*., 1997). For example, Flachaire and Hollard (2008) touch on the particular case in which respondents have to estimate numerical values, implying that two different surveys may lead to two different valuations of the same object. The author points towards the design of a survey which can influence a respondent's answers, meaning surveys are sometimes viewed with wariness when used to provide economic values, since framing effects can distort the value of survey-based valuation (Flachaire and Hollard, 2008).

Although the use of surveys to measure risk aversion has its problems, correlations between survey measures and experimental measures are in the right direction (Ding, Hartog, and Sun, 2010). One of the main benefits the various literatures touch on above, is that each measure used helps bring about valuable findings to the topic as a whole and to each research paper. For example, Barsky *et al* (1997) finds that risk tolerance is positively related to risky behaviours and Hartog and Jonker (2002) find that women are more risk averse than men.

2.2: Existing literature on the relationship between income and risk

To begin, it's important to note that it's still largely debated in the area whether income drives an individual's risk profile or an individual's risk profile drives an individual's income. Thus, causality may run in both directions. Hopland *et al* (2013) find that decision makers with high income are more willing to accept financial risk, hence have less risk aversion. They study the relationship between income and risky choice and combine observations of stopping decisions in a Norwegian game show with reliable data on each subject's income. Participants in the experiment are randomly drawn from a large subject pool that is representative of the Norwegian population. This makes the findings very useful in that its representative of the whole population.

Donkers and Melenberg (2001) find a significant relationship between risk aversion, age, gender, education and income. Their paper uses data from the Dutch CentER Savings Survey (CSS) which includes a set of hypothetical questions on lotteries (similar to that what other studies previously mentioned have used). In particular, they find that income and education level are positively related to an individual's attitude towards risk.

It seems to be a reoccurring trend in the literature that as income increases individuals risk aversion reduces. Barsky *et al* (1997) find that the pattern of risk tolerance by income and wealth is similar to that for age. They state that risk tolerance rises at the high end of wealth, income, and age distributions. Schooley and Worden (1996) take a different stance on the issue around income and risk. In their research they state that household income is not significant but point towards a household head, and/or partner being a full-time earner having more significance in relation to the holdings of risky assets per dollar of wealth. Schooley and Worden (1996) point towards the negative sign on the coefficient they found, to be the indication that those households with no full-time earnings are less willing to hold risky assets.

Yesuf and Bluffstone (2007) find that from the 262 households in the Ethiopian highlands they examine, 50 percent of these are severely or extremely risk averse. The author acknowledges that this contrasts with studies in Asia, like Vieder *et al* (2013) study, where most household decision-makers exhibit moderate to intermediate risk aversion. More specifically, the study highlights that households that stand to lose as well as gain something are significantly more risk averse than households playing gains-only games, something that has been identified in numerous risk related literature as prospect theory. The theory, created by Kahneman and Tversky (1979), describes how individual's value identical gains and losses differently, such that they are risk seeking in losses and risk averse in gains.

What's more relevant to this research paper is that Yesuf and Bluffstone (2007) identify significant differences in risk averting behaviour between relatively poorer and wealthier farm households, suggesting that as wealth increases, households are willing to take more risk.

Given the vast array of literature that's been touched on, and the wide range of conclusions arising from the various studies, it's important that this paper can provide an insight into where the current debate stands within the UK. Throughout the literature the reoccurring theme surrounded the relationship between an individual's improvement in finances, whether that's income or wealth, and an individual becoming more risk seeking. As a result, the hypothesis tested will be that as income increases, individuals risk aversion reduces.

3. Methodology

3.1: Dataset description

This study uses the Wealth and Assets Survey (WAS) conducted by the Office for National Statistics (ONS). The WAS is a longitudinal survey which aims to address gaps identified in data about economic well-being of households. It does this through gathering information on households; assets, savings, and debt amongst numerous other information (ONS, 2016).

The survey data was collected from July 2006- June 2014 in four separate waves. The first wave of interviews was carried out from July 2006 to June 2008 with 30,595 participants. Wave 2 occurred between July 2008- June2010 with the same households being approached again, only this time 20,170 households participated. Wave 3 covered July 2010- June 2012 and Wave 4 covered July 2012- June 2014. For the purpose of this research, the data will be obtained from Wave 4 in order to give the most up to date analysis of the UK.

The survey is split into two parts- the household schedule and the individual schedule. The part most relevant to this paper is the individual schedule given this focuses on each adult within the households sampled and asks question about economics status, education, employment and tax credits, as well as saving attitudes and behaviour (ONS, 2016).

There are numerous risk related questions asked in the WAS but the one selected for the purpose of this research is “What would you choose if given the choice between a guaranteed payment of £1,000 and a one in five chance of winning £10,000”. The reason for this is that previous successful studies, like those touched upon in the literature review have used questions of a similar nature. Also, the question is simple and easy for individuals to digest with only two possible answers.

3.2: Analysis

The analysis will focus on the most recent wave (Wave 4) to gain an insight into the current picture surrounding individuals risk profiles and incomes. It will examine if there is a relationship between income and risk and if so, analyse the nature of the relationship. It will look at the descriptive statistics of the data in order to gain a greater understanding on the composition of the data. Following from this, bar charts will be utilised in order to provide a visual representation of how the variables are associated and how they differ.

