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Risk aversion and life cycle decisions

This paper tries to find a relation between an individuals' risk attitude and the fact whether he/she is married, has children or is divorced.
This paper finds no significant relation between an individuals' risk attitude and whether he/she is married or has children. It does find that the odds of an individual who is risk seeking to be divorced are more than the odds for an individual who is not divorced. This paper also surprisingly finds that risk-seeking males have higher the odds to be married compared to risk seeking women. However this effect is only significant in the subsample and at 10% significance level.

Table of contents

1. Introduction

It is becoming more and more common in economics to link economic aspects with psychological aspects. The emerging discipline of behavioural economics is a result of this. Here in this field it is common to examine what kind of relation exists between economic aspects and more psychological, behavioural aspects. Examples of this are (Brewer, 2007) who found that risk perceptions are rightly placed as core concepts in theories of health behaviour. And (Ulleberg & Rundmo, 2003) who concluded that personality primarily influences risky driving behaviour indirectly through affecting the attitudinal determinants of behaviour. Another example is the research done by (Andersona & Mellor, 2008) who found that risk aversion is negatively and significantly associated with cigarette smoking, heavy drinking, being overweight or obesity, and seat belt non-use.

A last example of a research conducted in the behavioural economics field is a research done by (Bucciol & Zarri, 2013) who found that there is a correlation between the risk attitude of a person and the occurrence of negative events out of their control, such as being a victim of a physical attack or losing an child.

This paper continuous this trend by examining the relation between a persons' risk attitude and whether he/she is married, has children or is divorced. Whatever the outcome of this research might be, it will be a useful addition to the already existing literature about the relation between a persons' risk attitude and being married, having children or being divorced. This is because there still isn't any clear evidence that one type of risk attitude relates to a specific outcome. This statement is backed up, when we examine some findings other researchers made. For example (Andersen & al, 2000) found that having children at a later age strongly increases a woman's chances of at least three untoward outcomes, namely stillbirth, miscarriage, and ectopic pregnancy. Based on this finding one can argue that people who get children at a later age take more risks, because the chance of a complication gets higher, therefore these people can be seen as less risk-averse.

On the other hand by reasoning one can argue that people who are more risk averse, generally speaking have a more 'quiet' lifestyle than people who are

more risk seeking. Risk seeking people tend to be more adventurous, and are less likely to settle down which usually involves having children and getting married. Having children means taking more responsibility and taking fewer risks, because you want more certainty for your children. Which is in line with the findings of (Görlitz & Tamm, 2015) who found that men and women experience a considerable increase in risk aversion, which already starts as early as two years before becoming a parent. This increase of risk aversion is at his peak right after giving birth. As you can see, arguments can be made for both a risk averse as a risk seeking to be related to being married, having children or being divorced. This ambiguity grows further when on the one hand we find that (Guillon, 2016) states that risk aversion is positively correlated with condom use among heterosexual men, meaning less chance at unwanted pregnancies and thus having children. While another finding is that the use of a condom amongst heterosexual women is positively correlated with the future preferences. Meaning that when a heterosexual woman has the future preference to have children, she might engage in unprotected sex. So while the action itself of having unprotected sex might be seen as risk seeking behaviour, the goal of performing this action might be to have children.

By looking at the examples this paper just mentioned it isn't very clear what the predicted relation should be between a persons' risk attitude and having children.

When we examine findings that could help this paper make predictions about the relation between a persons' risk attitude and getting married/divorced, we find evidence that married individuals are less risk seeking than not married individuals. For example (Roussanov & Savor, 2013) find that single CEO's exhibit higher stock return volatility than married CEO's.

On the other hand one can argue that when you are married as an individual, you're financially more stable which would allow you to take more risks. The contradiction between the findings of papers like (Roussanov & Savor, 2013) and the argument just made, make it worthwhile for this paper to examine this relationship.

Since this paper is interested in the relation between a persons' risk attitude and whether he/she is married, it seems only logical to also research its relation to

being divorced. It is well known that getting married and being divorced go hand in hand together.
Like mentioned before this paper will try to determine if there is a relation between the risk attitude of an individual and the mentioned characteristics. Therefore the research question of this paper is constructed as follows:

Is their a relation between the risk attitude of an individual and important life decisions, such as getting married, having children or getting divorced?

This research will be supplementary to the already existing literature. Where most of the existing literature focuses only on one of the characteristic (having children, getting married/divorced), this research tries to find results about all three characteristics. This would be a useful addition to the existing literature, since this research is done with a sample from the Netherlands,, where most researches regarding this topic originate from other countries. There is also a social relevance in having more information regarding this topic. For certain companies (e.g. companies who sell financial products) it could be very useful to know if certain characteristics (being married/divorced or having children) of an individual could go hand in hand with a certain risk attitude.

This paper shows significant findings that the odds of someone who is risk seeking to be divorced are higher than for individuals who are more risk-averse, ceteris paribus. There is no significant difference in odds found between the individuals who are risk averse and individuals who are risk seeking with regard to their relation to being married and/or having children.
The structure of the paper is as follows: in section 2 previous literature regarding this topic will be discussed; in section 3 the experimental design along with methodology will be discussed; in section 4 the results will be presented, leading to the discussion and conclusion in section 5.

2. Literature review

Determinants of getting married

This paper faces the problem that there isn't much prior literature about the determinants of being married. A possible reason for this is that the reasons to get married differ too much per person. Despite this there are still one or two paper that focus on the determinants of being married, which will be discussed here.

One of these papers is from (Kabir , Jahan , & Jahan, 2001) who stated that for females, education appears to be the strongest determinant of variation in age at marriage. And that other factors such as: place of residence, work status, religion and geographic region show statistically significant relationships.

This paper is also interested in whether gender influences the relation between a persons' risk attitude and being married. (Eckel & Grossman, 2008) find that women are more sensitive to risk than men, and that this will be reflected in all aspects of their decision making, which also includes the decision making to get married. So if the result is that risk attitude is a determinant of getting married, we can also expect that there will be an interaction effect between gender and a persons' risk attitude. The findings of (Bergstrom & Schoeni, 1996) support this expectation; they constructed a model that found that the income of males will be positively associated with age-at-first-marriage. For females this relation between earnings and age-at-first-marriage was a lot weaker. So they also find differences between males and females.