The analysis will then move onto logistic regression which will show how well each independent variable predicts the dependent variable, an individual’s risk profile. The reported results are odds ratios, meaning how much more likely a variable, in this case income, makes an individual risk seeking or risk averse.

The primary model used is as follows: [2]

---

[2] Where:

“$Risk\ Aversion^{i}$” represents the dependant variable.

“α^{0}” represents the intercept.

“γ” represents the slope parameter.

“$(Income)$” represents the independent variable and therefore indicates which risk profile an individual has as measured at Wave

$$Risk\ Aversion^{i} = \alpha^{0} + \gamma^{0}(Income)^{i} + \beta(Controls)^{i} + e^{i}$$

3.3: Control variables

The model will then include a number of control variables. One reason for this is to explain more of the variation in the outcome. The other, is to mitigate against the possibility that the relationships found between risk and income are simply the result of other variables (Cook and Whittle, 2015). A number of variables are included in the model to control for any such confounding factors as well as improving the effectiveness of the model. The control variables can be categorised into two groups; personal characteristics and labour market variables.

3.3.1: Personal characteristics

Gender
Age

3.3.2: Labour market variables

Educational qualifications (Degree)
Self-employment

Model-

$$Risk\ Aversion^{i} = \alpha^{0} + \gamma^{0}(Income)^{i} + \beta^{1}(\text{Sex})^{i} + \beta^{2}(\text{Age})^{i} + \beta^{3}(\text{self-employment})^{i} + \beta^{4}(\text{Degree qualification})^{i} + e^{i}$$

These variables have been selected as numerous research, seen in the literature review, indicates these can affect risk. Also, the choice of these elements was driven in part by data availability.

4. Static analysis & discussion

4.1: Descriptive analysis

Out of the 11,487 cases 79.9% were categorized as risk averse, with 20.1% being risk seeking. The first point to note is how well this fits with the majority of literature within the area. Its widely held that on average, individuals tend to prefer a safer option than a risky alternative and these results coincide with this those of Tversky and Kahneman (1981).

The mean income of the sample is £25,746. This aligns well with the average income in the UK in 2015- £27,600 (ONS, 2015). Of the 11,487 individuals, 53.5% were female, with 46.5% male. 63.8% of the 11,487 cases had no degree, with 36.2% having a degree. 59.3% of the sample identified themselves as being married, with 40.7% classed as not married. The large majority of the sample were aged between 25- 44 (41.8%) and 45- 64 (48.8%) with 16-24 making up 5.8% of the sample and 65 and over equaling 3.6%.

---

4. The average net pay per month variable from the WAS will be used to measure income in thousands of pounds.

"e^{i}" represents the error term, sample size = 11,487

Fig. 4.1: The distribution of income for both females and males.