This aim of this study is to find a relation between the risk attitude of an individual and the fact if someone is married/divorced or has children.

We've seen however that risk attitude is rarely mentioned as one of the determinants of getting married. (Spivey, 2010) encountered the same problem and stated that 'The literature on marriage and fertility decisions has paid little attention to the effect of risk preferences and uncertainty on the timing of these decisions'. This paper mainly agrees with this statement, since there are very few papers that link these topics together. In the introduction we have seen that there are a couple of papers, who have made statements from which you can indirectly conclude or assume certain relations regarding this topic.

Therefore the research of (Spivey, 2010) is one of the few relevant research this paper finds regarding this relationship. (Spivey, 2010) found that risk aversion significantly affects the time to marriage; respondents of his research who were more risk averse married sooner (at a earlier age) than respondents who were more risk seeking. Which is in line with what (Schmidt, 2008) found that being risk averse is positively related to being/ getting married.
At the study of (Spivey, 2010), the age at which someone got married was taken into account, however in the study that that this paper conducts only the fact if someone is married or not is taken into account. Despite this, the findings of this study could be seen as very useful when conducting this research.
An other rare research that found results regarding this matter is from (Faff & McKenzie, 2011). They found that marital status, number of dependents, age, education, income, combined income, and net assets are significant determinants of risk tolerance in their own right. This finding supports the prediction that risk preference and marital status are correlated.

Determinants of getting divorced

(Light & Ahn, 2010) argued that getting divorced is usually seen as a risky gamble. They found that a 1-point increase in risk tolerance raises the predicted probability of divorce by 4.3% for a representative man and by 11.4% for a representative woman. This finding makes this paper believe that there is a relation between getting divorced and having a certain risk attitude.
Unfortunately there aren't many other researches found by this paper that link the probability of being divorced to an individuals' risk attitude.
However there are other factors that may influence the probability that someone is divorced. One of these factors is whether a person lives in an urban or a rural area. So does (Gautier, Svarer, & Teulings, 2009) find that from the marriages formed in the city, couples that remain living in the city have a 23% higher divorce rate than couples that move to a rural area.
Another interesting statement regarding this topic is the statement made by (Hoem, 1997). He said that the sign of the educational gradient in divorce risks seems to depend on the balance between countervailing influences. And that this differs a lot per country. This finding done by (Hoem, 1997) makes it

worthwhile to look into the relationship between education and the probability of being divorced, when using a sample from the Netherlands. Another finding regarding this topic, which moreover is in line with the previous finding done is the finding by (National health statistics report, 2012). This paper has found that divorce is linked to a number of demographic variables, including religious background and education level. Specifically, those who have religious affiliations and who are more highly educated tend to have longer-lasting marriages. Their data also reveal that divorce risk is linked to race/ethnicity. For example, African American women seem to have much higher odds of early divorce than Asian American women.

Most of the other researches done, mainly find that certain psychological and/or social factors are the key determinants of a person getting divorced in their life. This is in line with what (Lehmiller, 2017) argued; he said that there are many psychological factors that statistically speaking are associated with being divorced.

Relation risk attitude and having children

When we look at the prior literature regarding this topic, some interesting findings are done. By examining other researches this paper comes o thhe concusion that the relation between a persons' risk attitude and the fact if he or she has children is complicated. On the one hand (Schmidt, 2008) finds that greater tolerance for risk (more risk-seeking behavior) leads to earlier births at young ages, which is consistent with the finding that these women are less likely to effectively take contraception. On the other hand (Browne, Jaeger, Richter, & Steinorth, 2016) found that the existence of children in a household moderates the willingness of the parents to take risks, which makes parents less willing to take risks. He states however that this only holds when we look at the birth of the first child, since no change in the willingness to take risks is found due to the birth of more than one child. This is similar to what (Görlitz & Tamm, 2015) found, which is that men and women experience a considerable increase in risk-aversion that already starts as early as two years before becoming a parent. This increase in risk-aversion is the largest shortly after giving birth and disappears when the child becomes older. We see that both types of risk attitude play a role,

which depends on the timing of measurement. More specifically, it matters if you measure a persons' risk attitude around the time the women gets pregnant or when the women gives birth.
Of course there are also other important determinants, when analysing the probability of having children. So does the (National center for health statistics, 2018) find that among women aged 18 to 44, those in rural areas have had more children than their urban counterparts; with 1.56 children per rural woman and 1.28 children per urban woman, on average.

Gender differences
Most previous studies agreed that women are generally more risk averse than men. For example (Bernasek & Shwiff, 2001) who state that single women are more risk averse than single men and married couples. This is in line with the findings of (Faff & McKenzie, 2011) who found strong evidence that women differ from men in their attitude to financial risk taking. They conclude that in general, women are shown to be less risk tolerant than their counterpart, being males.
However recent studies show that this isn't always the case. (Hibbert, Lawrence , & Prakash,, 2008) find that when individuals have the same level of education, women are no more risk averse than men. This is in line with what (Filippin & Crosetto, 2014) state, that gender differences systematically correlate with the features of the elicitation method used and in particular the availability of a safe option and fixed probabilities. Therefore it is important that the elicitation method of this research is clear and will be thoroughly discussed; this is done in section 3.2.
These findings make it even more interesting for this paper to examine the role that gender will have when examining the relation between risk attitude and having children and getting married/divorced.

Based on all these prior findings the following four hypotheses are formulated:

H1: Individuals who are more risk-averse are more likely to be married than individuals who are risk seeking.

H2: Women who are risk seeking are less likely to be married than men who are risk seeking.

H3: Individuals who are more risk seeking are more likely to be divorced compared to Individuals who are risk averse.

H4: Individuals who are more risk-averse are more likely to have children than individuals who are more risk seeking.

3. Methodology and Data

The goal of this paper will only be, to try to find if there is a (co) relation between having children, being married or being divorced and the risk attitude of an individual.

The main argument why it should not be the goal to find a causal relationship is the possibility of simultaneity. Simultaneity occurs when the dependant variable y causes x, and the independent variable x causes y at the same time.[1]

In this research simultaneity can occur as follows:

- Having children, being married or being divorced has a certain effect on the risk attitude of an individual.
- Having a certain risk attitude affects whether an individual has children, is married or is divorced.

Because it is basically impossible to determine which of the two effects is more dominant at an individual, one must be very cautious to make causal claims. (Görlitz & Tamm, 2015) have encountered the same obstacle and emphasized that, analyses using risk preferences as the explanatory variable for economic outcomes, should be careful in interpreting the findings as causal effects.

3.1 Experimental design

The hypotheses will be tested using cross-sectional data that is acquired by an organization called LISS. This organization collects data by conducting surveys and questionnaires; by doing so this paper will use data from 3454 individuals. This paper will use data from a questionnaire LISS conducted called 'Measuring higher order risk attitudes of the general population'. In the part of the questionnaire that this paper will use, each time the participants had to choose between a certain amount of money and a lottery.

The questions were presented in a way such that the experimental condition couldn't influence the results. The experiment tried to do this in three different ways: 1) For some participants the sequence of questions was mirrored, opposed to the original setting. 2) Some of the participants (40 percent) could win real money based on the choices he/she made, while for the rest (60 percent) the

[1] Simultaneity is often confused with reverse causality, which takes place when only the dependent variable y causes x (not the other way around)

game consisted out of hypothetical choices. 3) A part of the participants that had to make hypothetical choices were presented with payoffs that were multiplied by 150. This was done to eliminate the factor that people behave different when it comes to choices concerning small amounts of money opposed to larger amounts of money.

The five games that were presented to the participants can be seen in figure 1.

Figure 1:Experiment to measure risk attitude

	Left	Right	
Game 1	20	(65, 0.5; 5, 0.5)	EV=35
Game 2	25	(65, 0.5; 5, 0.5)	EV=35
Game 3	30	(65, 0.5; 5, 0.5)	EV=35
Game 4	35	(65, 0.5; 5, 0.5)	EV=35
Game 5	40	(65, 0.5; 5, 0.5)	EV=35

1. The lottery is presented as follows: (x,y), where x is the payoff that can be earned with a y% chance.
2. EV= Expected Value, which is calculated by multiplying x with y

As can be seen in figure 1, each game a participant had the choice to choose the left or the right option. With the left (right) option being 'the safe option' in the original (mirrored) setting, where the outcome started at 20 euros and increased each game with 5 euros up to 40 euros. The right option was a lottery in which you had a 50 percent probability to win 65 euros and a 50 percent probability to win 5 euros.

Note: Unless monotonicity is violated a participant will not switch more than one time from the left to the right, vice versa. However after testing if some participants violate monotonicity, it becomes clear that approximately 1/3 of the participants violate this principle. To make sure this doesn't affect our estimations of the risk attitudes of the individual, a subsample is created where the participants who violate monotonicity are left out.[2]

[2] The use of this subsample rather than using the whole sample doesn't alter any conclusions being made.

3.2 Eliciting risk attitude

An important part of finding a relation between the risk attitude of an individual and whether he/she is married/divorced or has children, is eliciting the risk attitude of an individual. This will be done using the same method as (Holt & Laury, 2002). They elicited risk attitude by counting the number of safe choices a participant makes. This paper will also make use of the general definition used by (Kahneman & Tversky, 1979) to determine whether an individual is risk-averse or risk seeking. According to (Kahneman & Tversky, 1979) an individual is risk averse if he prefers the certain prospect (x) to any risky prospect with an expected value of (x). An individual is risk seeking when he prefers any risky prospect with an expected value (x) to the certain prospect (x). So in order to determine whether someone is risk-averse or risk seeking, it is required to calculate the expected value of the 'risky' prospect. The expected value of each game can be seen in figure 1.

With the definition stated by (Kahneman & Tversky, 1979) in the back of our minds we can conclude that a risk- averse individual will choose the safe option at least two times (game 4 and 5). Depending on the level of risk- averseness, this individual could also choose the safe option in game 1,2 and 3.

A risk-seeking individual will only choose the safe option one time or less depending on how risk seeking the individual is.

Figure 2: summary experiment results

Category	Definition	Number of women	Number of men	Total Individuals
Risk averse	Chooses safe option 2 times or more	1576	1335	2911
Risk seeking	Chooses safe option 1 time or less	241	302	543
Total		1817	1637	3454

The above figure summarizes the results of the experiment.

3.3.1 Data description

Risk attitude:	
Risk averse	Yes, **2528 (85%)**; No, **445 (15%)**
Risk seeking	Yes, **445 (15%)**; No, **2528 (85%)**
Experimental controls:	
Exp. Condition	Normal real stakes, **889 (30%)**; Low real stakes, **297 (10%)**; Normal hypothetical stakes, **929 (31%)**; High hypothetical stakes, **858 (29%)**
Position of tasks	Safe option on the right, **1.514 (51%)**; Safe option on the left, **1.459 (49%)**
Seq. order	Ascending value, **1.505 (51%)**; Descending value, **1.468 (49%)**
Demographic controls:	
Female	Yes, **1.520(51%)**; No, **1.453 (49%)**
Age (in years)	Mean: **48.63**; Std. Dev: **17.29**; Range: **[16, 93]**; Median: **50,50**
Childcat	No children, **1710 (58%)**; One or two children, **968 (33%);** More than two children, **295 (10%)**
Children	Yes, **1263 (42%)**; No, **1.710 (58%)**
Married	Yes, **1.991 (67%)**; No, **982 (33%)**
Civil Stat.	Married, **1.991 (58%)**; Separated, **3 (0%)**; Divorced, **294 (9%)**; Widow or widower, **184 (5%)**; Never been married, **982 (28%)**
Divorced	Yes, **294 (9%);** No, **3160 (91%)**
Educcat	Low education, **824 (28%);** Mid education, **955 (32%);** High education, **1165 (40%)**
Urbancat	Not Urban, **1127 (38%);** Slightly urban, **650 (22%);** Urban, **1188 (40%)**

Table 1: Descriptive statistics of the used variables of this paper

3.3.2 Additional information data

The variable *childcat* is manually constructed, resulting in the three categories shown in table 1. This paper chose for these specific specifications because having no children compared to having any children is a big difference for an individual. Furthermore this paper also chose to distinguish for individuals who have more than two children. This is done because the average amount of children for an individual in the Netherlands is approximately two children (Centraal Bureau Statistiek, 2018).