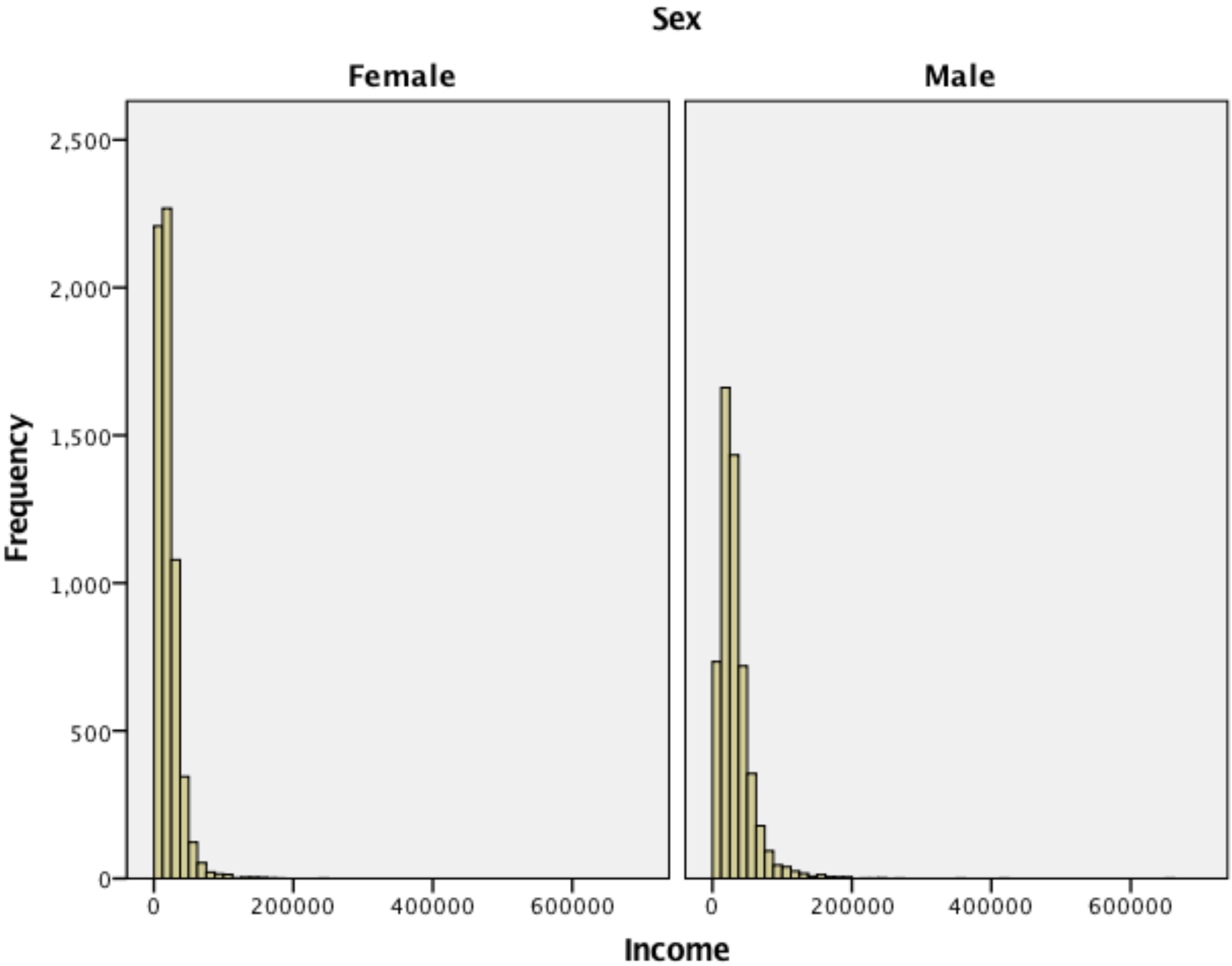


Fig. 4.1 provides information on the distribution of income amongst males and females. It shows that income is not normally distributed but skewed to the right for both genders. The skewedness to the right is greater for females than males. The fact incomes are clustered to the left nearer the lower values in the data indicate a positive skewedness. This is not unusual given the average income in the UK for full-time employees was £27,600 in 2015 with women tending to earn less than men, on average (ONS, 2015).

4.2: Association charts

Fig. 4.2. Association of risk, mean income and sex.