The variable *married* is constructed out of the variable *civil stat.* The individuals who are divorced or a widower or separated aren't considered in this variable.[3]
The variable *educcat* is also manually constructed, according to the definitions of (Centraal Bureau Statistiek, 2018). Someone is labelled as low educated when he/she has only finished primary school, VMBO, or has no education. Someone belongs to category 'mid education' when he/she has only finished HAVO/VWO, MBO. Someone is highly educated when he/she finished HBO or university (Centraal Bureau Statistiek, 2018).
The variable *urban* is also categorized using the definitions of Centraal bureau Statistiek. According to (Centraal Bureau Statistiek, 2018) someone lives in a non-urban area when there are less than 1000 houses per square kilometre. An area where there are more than 1500 houses per square kilometre is defined as urban. Based on these two definitions, the gap that contains the areas with 1000 to 1500 houses per square kilometre will be defined as slightly urban.

3.4 Model choice

When we look at the aim of this study it is clear that the variables: 'married', 'children' and 'divorced' will be used as the dependant variables. When we examine the data in the previous section, we can see that these variables are binary variables[4]. Therefore this paper has the choice between using a probabilistic (probit) or a logistic (logit) model. There isn't much difference between the conclusions that are drawn from both models. Therefore this paper will choose to use a logistic (logit) model to do the analysis, because of the familiarity with this model and because it easier to interpret by using odds ratios.[5]

[3] This paper acknowledges that widowers and divorced individuals also chose to married once in their lives. However since it is unclear when these individuals were married and what their risk attitude on that specific moment was, these individuals aren't considered.
[4] Binary variables are variables that can only take two values.
[5] More details about how odds ratios are calculated follow in this section.

Logit/logistic model

The general form of a probit model is as follows:

$$\Pr(y=1 \mid x_1, x_2) = \frac{\exp(\beta_0 + \beta_1 x_1 + \beta_2 x_2)}{1 + \exp(\beta_0 + \beta_1 x_1 + \beta_2 x_2)}$$

Y= the dependant variable

x1,x2….xN= the name of an independent variable

β0= coefficient of the constant

β1,β2….βn= coefficient of independent variable

This model has a S-shaped distribution that will take any value that is between the parentheses and transforms it to a probability that has to be between 0 and 1. This solves the problem a linear probability model has, where the minimum and maximum value can fall outside 0 and 1. This is of course impossible since we are talking about probabilities.

The outputs shown in section 4 are those from the STATA demand 'logistic'. This way the coefficients can be directly interpreted as odds ratios. An odds ratio compares two odds with each other. This is much more convenient and straightforward to interpret than odds log units, which are projected when just using the 'logit' demand in STATA.

To clarify how STATA obtains the output when performing a logistic regression (command 'logistic'), we will use the model of this paper where we consider 'risk seeking' as the only independent variable as an example. In order to know how STATA obtains the output when running the 'logisitc' command, we first have to understand how STATA obtains the output when running a 'logit' command. Let us consider the following output:

Figure 3: STATA output 'logit' command

```
. logit married riskseeking

Iteration 0:   log likelihood = -1886.0569
Iteration 1:   log likelihood = -1882.8283
Iteration 2:   log likelihood =  -1882.823
Iteration 3:   log likelihood =  -1882.823

Logistic regression                             Number of obs     =      2,973
                                                LR chi2(1)        =       6.47
                                                Prob > chi2       =     0.0110
Log likelihood =  -1882.823                     Pseudo R2         =     0.0017

------------------------------------------------------------------------------
     married |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
 riskseeking |   .2851848   .1137721     2.51   0.012     .0621956    .5081739
       _cons |   .6659748   .0420036    15.86   0.000     .5836492    .7483004
------------------------------------------------------------------------------
```

Here we see the output when STATA runs the command 'logit', when the dependent variable is 'married' and the independent variable is ' risk seeking'.

Variable 'married': married =1 and not married=0

Variable 'risk seeking': risk seeking=1 and risk averse=0

This can be summarized as:

Figure 4: Summary outcomes

	Married= yes	Married=no
Risk seeking	Married and risk seeking	Not married and risk seeking
Risk averse	Married and risk averse	Not married and risk averse

Let p(x) be the probability of being married for any given value of 'risk seeking', and

Logit(p(x))= log[p(x)/1-p(x)]= $\alpha+\beta x$

Then x=0 (risk averse), logit(p(x))=logit(p(0))= $\alpha+\beta$(risk averse)= 0.6660

x=1 (risk seeking), logit(p(x))=logit(p(1))= $\alpha+\beta$(risk seeking)= 0.6660+0.2852

The odds of being married amongst risk averse individuals: p(risk averse)/(1-p(risk averse))

The odds of being married amongst risk seeking individuals: p(risk seeking)/(1-p(risk seeking))

So,
Odds Ratio = odds of being married amongst risk seeking individuals=
p(risk seeking)/(1-p(risk seeking))
/
odds of being married amongst risk averse individuals =
p(risk averse)/(1-p(risk averse))

We get,
β= logit(p(risk seeking)) – logit(p(risk averse))
= log [(p(risk seeking))/(1-p(risk seeking))]- log [(p(risk averse))/(1-p(risk averse))]
= log [(p(risk seeking))/(1-p(risk seeking))] / log [(p(risk averse))/(1-p(risk averse))]
= log(Odds Ratio)= 0.2852

We see that the coefficient of β(risk seeking) is in logs, so to obtain the odds ratio we have to exponentiate the coefficient of β(risk seeking).
We get: e^β= e^log(odds ratio)= e^0.2852=1.3300= Odds ratio

When we analyse the output of STATA when the 'logistic' command is run on the same model, we see the same odds ratio as this paper just computed.

Figure 5: STATA output 'Logistic' command

```
. logistic married riskseeking  // Model without controls

Logistic regression                             Number of obs     =      2,973
                                                LR chi2(1)        =       6.47
                                                Prob > chi2       =     0.0110
Log likelihood =  -1882.823                     Pseudo R2         =     0.0017

------------------------------------------------------------------------------
     married | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
 riskseeking |   1.330008   .1513177     2.51   0.012      1.06417    1.662253
       _cons |   1.946387   .0817553    15.86   0.000     1.792568    2.113405
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.
```

Assumptions logit/logistic model

-The most important assumption this model makes is that the dependant variable is a binary variable, and that the two outcomes are mutually exclusive and exhaustive.

- The data are generated from a random sample, and this sample should be large enough.

-This model assumes linearity of independent variables and log odds

- The logit model also assumes that all important variables are included in the right form and that all observations on Y (Y1,Y2…..Yn) are statistically independent from each other, ruling out serial correlation.
- Each explanatory variable must have some variation, and there must not be (near) perfect linear dependencies amongst the explanatory variables.

Pro's and cons of a logit/logistic model

An advantage is that the probability of an outcome always falls between 0 and 1, which isn't the case with linear probability models. This model along with a probit model is the best model to choose from when the dependent variable is binary.

A disadvantage is that the coefficients aren't as straightforward to interpret. These should be interpreted as odds log units, which isn't that common for most people. Using odds ratios helps making the model easier to interpret. However the sign and significance can be directly interpreted.

4. Results[6]

4.1 Results relation risk attitude and being married

	Relation Risk attitude and being married (Logistic model)					
	(1)	(2)	(3)	(4)	(5)	(6)
Risk Seeking	1.3300** (0.1513) {1.0641; 1.6623}	1.3214** (0.1510) {1.0562; 1.6532}	0.9214 (0.1439) {0.6784; 1.2514}	*1.1279 (0.2384) {0.7453; 1.7069}*	*0.8326 (0.1587) {0.5730; 1.2098}*	*1.1495 (0. 2990) {0.6903; 1.9140}*
Risk Seeking * Female				*0.6370 (0.1977) {0.3467; 1.1704}*		*0.4935* (0.1850) {0.1993; 0.8663}*[7]
Experimental Controls		X	X	X	*X*	*X*
Demographical Controls[8]			X	X	*X*	*X*
Monotonicity					*X*	*X*
R – Squared	0.0020	0.0026	0.4312	0.4317	0.4475	0.4490
Observations	2937	2937	2937	2937	1971	1971

Table 2: Models with the variable 'married' as the dependent variable, All models are estimated with an constant that estimates the baseline odds. Note: The coefficients shown are odds ratios. Risk Averse is the reference category. In columns (4) and (6) interactions are included. In columns (5) and (6) individuals who violated monotonicity are left out. Standard errors are provided in parentheses (…). Odds ratios and standard errors are rounded to four decimal points. The 95% confidence interval is given between {…}. Significance at: *10, **5 and ***1 percent levels. R-squared in this model stands for Mc Faddens' R square.

In table 1 the results are shown of the model when we use the variable 'married' as the dependent variable.

In column (1) there are no controls included in the model, here we observe an odds ratio of 1.33 for the variable 'risk seeking'. This should be interpreted as follows: The odds of being married for individuals who are risk seeking is 33% more than the odds of being married for individuals who are risk averse with the true population effect between 6.4% and 66.2%. This difference is statistically significant at a 5% significance level. However like mentioned earlier this model

[6] All the interpretations are done, using the ceteris paribus assumption, meaning that all the other variables that are not being discussed are held fixed

[7] Confidence interval is calculated at 90%, because of the significance at a 10% level

[8] The demographic variables in this model are: female, age, age^2, urbancat, educcat, children

does not have any controls included, which could be of important relevance. Therefore we shouldn't put to much weight on this model.
In column (2) the experimental controls are added to the model; these controls are specified and explained in section 3.1. We observe an odds ratio of 1.3214 for the variable 'risk seeking'. In this model we can say that the odds of being married for individuals who are risk seeking is 32.1% more than the odds of being married for individuals who are risk averse with the true population effect between 5.6% and 65.3%. This difference is statistically significant at a 5% significance level. Note that still a lot of controls are missing in this model (demographic), so we can't really draw any conclusions based on this model.
We can see in column (3) that both the experimental and demographic controls are added to the model. We see an odds ratio of 0.9214, from here follows that the odds of being married for individuals who are risk averse is 8.5% (1/0.9214*100-100) more than the odds of being married for individuals who are risk seeking. However this difference is not significant at a 5% significance level. Another way to know that this odds ratio is not significant, is due to the fact that the value 1 lies within the confidence interval. And an odds ratio of 1 means that there is no significant difference between risk averse and risk seeking individuals.
In column (4) we see an odds ratio of 1.1279, meaning that the odds of being married for individuals who are risk seeking is 12.8% more than the odds of being married for individuals who are risk averse. However this difference is not significant at a 5% significance level. The interaction between risk seeking and female is a not significant meaning that there is no significant difference between males and females when describing the relation between their risk attitude and being married.
Also when removing the individuals who violated monotonicity in column (5) and (6) we observe that there isn't a significance difference between risk seeking and risk averse individuals regarding the fact if they are married. We do find that the odds for males who are risk seeking to be married are 102% more than for females who are risk seeking (1/0.4935*100-100), and that this effect is significant at a 10% significance level.

Next we will take a closer look at how the demographic variables are related to the dependent variable 'married'

This paper does this with the help of the results shown in table 2.

Logistic model with dependent variable 'married' (without variable: 'risk seeking')		
	(1)	(2)
Female	1.1451 (0.1293) {0.9177; 1.4287}	1.9999 (0.1715) {0.9067; 1.5879)
Age	1.3686*** (0.0284) {1.3141; 1.4254}	1.3798*** (0.0360) {1.3110; 1.4522}
Age^2	0.9979*** (0.0002) {0.9975;0.9983}	0.9979*** (0.0003) {0.9974;0.9984)
Children	5.1423*** (0.6931) {3.9485; 6.6970}	6.2013*** (1.0822) {4.4049; 8.7303}
Not Urban Slightly Urban Urban	Base outcome 1.0287 (0.1582) {0.7610; 1.3904} 0.6921 (0.0890)*** {0.5380; 0.8903}	Base Outcome 1.0442 (0.2030) {0.7132; 1.5286} 0.6964 (0.1130)** {0.5566; 0.9571}
Low education Mid education High education	Base Outcome 1.0101(0.1592) {0.7416; 1.3756} 0.6013 (0.0886)*** {0.4504; 0.8027}	Base Outcome 1.1653 (0.2363) {0.7831; 1.7341} 0.5748 (0.1066)*** {0.3997; 0.8266}
Monotonicity		X
R-squared Observations	0.4300 2937	0.4456 1971

Table 3: Models with the variable 'married' as the dependent variable and without the explanatory variable 'risk seeking'. All models are estimated with a constant that estimates the baseline odds. Note: The coefficients shown are odds ratios. In column (2) the individuals who violated monotonicity are left out. Standard errors are provided in parentheses[..}. Coefficients and standard errors are rounded to four decimal points. The 95% confidence interval is given between {…}. Significance at: *10, **5 and ***1 percent levels. R-squared in this model stands for Mc Faddens' R square.