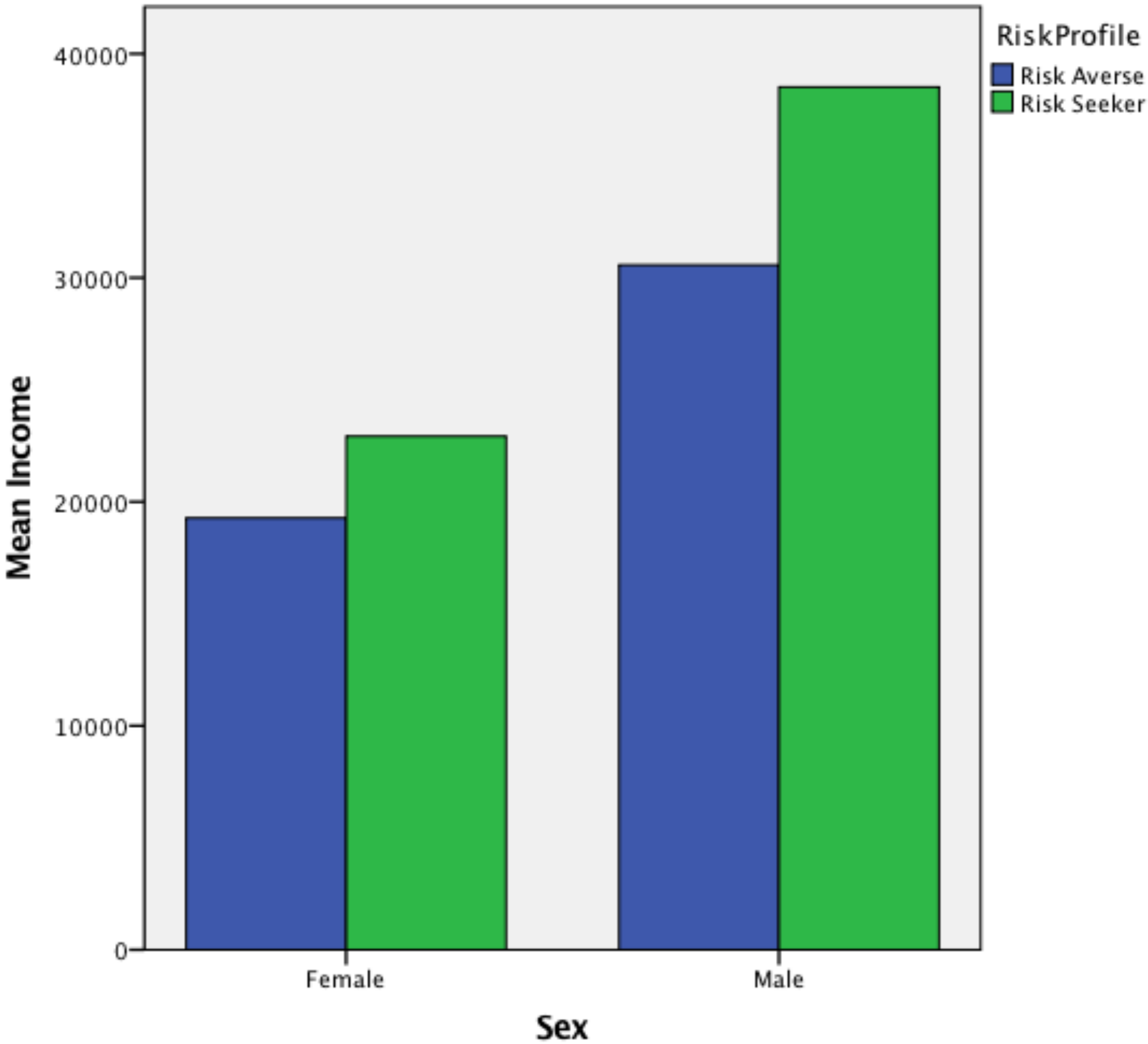
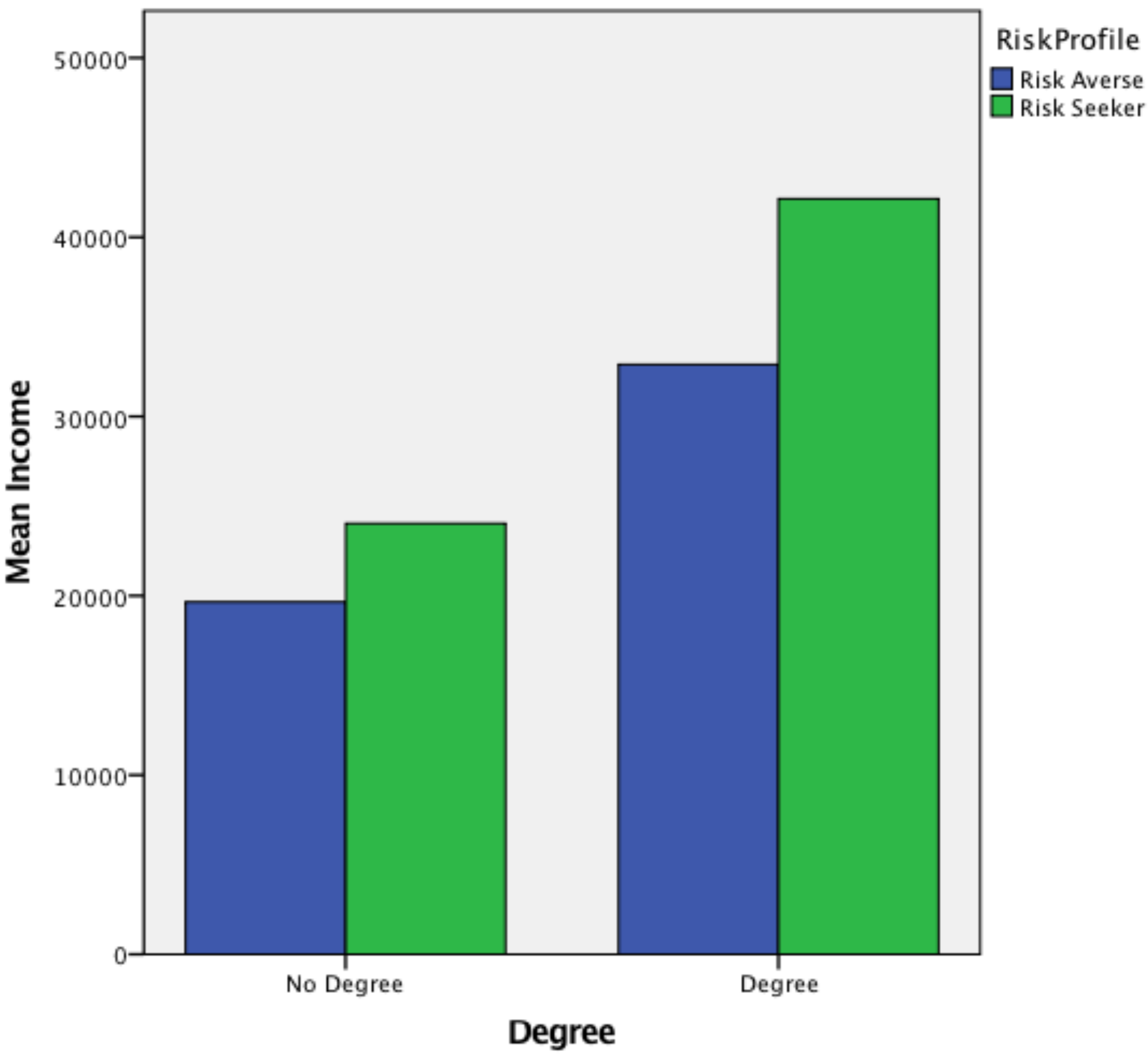


Fig. 4.2 shows the number of men and women in relation to their respective incomes and risk profiles. Focusing first on the risk profiles, the main point to take is that higher average incomes for both males and females are associated with a risk seeking profile. Whereas, the risk averse individuals, again for both genders, exhibit a lower income. This would indicate that higher incomes are associated with a risk seeking profile.