The variables in table 3 are the same variables that are used in table 2 as demographic control variables.

The odds ratios in table 3 should be interpreted the same way as in table 2. For example if we look at the odds ratio of ' high education' we see that this odds ratio takes a value of 0.6013. This means that the odds of being married for an individual that is low educated is 66.3% (1/0.6013*100-100) more than the odds of being married for an individual that is highly educated, with the true population effect between 45% and 80%. This difference is significant at a 5% significance level.

The coefficients of table 3 also show that being older gives you higher odds to be married compared to not being married. Furthermore we also observe that living in a non-urban area gives you a higher odd of being married, compared to living in an urban area. And the odds for someone who has children to be married are more than the odds for someone to be married who does not have children.

As mentioned before, the variable 'risk seeking' is significant in table 2 when no control variables are present in the model. However when the control variables are added, the variable 'risk seeking' is not significant anymore. This probably indicates that there isn't a significant difference between individuals who are risk seeking and individual who are risk averse with respect to whether they are married or not.

4.2 Results relation risk attitude and being divorced

	Relation Risk attitude and being divorced (Logistic model)			
	(1)	(2)	(3)	(4)
Risk Seeking	1.4884*** (0.2252) {1.1065; 2.0022}	1.4682** (0.2228) {1.0905; 1.9768}	1.3805** (0.2127) {1.0207; 1.8672}	*1.4559*** *(0.2559)* *{1.0317;* *2.0546}*
Experimental Controls		X	X	*X*
Demographical Controls[9]			X	*X*
Monotonicity				*X*
R – Squared	0.0032	0.0040	0.0237	0.0286
Observations	3454[10]	3454	3454	2314

Table 4: Models with the variable 'divorced' as the dependent variable, All models are estimated with an constant that estimates the baseline odds. Note: The coefficients shown are odds ratios. Risk Averse is the reference category. The only demographic control is this model is 'age'.In column (4) individuals who violated monotonicity are left out. Standard errors are provided in parentheses (…). Odds ratios and standard errors are rounded to four decimal points. The 95% confidence interval is given between {…}. Significance at: *10, **5 and ***1 percent levels. R-squared in this model stands for Mc Faddens' R square.

In column (3) all the control variables are added resulting in the following: we observe an odds ratio of 1.3805. This means that the odds for individuals who are risk seeking to be divorced is 38.1% more than for individuals who are risk averse, with the true population effect between 2.07% and 86.7%. This difference is significant and a 5% significance level. When we take a look at the subsample where the individuals who violated monotonicity are left out, we also see that individuals who are risk seeking have a higher odd to be divorced compared to risk-averse individuals. Possible explanations for these finding can be found in section 5.

[9] The demographic variables in this model are: age, urban, educcat

[10] Note that in this regression the individuals who are widowed are also counted as individuals who are not divorced.

Logistic model with dependent variable 'divorced'		
	(1)	(2)
Risk seeking	See table 4	See table 4
Age	1.0226*** (0.0040) {1.0147; 1.0305}	1.0243*** (0.0050) {1.0146; 1.0342}
Not Urban Slightly Urban Urban	Base outcome 1.4049 (0.2349)** {1.0124; 1.9496} 1.3729 {0.2000)** {1.0320; 1.8263}	Base outcome 1.2891 (0.2610) {0.8669; 1.9170} 1.2826 (0.2236) {0.9114; 1.8051}
Low education Mid education High education	Base outcome 1.1519 (0.1893) {0.8347; 1.5895} 1.1877 (0.1846) {0.8759; 1.6106}	Base outcome 1.1789 (0.2337) {0.7993; 1.7382} 1.2297 (0.2319) {0.8497; 1.7795}
Monotonicity		X
R- squared Observations	0.0237 3454	0.0286 2314

Table 5: Models with the variable 'divorced' as the dependent variable. All models are estimated with a constant that estimates the baseline odds. Note: The coefficients shown are odds ratios. In column (2) the individuals who violated monotonicity are left out. Standard errors are provided in parentheses [..}. Coefficients and standard errors are rounded to four decimal points. The 95% confidence interval is given between {…}. Significance at: *10, **5 and ***1 percent levels. R-squared in this model stands for Mc Faddens' R square.

Looking at the results of table 5, column (1) we can conclude that each year of age gives you 2.3% higher odds of being divorced with the true population between 1.5% and 3.05%. This difference is significant at a 5% significance level. We also conclude that living in an urban area gives you higher odds to be divorced compared to living in a non-urban area.

4.3 Results relation risk attitude and having children

	Relation Risk attitude and having children (Logistic model)					
	(1)	(2)	(3)	(4)	(5)	(6)
Risk Seeking	0.8935 (0.0861) {0.7397; 1.0794}	0.8866 (0.0859) {0.7333; 1.0719}	1.1406 (0.1456) {0.8881; 1.4647}	*1.0777* *(0.1805)* *{0.7760;* *1.4965}*	*1.2194* *(0.1840)* *{0.9072;* *1.6389}*	*1.0272* *(0.2039)* *{0.6962;* *1.5157}*
Risk Seeking * Female				*1.1441* *(0.2939)* *{0.6915;* *1.8928}*		*1.4950* *(0.4495)* *{0.8294;* *2.6949}*
Experimental Controls		X	X	X	*X*	*X*
Demographical Controls			X	X	*X*	*X*
Monotonicity					*X*	*X*
R – Squared	0.0003	0.0014	0.2672	0.2672	0.2826	0.2832
Observations	2967	2967	2937	2937	1971	1971

Table 6: Models with the variable 'children' as the dependent variable. All models are estimated with an intercept; Risk Averse is the reference category. In Columns (4) and (6) interactions are included. Standard errors are provided in parentheses. Coefficients and standard errors are rounded to four decimal points. Significance at: *10, **5 and ***1 percent levels. R-squared in this model stands for Mc Faddens' R square.