Fig. 4.2 also conveys that there is a greater return for males being risk seeking than there is for females being risk seeking, in terms of mean income. This is represented by the difference in mean income between risk averse males and risk seeking males and by the difference in mean income between risk averse females and risk seeking females. Whether it is risk profiles driving income levels or income levels driving risk profiles is unknown at this point. The chart also conveys that males, no matter what risk profile, have a greater mean income than females.

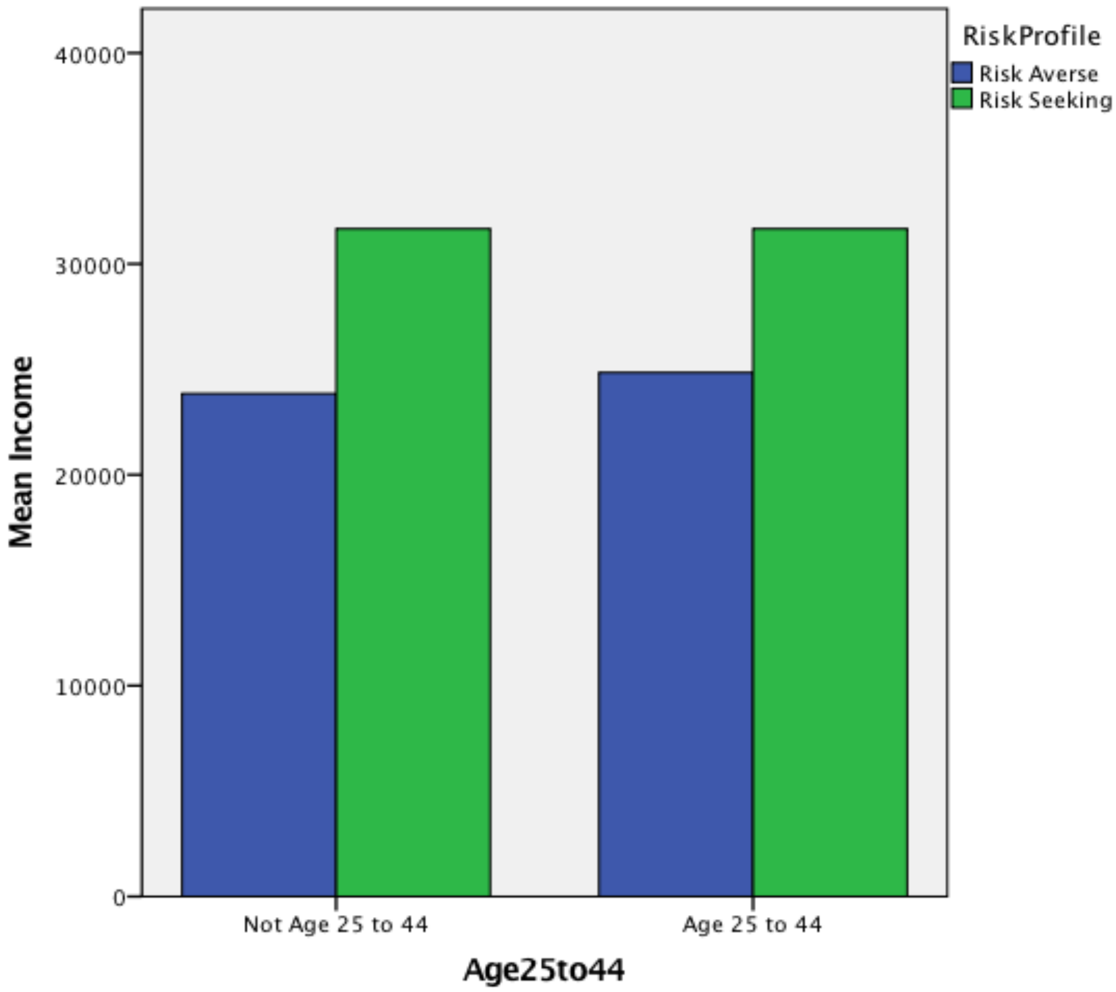
Fig. 4.3: Association of risk, mean income and education.



It's apparent from Fig. 4.3 that education level has a very strong association with mean income. This is not surprising given the vast array of literature which echoes this Houthakker (1959) and Morgan and Martin (1963). However, what is of more interest to the research is that there is no apparent distinction in this graph, between an individual with a degree and one without a degree in terms of risk profile. Elaborating further, risk seeking individuals in the category of 'No Degree' earn a higher mean income than their risk averting counterparts. Similarly, risk seeking individuals in the 'Degree' category earn more than risk averse individuals in the 'Degree' category. Similar to Fig. 4.2 risk seeking is associated with a greater mean income than risk aversion. Also, there is a greater monetary return for degree educated individuals being risk seeking than there is for non-degree educated individuals being risk seeking, in terms of mean income.

Given the majority of individuals in the sample are aged between; 25-44 and 45- 64, association measures will only be conducted on these two groups.

Fig. 4.4: Association of risk, mean income and age.



It's apparent from Fig. 4.4. that an individual aged between 25 to 44 has little difference to an individual not aged 25-44, in terms of risk profile and mean income. However, as seen in the other association graphs, risk seekers have a greater mean income than their counterparts, risk averters, irrespective of what age category they are in. This is contrary to what Donkers *et al* (2001) and Hartog *et al* (2002) find. Using several cross-sectional Dutch datasets, they find that older individuals exhibit more risk aversion than their younger counterparts.

Its apparent from section 4.2 that no matter what the independent variable is, risk seekers, on the whole, have greater mean incomes than risk averse individuals. Given that all the above are statistically significant, this is an important finding and one that has been found in numerous other studies. Cohn *et al* (1975), for example, find in their paper that greater income is highly positively correlated with risk seeking. However, as mentioned previously in the analysis and also highlighted by Cohn *et al* (1975), although there is an association between income and risk attitudes, the causality is still unknown.

4.3: Logistic regression

At present the analysis has shown there is a relationship between risk and income, however, its unknown at this time how much of a contribution income plays in defining an individual's risk profile. The logistic regression will solve this through providing firstly income with a predictor coefficient 'b', and secondly through providing the other independent variables with a predictor coefficient. An odds ratio represented by Exp(B) will also be analyzed in order to measure the effect size. The OR of the independent variables is the ratio of relative importance of the independent variables in terms of effect on the dependent variables odds.

The model will first examine risk and income and then incorporate all the control variables. This will allow the model to explore the predictive ability of variables while controlling for the effects of other predictors. Therefore, more variables will be added to test whether the relationship is due to other factors, for example, gender or education.

The first model looks at income as a predictor of individual risk.
Table. 4.3.1: Logistic regression on risk and income.

								95% C.I.for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Income	.013	.001	174.656	1	.000	1.013	1.011	1.015
	Constant	-1.742	.037	2230.068	1	.000	.175		

a. Variable(s) entered on step 1: Income.

Firstly, the B value of 0.013 demonstrates a positive relationship between income and risk meaning an increase in income slightly increases the likelihood of an individual being risk seeking. Within the model, the OR is 1.013 (Exp(B)) which implies that for every £1,000 increase in income, an individual's odds of becoming more risk seeking increase by 1.3%. Manipulating the data further in order to get an OR for risk aversion, the data shows that for every extra £1,000 an individual earns, the odds of being in the risk aversion category decrease by 1.3% (1/1.013= Exp(B)= 0.987). Given p= 0.000, the income variable contributes significantly to the predictive ability of the model. Thus the model suggests that when solely focusing on income, it does impact an individual's risk profile. However, to understand the predictive power further, other variables need to be added to ensure other factors aren't driving income. This allows for an insight into how much of the relationship can be attributed to income and how much to the other variables.

Table. 4.3.2: Logistic regression on risk, income, gender, education, age, self-employment.

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	Income	.010	.001	87.520	1	.000	1.010	1.008	1.012
	Sex(1)	.345	.049	48.643	1	.000	1.412	1.281	1.555
	Degree(1)	.132	.051	6.599	1	.010	1.141	1.032	1.262
	Age 25 to 44(1)	.118	.048	6.054	1	.014	1.125	1.024	1.236
	Self Employed(1)	.333	.162	4.222	1	.040	1.395	1.015	1.916
	Constant	-1.942	.048	1668.148	1	.000	.143		

a. Variable(s) entered on step 1: Income, Sex, Degree, Age25to44, Self Employed.

Incorporating all control variables into the model the OR for income now reduces to 1.10 immediately implying that some of the impact income had on risk seen in the previous model, was due to the control variables. Still, for every £1,000 increase in income the odds/chances of an individual being risk seeking is 1.1%.

Gender

The OR for gender is significantly greater than the OR for income at 1.4 conveying that gender has a greater impact on risk than income does. The model predicts that males are more likely to be risk seeking than females controlling for other factors with B=0.345. If male and females had an equal chance of being risk seeking Exp(B) would be 1. Given its 1.4, the odds of a male being risk seeking are 40% greater than the odds of a female being risk seeking. Furthermore, the odds of men being risk seekers are 1.4 times higher than they are for women. Although the OR is 1.4, the model is 95% confident that the actual value of OR in the population lies somewhere between 1.28 and 1.56.

Education level

The degree variable within the model conveys that those with a degree are more likely to be risk seeking than those without, with B= .132. To go further, the odds of a degree educated individual being risk seeking are 14% greater than the odds of an individual without a degree.

Age

Age is included in the model due to individuals aged between 25 to 44 making up 42% of the population. The model analyses whether those aged between 25 to 44 have a different risk profile than those not within that age category. Controlling for other factors, the model predicts that those aged between 25 to 44 are more likely to be risk seeking than any other age within the sample i.e. than those aged between 16- 24 and 45 and over. This is demonstrated by B= .118. To add further context, the odds of individuals aged 25 to 44 being risk seeking are 13% greater than those not within that age bracket (Exp(B) = 1.125). With a statistical significance of 0.014, the model is 95% confident that that the actual value of OR for those aged between 25 to 44 is between 1.024 and 1.236.

Self-employment

The model found that self-employment was a good predictor of an individual's risk profile. Like the other variables, self- employment has a positive relationship with risk seeking with B=0.333. In fact, the odds of risk seeking for self-employed individuals are 40% greater than those who aren't self-employed. This mirrors Hartog *et al* (2002) research on measured risk aversion and individual characteristics which finds that self-employed individuals are significantly less risk averse. Hartog *et al* (2002) points towards a lower level of risk aversion being a widely adopted assumption to explain entrepreneurial activity.