When examining table 6 we see that none of the odds ratio of the variable 'risk seeking' are significant at a 5% significance level. This holds even after the experimental and demographic controls are added. Together with the results shown in table 6 this suggests that there is no significant difference in odds between risk averse and risk seeking individuals with respect to having children. Possible explanations for this finding are discussed in section 5.

Logistic model of having children (without the variable: risk seeking)		
	(1)	(2)
Female	0.8163 ** (0.0748) {0.6821; 0.9769}	0.7439*** (0.0851) {0.5944; 0.9311}
Age	0.8939*** (0.0041) {0.8860; 0.9019}	0.8880*** (0.0052) {0.5944; 0.9311}
Not Urban Slightly Urban Highly Urban	Base outcome 0.7799 (0.0936)** {0.6165; 0.9867} 0.4892 (0.0581)*** {0.3975; 0.6020}	Base Outcome 0.7345 (0.1090)** {0.5492;0.9825} -0.4318 (0.0568)*** {0.3337;0.5589}
Low education Mid education High education	Base Outcome 1.4238 (0.1745)*** {1.1198; 1.8105} 1.1589 (0.1383) {0.9172; 1.4643}	Base Outcome 1.3977 (0.2137)** {1.0358; 1.8861} 1.1340 (0.1677) {0.8488; 1.5152}
Married	10.1038*** (1.4525) {7.6228; 13.3922}	12.5772*** (2.3226) {8.7578; 18.0624}
Monotonicity		X
R-squared Observations	0.2659 2937	0.2757 1985

Table 7: Models with the variable 'children' as the dependent variable and without the explanatory variable 'risk seeking'. All models are estimated with an intercept. Standard errors are provided in parentheses. Coefficients and standard errors are rounded to four decimal points. Significance at: *10, **5 and ***1 percent levels.

The variables that are shown in table 7, are the same variables that are used as demographic control variables in table 6. These variables are important determinants of the fact if an individual has children.[11]

[11] Note that there are probably also other determinants when examining if someone has children or not, these are however not included due to the fact that this data was not available at the moment. Moreover, according to previous literature the used variables cover a large part of the explanatory factor of having children,

The odds ratio of table 7 should be interpreted the same way as earlier. For example if we look at the odds ratio of 'mid education' in column (1) we conclude that the odds for individuals who have a mid education to have children are 42.4% more than for individuals who are low educated, with the true population effect between 12% and 81%. This difference is significant at a 5% significance level. Further elaborations and possible explanations for these findings can be found in section 5.

5. Discussion and conclusion

This paper tries to find out what kind of relation exists between an individuals' risk attitude and the fact whether he/she is married, has children or is divorced. Testing the following four hypotheses does this:

H1: Individuals who are more risk-averse are more likely to be married than individuals who are risk seeking.

H2: Women who are risk seeking are less likely to be married than men who are risk seeking.

H3: Individuals who are more risk seeking are more likely to be divorced compared to Individuals who are risk averse.

H4: Individuals who are more risk-averse are more likely to have children than individuals who are more risk seeking.

This paper finds significant results when looking at the relation between a persons' risk attitude and if he/she is divorced. This paper finds that the odds for individuals who are risk seeking to be divorced are 38.1% more than for individuals who are risk averse. This result was expected and is line with the third hypothesis. Getting divorced usually means that there will be a lot of uncertainty in the future. Divorce is often seen as a high stake income gamble (Light & Ahn, 2010), involving a lot of risks. Taking risks is of course more associated with risk seeking people than that it is with risk averse individuals. Based on the results we can conclude that we accept the third hypothesis stating ' *Individuals who are more risk seeking are more likely to be divorced compared to Individuals who are risk averse.'*

Like mentioned before there are a lot of other factors that could play a role in the decision to terminate a marriage. So does the (National health statistics report, 2012), (Bumpass & al, 1991) and (Lehrer & Chiswick, 1993) find proof that factors like the age at which you get married, whether your parents are divorced, and religion play important roles in determining the probability that a person

will get divorced. Along with these factors a lot of other factors (adultery, loyalty etc.), which can't be measured, could play a role. Therefore no causal claims are made regarding the relation between a persons' risk attitude and if he/she is divorced. The claim that this paper makes, which is that risk seeking people have a higher odd to be divorced is however possible to make. A lot of factors, including the ones just mentioned could also be driven by a person risk attitude. Take for example the supplementary finding this paper makes about the relation between a persons' risk attitude and whether you live in an urban area or not. The fact that this paper finds that living in a urban area gives you higher odds of being divorced compared to living in a non-urban area, could also be driven by a persons risk attitude. So do (Kishore, Grewal, & al, 1999) find that many risk behaviours (drinking, weapon use etc.) are more common in urban areas compared to rural areas. This finding is in line with what this paper finds regarding the relation between risk seeking people and being divorced. It would be interesting for further researches to take data from the other factors just mentioned in consideration.

The first two hypotheses examined the relation between an individuals' risk attitude and is married. This paper fails to find any significant relation between these two aspects. This could be explained by the fact there are probably a lot of other factors, which are arguably more important. Therefore for factors like age, gender, education and place of residence this paper does find a significant relation. Also think about factors like religion or even the core values (like opinion about love) of a person could play a significant role. Just like argued before, a persons' risk attitude could influence all of these factors. However in this case apparently, the effect of a persons' risk attitude isn't strong enough to be considered significant.

The second hypothesis focuses on the differences between males and females. The only finding this paper does is that the odds for males who are risk seeking to be married are 102% more than for females who are risk seeking. The fact that this effect is only significant at a 10% significance level and that this effect is only found in the subsample means we should be carful to draw any conclusion from this finding. A possible explanation for this finding could be that for males

to get married, and giving up certain aspects in life is more seen as a big step and taking a risk. However this is just a speculation, which isn't based on any prior findings. Especially since this finding contradicts what (Spivey, 2010) found, which is that individuals who are risk averse are more likely to be get married. And if you combine this with the findings of (Bernasek & Shwiff, 2001) who found that women are generally more risk- averse than men, you would expect the opposite.

The fourth hypothesis is interested in examining the relation between an individuals' risk attitude and whether he/she has children. This paper doesn't find a significant relation between the two aspects. This result was partly to be expected since there are so many factors, which aren't taken into account. This result was also to be expected since we examine the relation with ' having children'. Since it is unclear from the data in our dataset when the individuals had children, and at what age this was. It is also unclear how having children affected the individuals risk attitude. In order to know a study should be conducted, which involved panel data from the years before someone had children and after someone had children. Where each year the persons' risk attitude should be tested, and compared to see if there is a change. Even when performing an extensive study like that, one could not be sure that the event of having children causes the change in a persons' risk attitude. Since there could be other factors influencing this that are not taken into account.

Other supplementary findings are that the odds of someone who is living in a non-urban area to have children are more than for someone in a urban area. A possible explanation for this is that people want a safe environment for their child and that crime rates in urban areas are generally higher than in non-urban areas (Sacerdote & Glaeser, 1999). Another finding is that people who have a mid-education have higher odds to have children compared to people who have a low education level. A possible explanation for this is that individuals with a lower education are generally less financially stable, which is often a reason to postpone having children.

Just like any other research this paper has some limitations. The most important one is existence of simultaneity. This paper acknowledges that this a problem with this topic, and therefore tries avoid making causal claims. This limitation is

a common one when it comes to linking risk attitude to a psychological aspect. A way to solve this is to use an IV estimator. This can be done by finding an instrument that is correlated with risk attitude, but not directly with getting married/divorced or having children. By example this could be a variable that states whether you grew up in poor or rich. However this paper doesn't have access to such a variable. Another limitation is that the risk attitude of an individual is elicited by using monetary incentives choices. A point of critique to using this method is that a persons' attitude could differ when it comes choices that are not money related. However since using monetary incentives/choices is the most common way to elicit a person risk attitude, this paper also opted for this method.

Appendix A: Robustness checks

1) Wald chi square test (command 'test' in STATA)

This test checks if the explanatory variables in the model add anything significant to the model. If they don't add anything this means that the variable can be removed from the model. The null hypothesis of this model is that the variable is equal to 0. And the alternative hypothesis is that the variable is different from 0.

Model with 'married' as dependent variable[12]

```
. test higheduc mideduc loweduc

 ( 1)  [married]higheduc = 0
 ( 2)  [married]mideduc = 0
 ( 3)  [married]loweduc = 0

           chi2(  3) =   22.17
         Prob > chi2 =    0.0001
```

```
. test female children age

 ( 1)  [married]female = 0
 ( 2)  [married]children = 0
 ( 3)  [married]age = 0

           chi2(  3) =  327.97
         Prob > chi2 =    0.0000
```

```
. test urban slightlyurban nonurban

 ( 1)  [married]o.urban = 0
 ( 2)  [married]slightlyurban = 0
 ( 3)  [married]nonurban = 0
       Constraint 1 dropped

           chi2(  2) =   11.12
         Prob > chi2 =    0.0039
```

```
. test age age^2

 ( 1)  [married]age = 0
 ( 2)  [married]age^2 = 0

           chi2(  2) =  792.68
         Prob > chi2 =    0.0000
```

```
. test riskseeking

 ( 1)  [married]riskseeking = 0

           chi2(  1) =    0.32
         Prob > chi2 =    0.5738
```

When we examine the results of the Wald test we observe that all of the categories of the variable ' urban' are jointly significant at a 5% significance level (0.0039<0.05). So we include the variable ' urban' in our model. The same reasoning holds for the variables female, children and age that are also all jointly significant. We also see that both age and age^2 are jointly significant, the

[12] Wald test is performed on the same model as in table 2 column 4, with the only difference being that dummies were made for the categories of the variables 'educat' and 'urban'.

variable age^2 was added to the model, because of the expectation that the relation between being married and age isn't linear.
The categories of the variable 'educcat' are also jointly significant (0.0001<0.05). Even though independently the category 'mid education' is not significant. The fact that this is the case is because of multicollinearity of the categories of 'educcat' . Because the categories are jointly significant, the variable ' education' is also added to the model.
The variable 'risk seeking' doesn't add anything to the model, because the null hypothesis of the Wald test can't be rejected (0.5738>0.05).

Model with 'children' as dependent variable[13]

```
. test urban slightlyurban nonurban

 ( 1)  [children]o.urban = 0
 ( 2)  [children]slightlyurban = 0
 ( 3)  [children]nonurban = 0
       Constraint 1 dropped

           chi2(  2) =   45.72
         Prob > chi2 =    0.0000
```

```
. test female married age

 ( 1)  [children]female = 0
 ( 2)  [children]married = 0
 ( 3)  [children]age = 0

           chi2(  3) =  608.69
         Prob > chi2 =    0.0000
```

```
. test loweduc mideduc higheduc

 ( 1)  [children]loweduc = 0
 ( 2)  [children]mideduc = 0
 ( 3)  [children]higheduc = 0

           chi2(  3) =    8.54
         Prob > chi2 =    0.0360
```

```
. test riskseeking

 ( 1)  [children]riskseeking = 0

           chi2(  1) =    0.20
         Prob > chi2 =    0.6542
```

When see that the categories of the variable ' urban' are jointly significant at a 5% significance level. So we include the variable ' urban' in our model. Again the same reasoning can be used for the variables female, married and age that are also all jointly significant. The categories of the variable 'educcat' are also jointly significant (0.0360<0.05). The category 'high education' is not independently significant, but because the categories are jointly significant, the variable '

[13] Wald test is performed on the same model as in table 5 column 4, with the only difference being that dummies were made for the categories of the variables 'educat' and 'urban'.

education' is also added to the model. Again our variable of interest, which is ' risk seeking' doesn't add anything to the model (0.6542>0.05)

Model with 'divorced' as dependent variable

```
. test age riskseeking

 ( 1)  [divorced]age = 0
 ( 2)  [divorced]riskseeking = 0

           chi2(  2) =   35.52
         Prob > chi2 =    0.0000
```

The variables 'age' and 'risk seeking' are jointly significant at a 5% significance level, and are therefore included in the model.

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