Static analysis summary

Out of all the variables within the model, an individual's gender is the most predictive on an individual's risk profile with income being the least predictive. All of the logistic regressions models have pointed towards the characteristics of an individual likely to be risk seeking as; a higher earner, male, degree educated, aged between 24 to 44 and self-employed. With a greater chance of risk averters displaying characteristics of; a low earner, female, no degree education, not aged between 25 to 44 and not self-employed. A large amount of literature like Barskey *et al* (1997), Sahm (2008), Dohmen *et al* (2009) and Schooley and Worden (1996) all display similar results to these found in the logistic regression models so this comes as no surprise.

5. Main outcomes

It was evident throughout the various statistical techniques used that an individual's risk profile has a positive relationship with income. To go further, as an individual's income increases their propensity to take risk and likelihood to gamble for the £10,000 increases, for example, for every £1,000 increase in income, the odds of an individual being risk seeking increase by 1%. Despite control variables being added to the logistic regression, the estimated effect of income remained remarkably stable which suggests a possible causal effect between income and an individual's risk profile.

Although the model estimated that income remained stable when incorporating other variables, the model pointed towards other characteristics such as; gender, education level, self-employment and age to be of greater predictive power of an individual's risk than income. The findings align particularly well with the research of Halek and Eisenhauer, 2001, Riley and Chow, 1992 and Bellante and Green, 2004, who all find that income, gender, education, age and self-employment have a relationship with risk.

All of the above has aided the understanding of the relationship between income and individuals risk profiles in the UK, as well as provided an assessment on how much income predicts risk levels in the UK. Relating the results back to the hypothesis mentioned in section 2, it can be concluded that as an individual's income increases, they become less risk averse. However, it needs to be highlighted that this research doesn't examine the causality between income and an individual's risk profile or the causality between risk and other variables. Thus, the causality is still unknown.

6. Policy recommendations

Given the main findings of this research, the first policy recommendation surrounds the results from Section 4.2 which highlights that those of risk seeking nature earn significantly more mean income than those of a risk averse profile. At a micro level, this in itself suggests that those of low income may be too risk averse when investing in financial products that provide higher returns. In order to overcome this, policymakers should, seek to improve the financial education of low income earners. This will provide low income earners with a greater knowledge on investing in financial products and steadily move them away from a risk profile deemed too risk averse.

On a broader macro sense, given the findings highlight that richer individuals take more risks; this could prove problematic. Firstly, a boom in the economy could lead to rich individuals starting unsuccessful businesses as well as irrational investments in housing. This could possibly be a factor behind booms turning into busts. The immediate policy recommendation from this would be to ensure that monetary policy considers the role of risk preferences when used. Also, a change in banking regulation which requires more financial oversight by banks when providing loans and mortgages to individuals could help reduced risky investments.

Acronyms and Abbreviations

WAS	Wealth and Assets survey
ONS	Office for National Statistics
Min	Minimum
Max	Maximum
Std. Dev.	Standard Deviation
Stat.	Statistic
OR	Odds Ratio

References

Baltussen, G, Thierry, P, Thaler, R, H, and Martijn J, (2008) 'Deal or No Deal? Decision Making under Risk in a Large-Payoff Game Show.' *American Economic Review,* 98(1), pp. 38-71.

Barsky, B, R, Juster, T, F, Kimball, S, M, Shapiro, D, M. (1997) 'Preference parameters and behavioural heterogeneity: An experimental approach in the health and retirement study.' *The Quarterly Journal of Economics,* 112(2), pp. 537-579.

Beetsma, R, M, W, J, and. Schotman, P, C. (1997) *'Measuring risk attitudes in a natural experiment: an empirical analysis of the television game show LINGO.'* Center Discussion paper 9808, Tilburg, Tilburg University.

Bellante, D, and Green, C, A. (2004) 'Relative Risk Aversion among the Elderly.' *Review of Financial Economics,* 13(3), pp. 269–281.

Botti, F, Conte, A, DiCagno, D, T, and D'Ippoliti, C. (2007) 'Risk Attitudes in Real Decision Problems.' *The B.E. Journal of Economic Analysis & Policy*, 8(1), Article 6.

Brown V, J. (2014) 'Risk perception: it's personal.' Environ Health Perspectives, 122(10), A276–9, http://dx.doi.org/10.1289/ehp.122-A276

Cohn, A, R, Lewellen, G, W, Lease, C, R, and Schlarbaum, G, G. (1975) 'Individual investor risk aversion and investment portfolio composition.' *The Journal of Finance,* 30(2), pp. 605-620

Cook, W and Whittle, R. (2015) 'Do individuals' risk and time preferences predict entrepreneurial choice?' Munich Personal RePEc Arhcive, Manchester Metropolitan University, MPRA Paper No. 66674.

Ding, X, Hartog, J, Sun, Y. (2010) 'Can we measure Individual Risk Attitudes in a Survey?' Tinbergen Institute Discussion Paper, No. 10-027/3 [Online] [Accessed on 22nd June 2017] https://www.econstor.eu/bitstream/10419/87026/1/10-027.pdf

Dohmen, T, Falk, A, Hu man, D, Sunde, U., Schupp, J, & Wagner, G, G. (2009) 'Individual risk attitudes: Measurement, determinants and behavioural consequences.' *Journal of the European Economic Association,* 9, pp. 522-550.

Dohmen, T, Huffman, D, Schupp, J, Falk, A., Sunde, W, Wagner, G, G. (2011) Individual Risk Attitude: Measurement, Determinants, and Behavioural Consequences, *Journal of the European Economic Association,* 9(3), pp. 522- 550.

Donkers, B, Melenberg, B, Van Soest, A. (2001) 'Estimating Risk Attitudes using Lotteries: A Large Sample Approach.' *Journal of Risk and Uncertainty,* 22, pp. 165-195.

Flachaire, E and Hollard, G. (2008). 'Individual sensitivity to framing effects.' *Journal of Economic Behaviour & Organization*, 67(1), pp. 296-307.

Halek, M, and Eisenhauer, J, G. (2001) 'Demography of Risk Aversion.' *Journal of Risk and Insurance,* 68(1), pp. 1–24.

Hanna, S. D, Gutter, M. S, Fan, J, X. (2001) 'A Measure of Risk Tolerance Based On Economic Theory.' *Financial Counselling and Planning,* 12(2), pp. 53-60.

Hartog, J, Ferrer-i-Carbonell, A, Jonker, N. (2002) 'Linking Measured Risk Aversion to Individual Characteristics.' *Kyklos,* 55(1), pp. 3-26.

Hopland, A, O, Matsen, E, and Strom, B. (2013) 'Income and Choice Under Risk.' Department of Economics, Working Paper No. 14313, Norwegian University of Science and Technology. [Online] [Accessed on 8th August 2017] http://ideas.repec.org/p/nst/samfok/14313.html.

Houthakker, S, H. (1959) 'Education and Income.' *The Review of Economics and Statistics*, 41(1), pp. 24- 28.

Kachelmeier, S, J. and Shehata. (1992) 'Examining Risk Preferences Under High Monetary Incentives: Experimental Evidence from the People's Republic of China.' *American Economic Review*, 82(5), pp. 1120-1141.

Kahneman, D and Tversky, A. (1979) 'Prospect Theory: An Analysis of Decision under Risk.' *Econometrica,* 47(2), pp. 263- 291.

Lane, S. D., & Cherek, D. R. (2000). Risk aversion in human subjects under conditions of probabilistic re- ward. Psychological Record, 50, 221–234.

Maskin, E and Riley J. (1984) 'Optimal Auctions with Risk Averse Buyers.' *Econometrica,* 52(6), pp. 1473- 1518.

Morgan, J, N, and Martin, D, H. (1963) 'Education and Income.' *Quarterly Journal of Economics,* (August): pp. 423- 437.

Office for National Statistics (2015) *Annual Survey of Hours and Earnings: 2015 Provisional Results,* Unknown place of publication: Office for National Statistics. [Online] [Accessed on 17th April 2017] https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/bulletins/annualsurveyofhoursandearnings/2015provisionalresults

Office for National Statistics. Social Survey Division. (2016). *Wealth and Assets Survey, Waves 1-4, 2006-2014*. [data collection]. *4th Edition,* Accessed 02 December 2016, UK Data Service. SN: 7215, http://doi.org/10.5255/UKDA-SN-7215-4

Riley, W, B, and Chow, K, V. (1992) 'Asset Allocation and Individual Risk Aversion.' *Financial Analysts Journal,* 48(6), pp. 32–37.

Sahm, C. (2008) 'How Much Does Risk Tolerance Change?' *Finance and Economics Discussion Series 2007- 66,* Washington, Divisions of Research & Statistics and Monetary Affairs Federal Reserve Board, pp. 2-42.

Schooley, D, K and Worden, D. (1996) 'Risk Aversion Measures: Comparing Attitudes and Asset Allocation.' *Faculty Publications School of Business*, Paper 24, http://digitalcommons.georgefox.edu/gfsb/24

Thomas, P, J. (2015) 'Measuring risk-aversion: The challenge', *Elsevier,* 79(1), pp. 285- 301.

Tversky, A, and Kahneman, D. (1981) 'The Framing of Decisions and the Psychology of Choice.' *Science,* 211(4481), pp. 453- 458.

Vieder, M, F, Truong, N, Martinson, P, Nam, K, P. (2013) *'Risk Preferences and Development Revisited, A Field Experiment in Vietnam.'* Social Science Research Center, Berlin: WZB, Discussion Paper: SP II 2013–403, Berlin, WZB [Online] [Accessed on 10th April 2017] https://bibliothek.wzb.eu/pdf/2013/ii13-403.pdf

Villanueva, E. (2007) 'Estimating compensating wage differentials using voluntary job changes: Evidence from Germany.' *Industrial and Labor Relations Review,* 60(4), pp. 544- 561

Yesuf, M, and Bluffstone, R. (2007) '*Risk Aversion in Low Income Countries: Experimental Evidence from Ethiopia*.' IFPRI Discussion Paper 00715. Washington: