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Important life-events and preferences

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Abstract

The aim of this thesis is to examine whether single life-events can directly influence individuals' risk preferences. Longitudinal data were used to study this relationship. These data were retrieved from the German Socio-Economic panel, in which participants self-reported their risk preferences. The life-events observed were marriage, divorce, the death of a spouse and becoming a parent. The results suggest that becoming a parent significantly increases risk aversion among individuals and thus alters risk preferences. This result provides evidence for risk preferences not being stable but rather subject to change over time.

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1. Introduction

Does a manager who has recently experienced a major change in his or her life have a different risk attitude when managing a company than before the event occurred? Or do such events have no impact on risk preferences?

Risk preferences are a specific type of preference which individuals have. They show how much risk an individual is willing to take. More specifically, risk preferences can have three specifications, risk tolerant, risk averse and risk neutral. When choosing between alternatives with the same expected value, a decision maker that is risk averse always chooses the alternative with lower risk in terms of outcome. Risk tolerant decision makers would, on the other hand, choose the alternative with higher risk, while risk neutral decision makers would be indifferent between a riskier and a safer option with the same expected value. In this thesis, the term 'risk tolerance' is used to refer to risk preferences and utilises an ascending order. Thus, lower levels of risk tolerance imply more risk averse risk preferences and vice versa.

In neoclassical economic theory, risk preferences are assumed to be stable over time. According to this inference, risk preferences would not change, if exogenous shocks that induce a change in the underlying nature of an individual occurred (Jung & Treibich, 2015; Schildberg-Hörisch, 2018). Other streams of literature suggest that there could be factors that contradict the assumption of stable risk preferences during the life-span such as diseases (Tison, Davin, Ventelou, & Paraponaris, 2012) and natural disasters (Cassar, Healy, & Kessler, 2017; Eckel, El-Gamal, & Wilson, 2009). These findings show that risk preferences are not permanent but rather are subject to change in the case of significant events in a person's life. However, it is still unclear if those events can directly change behaviour as there might be simultaneously occurring factors that change with the event. For instance, in the case of natural disasters, one might lose all his or her belongings or might lose a job, depending on the devastation caused by the natural disaster. When taking into account that wealth and income have been shown to influence individual's risk preferences, these simultaneously occurring factors could then be the cause of the change in risk preferences rather than the natural disaster

itself (Barsky, Juster, Kimball, & Shapiro, 1997; Dohmen et al., 2011; Donkers, Melenberg, & van Soest, 2001; Hopland, Matsen, & Strøm, 2016; Tanaka, Camerer, & Nguyen, 2010; Yesuf & Bluffstone, 2007). Thus, to fully understand what exactly causes the change in risk preferences, all contemporaneously occurring circumstances that confound the effect must be taken into account.

This thesis examines whether events in a person's life can be the cause of a change in risk preferences. More specifically, changes in the family situation were chosen as life-events that provide insight into whether risk preferences are stable over time or change after an important life-event occurred. Literature predicts that emotions and the change in circumstances that come along with a change in the family situation can play a crucial role in the development of someone's risk preferences (Chaulk, Johnson, & Bulcroft, 2003; Loewenstein, Weber, Hsee, & Welch, 2001). Since changes in the family situation, such as a divorce, getting married, giving birth or losing a spouse, have been shown to lead to long-term emotional responses of individuals and since different family states result in a change in responsibilities and tasks, these factors indicate that such events could lead to a change in risk preferences of individuals (Carstensen, Gottman, & Levenson, 1995; Chiriboga & Cutler, 1978; Lucas, 2007; Nelson, Kushlev, & Lyubomirsky, 2014). Therefore, the main aim of this study is to investigate whether these important life-events are able to influence the risk preferences of individuals. This leads to the following research question:

> *Research Question: Can an important life-event, with respect to a changing family situation, directly change individuals' risk preferences?*

Data for this study have been obtained from the German Socio-Economic Panel Study. The dataset includes individual data which are representative of the German population during the period from 2004 to 2016. The survey incorporates a general question that elicits individuals' self-reported risk preferences on a 11-point Likert scale and questions regarding the family situation of the subjects. The survey data utilise a panel structure enabling differences within individuals to be observed. A conditional fixed-effects ordered logit model, namely the blow-up and

cluster estimator, was used to observe if there is a significant change in the individual's risk preferences following diverse life-events.

This thesis contributes to the growing stream of literature that focuses on the idea of varying risk preferences. If this is indeed the case, measures to forecast economic behaviour can lead to biased results. Understanding individuals' risk preferences is closely linked to the economic desire of predicting economic behaviour. It can be improved by a better understanding of the preference parameters which can be achieved by understanding the effects of family events that potentially cause heterogenous risk preferences over time (Barsky et al., 1997). Prior literature on changes in the family situation and the impact on risk preferences mostly examined the between-variation of individuals and thus either used cross-sectional data or models which compare groups of individuals between each other when examining the impact of marriage and parenthood on risk preferences (Chaulk et al., 2003; DeLeire & Levy, 2004; Sung & Hanna, 1996; Yao & Hanna, 2005). Thus, using a large panel dataset, representative of the German population, enables an analysis to be conducted of the within-variation effect of not only marriage and parenthood, but also getting divorced and losing a spouse.

The results reveal a positive and significant relationship between becoming a parent and risk aversion. Hence, an individual that becomes a parent is likely to be less tolerant to risk than he or she was before the event occurred. The other observed life-events (namely, getting married, divorced and losing a spouse) were not found to be significant or were not robust when controlling for year fixed-effects in the regression analysis. Thus, these events cannot explain a change in risk preferences of individuals by themselves. However, the answer to the research question of this thesis is that changes in family situation can cause a change in risk preferences. This contradicts the stable preference assumption.

The findings of this study have implications for situations and fields in which risk preferences of individuals influence their decision making. Differences in risk attitude due to changes in family situation could cause a difference in financial decision making or investment behaviour (Roussanov & Savor, 2014). Thus, the findings could prove useful in improving the predictions of the behaviour of

individuals who are in positions of power. The decisions of managers at large companies can have a significant economic impact. A change in risk preferences could drive managers to change the strategy of a company or to take on riskier or safer projects than they usually would. Also, investment bankers' risk behaviour could affect whether they invest money in safer or riskier assets, thus having a large impact on the economy of a specific country. Additionally, the decisions of politicians have a direct impact on society and the economy of a specific area or country. Besides these practical implications of a potential change in risk preferences, these findings could also be useful for further research, as currently the literature mostly assumes that risk preferences stay constant over time (Schildberg-Hörisch, 2018). Thus, understanding how risk preferences might change in specific fields and over time could improve the predictive power of models, for instance, by collecting risk preference data of individuals several times in an individual's life-cycle or after specific events in an individual's life occurred.

In the following section, a detailed review of the literature on the influence of different characteristics and events on risk preferences is provided. After establishing a fundamental understanding of the influence of emotions on decision-making, the factors that could influence risk preferences will be stated. Thereafter, the data and methodology are presented, followed by the presentation of the results. Lastly, a detailed discussion provides insights on the validity, causality and robustness of the results presented in the preceding section.

2. Literature

In the last decades, research has revealed some factors that influence risk taking behaviour. The literature captures risk preferences by observing different characteristics of individuals and events that occurred in the life-cycle of individuals, and their impact on risk preferences. While some streams of literature focus on individual demographic factors that might influence behaviour (Dohmen et al., 2011; Donkers et al., 2001; Harrison, Lau, & Rutström, 2007; Hartog, Ferrer-i-Carbonell, & Jonker, 2002; Sung & Hanna, 1996; Tanaka et al., 2010), others focus on individuals' health conditions that could affect risk preferences (Sahm, 2012; Tison

et al., 2012). Large streams of literature are concerned with the financial situation of households and individuals and its influence on risk tolerance (Barsky et al., 1997; Dohmen et al., 2011; Donkers et al., 2001; Harrison et al., 2007; Hopland et al., 2016; Malmendier & Nagel, 2011; Rosenzweig & Binswanger, 1992; Tanaka et al., 2010; Yesuf & Bluffstone, 2007). Specific events in the lives of individuals that are rare and happened only once to a few individuals, such as the experience of severe violence (Kim & Lee, 2014; Voors et al., 2012) and natural disasters were examined in recent studies (Cameron & Shah, 2015; Cassar et al., 2017; Chuang & Schechter, 2015). Furthermore, macroeconomic shocks have been the focus of some streams of literature (Malmendier & Nagel, 2011; Sahm, 2012). Finally, similar to this study, research was conducted in the field of family situations and their impact on risk preferences (Chaulk et al., 2003; DeLeire & Levy, 2004; Light & Ahn, 2010; Spivey, 2010; Sung & Hanna, 1996; Yao & Hanna, 2005).

2.1 Demographics

A change in the individuals' demographics and its influence on individuals' risk preferences has been examined widely in the last decades. A wide range of studies find that risk aversion increases with the level of education (Dohmen et al., 2011; Harrison et al., 2007; Tanaka et al., 2010). Hartog et al. (2002) find contrary results. They used hypothetical gambles to elicit their subjects' risk preferences and find that a higher education, in terms of university education compared to lower levels of education, increases risk tolerance. In addition, Sung and Hanna (1996) compared different types of individuals in terms of their education levels and find different results than the majority of the literature. They estimated different levels of risk tolerance for each group of individuals. Individuals with no high school diploma are the lowest educated group in their sample. Compared to them, risk tolerance increases by 11 percentage points for individuals who only obtained a high school diploma and 28 percentage points for individuals who graduated from university.

Hartog et al. (2002) find that gender also plays a crucial role in individuals' risk preference development and the widely held view among related literature is

that women are more risk averse than men (Dohmen et al., 2011; Donkers et al., 2001; Hartog et al., 2002). However, recent studies challenge the findings with regard to gender differences in risk behaviour. Two more recent studies find no variation in risk behaviour between women and men (Harrison et al., 2007; Tanaka et al., 2010).

Another extensive stream of literature examines the effect of age on risk preferences. Most of the findings show that age has a negative impact on risk tolerance. Sahm (2012) studied this effect by using panel data from the health and retirement study which asks participants about their willingness to gamble on lifetime income. The results show that risk tolerant behaviour significantly declines with age. Several studies further examined the effect of age on risk preferences by splitting the population into groups of adults and children. These studies find changes in risk behaviour between and within the two groups. Young children are mostly risk seeking and are also more risk seeking than adults (Deckers, Falk, Kosse, & Schildberg-Hörisch, 2015; Levin, Hart, Weller, & Harshman, 2007; Moreira, Matsushita, & Da Silva, 2010; Paulsen, Platt, Huettel, & Brannon, 2011). However, when children grow older they become less risk tolerant until, in most cases, they slowly become risk averse which also implies that most adults are risk averse (Levin et al., 2007; Paulsen et al., 2011; Bucciol & Zarri, 2015; Dohmen, Falk, Golsteyn, Huffman, & Sunde, 2017; Dohmen, Falk, Huffman, & Sunde, 2010; Josef et al., 2016; Sahm, 2012). A recent study which uses large datasets to study the effect of age on individuals' risk preferences find that risk tolerance decreases linearly from early adulthood up to approximately 65 years of age (Dohmen et al., 2017). Given that risk taking is in line with self-employment and higher stock market investment which are perceived as risky, Dohmen et al. (2017) even predict that an increase of age in the adult population will lead to less self-employment and less stock market investment keeping all other factors constant. However, two more studies find a more modest increase in risk aversion than the prior study. They predict that older adults, from the age of 45 onwards experience less increase in risk aversion than the previously portrayed linear relationship (Sahm, 2012; Schurer, 2015). Schurer (2015) even predicted that older individuals with a high socioeconomic status can experience an increase in risk tolerance.

Another demographic factor that likely shapes risk preferences is that of belonging to a specific religion. A recurring trend throughout the literature regarding this specific field is that religiosity leads to more risk averse behaviour (Dohmen et al., 2011; Ellison & McFarland, 2011; Hilary & Hui, 2009; Hoffmann, 2000; Miller & Hoffmann, 1995).

2.2 Health

Some studies examine the effect of health issues on individuals' risk preferences. Tison et al. (2012) find that cancer increases risk seeking behaviour, whereas diabetes decreases risk tolerant behaviour. They argued that cancer results in a reduced life expectancy which might be one reason for a patient to become more risk seeking for their remaining lifetime. In contrast, diabetes is an illness that does not necessarily lead to a reduced life expectancy but is a disease that requires long-term daily treatment which could be a reason for the reduced risk tolerant behaviour (Tison et al., 2012). However, Sahm (2012) finds that the diagnosis of a serious health condition does not change risk preferences in the long run.

2.3 Financial situation

The relationship between income and risk preferences was extensively researched in the last decades. The widely held view within related literature streams is that income influences risk preferences (Barsky et al., 1997). In fact, most studies find that as income increases, risk aversion decreases (Barsky et al., 1997; Dohmen et al., 2011; Donkers et al., 2001; Hopland et al., 2016). In addition, Malmendier and Nagel (2011) find that households which experience higher stock market returns are more willing to take risks. Also, the wealth level of individuals was found to have a significant impact on risk preferences while these literature streams did not find a significant impact of income on risk tolerance when wealth was also taken into account. Tanaka et al. (2010) studied risk preferences of farmers. They compared different villages within specific countries. They find no significant relationship between household income and risk preferences. What they do find is a relationship between the mean wealth of a farmer's village and risk

preferences. The wealthier a village, the greater its risk tolerance. Hence, when wealth increases, risk tolerance also increases which is consistent with the findings of Yesuf and Bluffstone (2007) who find evidence for a tendency towards riskier behaviour for farming households which are relatively wealthier than other farming households. Another study that finds no relationship between income and risk preferences used Danish Household Data. This study finds that household income does not have a significant effect on financial risk behaviour (Harrison et al., 2007).

However, even though there is some evidence indicating that there is a relationship between income, wealth, and risk behaviour, the effect might run in both directions. Thus, higher risk tolerance could also lead individuals or households to become wealthier or to obtain higher income. For instance, Rosenzweig and Binswanger (1992) find that wealthier households, in comparison to poorer households, invest in riskier assets. This investment strategy leads such household to obtain higher returns from their investments. Hence, the households in this study that were more risk tolerant were also wealthier on average.

2.4 Natural disasters

A part of the literature that focuses on life-events which individuals experience, examines the effect of natural disasters on risk behaviour. There seems to be a consensus throughout the literature that natural catastrophes lead to increased risk averse behaviour. For instance, Eckel et al. (2009) examine the short-term consequences of hurricane Katrina on individuals' risk behaviour. They find that after the hurricane, individuals concerned significantly reduced their willingness to take risks. Cassar et al. (2017) also find evidence that the tsunami in Thailand in 2004 led individuals to become more risk averse. In addition, the study of Cameron and Shah (2015) examined the effect of natural disasters on risk preferences. Similar to the above-mentioned literature, they find that those events had a negative influence on risk tolerant behaviour. They compared similar villages with each other, with only one village having experienced a natural

disaster such as a flood or an earthquake. They not only find that the effect described is present but also that the increased risk averse behaviour lasts for many years after the natural disaster occurred. Hence, in general, it seems that natural catastrophes encourage risk aversion among the individuals concerned. However, one recent literature review contradicts the previous findings. It summarises mixed results from previous studies regarding the influence of famines, floods, earthquakes, droughts, tsunamis and hurricanes. The direction of the relationships between those natural disasters and risk behaviour varies, some increase risk tolerance, some lead to more risk averse behaviour, while others do not have a significant effect on risk preferences (Chuang & Schechter, 2015).

2.5 Violence

Another stream of literature focuses on the effect of violence on risk preferences. Individuals can be exposed to violence in different ways, for instance domestic violence, violence in a community, or violence caused by war. One study provided evidence that such exposure to violence can affect the individual's risk behaviour. The evidence of this study comes from Burundi. Researchers examined individuals that observed violence in communities that have been attacked from outside in comparison to those individuals that experienced violence themselves. They found that exposure to both types of violence leads to more risk tolerant behaviour (Voors et al., 2012). Kim and Lee (2014) focused on early childhood violence and report contrary results. Data from the Korean war, during which children were exposed to severe violence, were used for the study. Kim and Lee (2014) were able to access data of 51 countries to observe the influence of a major civil war on risk behaviour. They find that exposure to such a traumatic and violent event at an early age results in individuals becoming more risk averse. This effect is present even five years after the end of the war (Kim & Lee, 2014).

2.6 Macroeconomic influences

One stream of literature focuses on the influence of macroeconomic conditions on the individuals' risk preferences. Sahm (2012) used panel data from the health and retirement study and finds that individuals are more risk tolerant in times of macroeconomic stability, while they are more risk averse in times of economic recession. Malmendier and Nagel (2011) proxied long-term macroeconomic conditions for households with the household's expected stock market returns from 1960 to 1970. They find that better macroeconomic conditions and thus, higher stock market returns lead to a higher willingness to take risk.

2.7 Family situation

So far, only a small fraction of literature is concerned with the topic of changes in family situations and their impact on risk preferences. In fact, most literature focuses on family situations in general and not on the change in family situations. Thus, most studies use cross-sectional data or use longitude data focused on between-variation. This means that the research has mostly examined these effects by comparing individuals with different family situations. DeLeire and Levy (2004) examined the riskiness of the job choices of married individuals, single individuals and individuals with children. They also focused on the individuals' between-variation. Results show that single parents are the most risk averse group to risky jobs. For single parents, women were more risk averse than men in terms of choosing a risky job. Earlier research also investigated whether marital status plays a role in the development of risk preferences. Sung and Hanna (1996) find that having a life partner increases risk tolerance for women while it decreases risk tolerance for men. In fact, Sung and Hanna (1996) estimate levels of risk tolerance for single females, for single males and for couples. They find that single females have the lowest level of risk tolerance. Compared to them, married couples were 14 percentage points more risk tolerant. However, single males were 20 percentage points more risk tolerant than single females. The study of Yao and Hanna (2005) confirm these results. In particular,

they find that single males are the most risk tolerant group of individuals, followed by married males, single females and finally married females. The prior results suggest that married individuals are less risk tolerant than single individuals.

A portion of the literature examines the relationship in the reverse causal direction, meaning that the studies examined whether risk preferences have an influence on changes in family situations. As an example, Light and Ahn (2010) examined the relationship between risk seeking preferences and the decision to get divorced. Their assumption was that getting divorced is a risky behaviour. They find that men that are more risk tolerant have a higher probability of getting divorced, keeping all other factors fixed. Another study examined whether risk behaviour has an influence on the timing of the first marriage. This study finds that more risk averse individuals get married earlier in life compared to more risk tolerant individuals. The authors further examined this effect by comparing siblings within families with each other. In this study, the authors find that the more risk averse siblings got married earlier than the more risk seeking siblings (Spivey, 2010). Also, Schmidt (2008) finds a similar pattern as described before. In particular, he finds that more risk tolerant women delay their marriage to a later point in life relative to more risk averse women. Schmidt's research also discusses the connection between risk preferences and childbirth. He finds that more risk tolerant women, in comparison to less risk tolerant women, delay childbearing to a later period in their life-cycle.

The study which is the most similar to this study is that of Chaulk et al. (2003) who examined different types of family situations and their effect on risk tolerance. However, in contrast to this study, Chaulk et al. (2003) used cross-sectional data to find evidence for their hypotheses. They conducted a study with volunteers that had different characteristics, such as married and single individuals as well as parents and non-parents. The study took place in a Canadian housing complex, the residents of which were faculty members, staff members and students of the University of British Colombia. 516 of the respondents were students and 268 respondents were from the faculty or staff of the university.

Chaulk et al. (2003) find no significant effect of gender and age on risk preferences. This might be surprising as the literature presented above generally reaches a consensus that age and gender influence risk preferences. The authors argue that this result is due to the more detailed analysis of gender and age in the study. For younger age groups, the study finds that men are more risk tolerant than women and that the risk tolerant behaviour of men declines with age, while women become slightly more risk tolerant as they get older. They did not find evidence that marital status has an effect on risk preferences. However, they do find that income and the presence of a child in a household significantly affect risk preferences. In particular, higher income increases risk tolerance among households while the presence of a child significantly reduces risk seeking behaviour (Chaulk et al., 2003).

3. The role of emotions in decision-making

Emotions play a crucial role in this study as family events likely stimulate a change in emotions that could be a driver of changes in risk preferences (Carstensen et al., 1995; Chiriboga & Cutler, 1978; Lucas, 2007; Nelson et al., 2014). Understanding the influence that emotions have on decision-making is therefore crucial to understand the overall impact which emotions have during a change in the family situation and, thus, to understand the impact of emotions on risk behaviour.

In the last decades, due to the introduction of the bounded rationality concept of decision-making, emotions play a significant and growing role in the literature on decision-making and are perceived as the main driver in decision making (Ekman, 2007; Gilbert, 2009; Loewenstein et al., 2001; Oatley, Keltner, & Jenkins, 2006). Bounded rationality implies that individuals have systematically biased convictions or systematically deviate from their preferences (Simon, 1955; Simon, 2013). To understand which biases and boundaries enable individuals to deviate from rational decision-making, emotions have to be understood fundamentally (Ekman, 2007; Gilbert, 2009; Loewenstein et al., 2001; Oatley et al., 2006).

The literature demonstrates that the impact of emotions in decision-making can overrule rational decision processes by individuals even if cognitive information is present that suggests another, more rational course of action (Loewenstein, 1996). This is especially valid when emotions are vivid (Loewenstein et al., 2001). One example of emotions impacting individuals and their decision-making frame is the consensus in the literature about individuals in good moods making optimistic judgements and individuals in bad moods making pessimistic judgements (Han, Lerner, & Keltner, 2007; Loewenstein & Lerner, 2003). While this might be straightforward, other coherences might be not. For instance, two studies find a positive correlation between the stock market performance of several countries and the hours of sunshine in those countries (Hirshleifer & Shumway, 2003; Kamstra, Kramer, & Levi, 2003). Edmans, Garcia and Norli (2007) find that when a given country's soccer team is eliminated from the World Cup, the stock market returns decline. Thus, emotions can have a strong impact on individuals and have the potential to cause changes in decision making or in risk behaviour.

4. Factors influencing risk preferences

In contrast to most streams of literature concerned with risk preferences, the aim of this study is to examine the direct effect of life-events on risk preferences. Thus, the effects of other factors that might simultaneously occur during a life-event, and in this case, a change in the family situation should be controlled for. Changes in the family situation can then only have a direct effect on risk preferences if the change in risk preferences is only caused by the change in the family situation and not by, for instance, a change in the financial situation of an individual that accompany the life-event. Thus, the aim of this study is to examine the causal effect of a change in the family situation on risk preferences. In the following, only factors that exclusively accompany the change in the family situation, and thus are unique to the given situation, are taken into account. On the one hand, these include emotions that come into play with a change in the family situation, since it has been found that especially negative emotions can bring about a change in behaviour (Cohn, Engelmann, Fehr, & Maréchal, 2015; Guiso, Sapienza, & Zingales, 2015; Kandasamy et al., 2014; Lorenz, Wickrama, Conger, & Elder Jr,

2006). On the other hand, family development theory gives additional insights on how risk behaviour might change when a different family state is reached (Chaulk et al., 2003; Klein & White, 1996; White, 1991).

Since emotions can influence behaviour in a crucial way, events linked to strong emotions could therefore be direct drivers of changes in behaviour. For instance, it was found that chronic stress periods during which the cortisol levels of individuals rises, result in increased risk aversion amongst these individuals (Kandasamy et al., 2014). Kandasamy et al. (2014) conducted an experiment in which they had subjects either take capsules that increased their chronic stress levels or placebo capsules. The increase in chronic stress levels caused by the capsules led to increased risk aversion of the subjects. Guiso et al. (2015) find a relationship between fear and risk behaviour. In a laboratory experiment, they showed that fear increases individual's risk aversion. In addition, Cohn et al. (2015) find that fear leads to increased levels of risk aversion. The researchers examined whether financial professionals are impacted by financial market trends in such a way that they change their risk tolerance in response to an economic boom or a recession. The results show that financial professionals are more risk averse in times of an economic crash, which is associated with fear. Thus, both types of negative emotions, stress and fear, can lead to a more risk averse behaviour.

Another approach to explain the effect which a change in the family situation has on risk preferences comes from family development theory. Family development theory divides the life-cycle of a family into different stages in which each family situation is accompanied by different responsibilities, different family members, different needs and different social expectations (Chaulk et al., 2003). According to family development theory, individuals and families adjust their expectations and their behaviour to the specific requirements of the stage the family is in at a certain point in time. In addition, every stage a family can be in, results in different uncertainties which can change the families' frame of perception, behaviour and decisions (Chaulk et al., 2003; Klein & White, 1996; White, 1991). As perceptions, expectations and behaviour of individuals change in a new family state,

the social meaningfulness of economic gains and losses can also vary, resulting in a change in how risks are evaluated.

A change in the family situation of an individual can occur due to many events. One crucial event in the life of many individuals is marriage. A change in someone's life and attitude that occurs due to marriage can be significant as can its effect on preferences. According to family development theory, individuals will adjust their perceptions and social expectations to those of husbands and wives, which are determined by norms such as family support, ownership of resources and the consensus in decision-making (Chaulk et al., 2003; Klein & White, 1996; White, 1991). It is also more likely that couples will adjust their savings behaviour to be able to purchase property together in the future or have children together when they are married. Thus, roles and norms in a marriage are accompanied by increased responsibilities. Furthermore, couples in a marriage have more to lose. This includes not only a loss of income, but also the stable surroundings which couples have built through marriage. Since most individuals experience a loss of money as worse than earning the same amount, a loss that is perceived as worse due to marriage should lead individuals to be more willing to prevent such a loss (Chaulk et al., 2003; Kahneman & Tversky, 1979). Thus, compared to singles or non-married couples, married couples should perceive a loss as worse than single families and should therefore be more risk averse than singles or non-married couples.

However, some individuals do not stay in a marriage for their whole life. Instead, some individuals get divorced. A divorce is associated with negative emotions and feelings of the person concerned. For instance, it has been found that divorced women suffer from significantly higher levels of stress than married women. Also years after the divorce, they self-report a higher amount of stressful life-events than married women (Lorenz et al., 2006). However, a divorce does not only lead to stress but could also lead to other negative emotions such as fear. Fear can be triggered in the state immediately after a divorce due to an environment that might be perceived as less safe and stable than the previous environment with the partner. A divorce may also lead to times of uncertainty and a lack of control

(Sorosky, 1977). Thus, taken together, a divorce can produce a higher level of stress and fear which leads to higher levels of risk aversion amongst the concerned individuals. However, as argued before, family development theory predicts that marriage leads to higher levels of risk aversion due to roles and norms in a marriage that lead to greater responsibilities (Chaulk et al., 2003; Klein & White, 1996; White, 1991). Thus, marriage also leads to an environment in which potential losses are perceived as worse than before the marriage. Therefore, this leads to increased risk aversion. Conversely, when individuals get divorced, they go back into a family state in which they have less to lose and might have fewer responsibilities, after controlling for children in the household. Thus, family development theory predicts that individuals are less risk averse after they get divorced than when they were still married (Chaulk et al., 2003; Klein & White, 1996; White, 1991).

Becoming widowed could also lead to negative emotions. Losing a spouse often leads to anxiety and chronic stress periods (Bonanno, 2001; Osterweis, Solomon, & Green, 1984; Sanders, 1980). These findings suggest that such loss can have a large impact on the emotional state of an individual in the years after the event happened. This can then lead to higher levels of risk aversion. However, family development theory again provides a contrary perspective. In the case of the death of a spouse, the life of the individuals that experience the loss changes. It goes into a direction in which the individuals concerned are not responsible for another person (Chaulk et al., 2003; Klein & White, 1996; White, 1991). This effect might be even stronger if the partner died due to some long-lasting illness which required the spouse to spend their resources on taking care of the partner. Thus, family development theory predicts that the loss of a partner might make individuals that experience the loss more risk tolerant.

Another change in the family situation can be the birth of a child. Thus, if the family is growing, parents are not only responsible for themselves but also for a child. Family development theory can also be applied to becoming parents as another family state. The family has different needs as the child needs a safe surrounding and demands time. Also social expectations and perceptions change due to the new family state (Chaulk et al., 2003; Klein & White, 1996; White, 1991).

Thus, the new family environment is characterised by a more secure structure which is the foundation for nourishing and socialising the children in the family while society also has high stakes in the socialisation and survival of new family members (Chaulk et al., 2003; Klein & White, 1996; White, 1991). These family preferences are supported by several studies which find that the arrival of children makes families lower their investment risk due to the increased need for stable resources (Barsky et al., 1997; Grable, 1997; Schooley & Worden, 1996; Xiao & Anderson, 1997). The aforementioned characteristics of parenthood indicate that a stable surrounding and a stable income is required to raise children. Monetary or non-monetary losses might hit parents harder than families without children as those losses might strain family resources needed to fulfil the requirements of parenthood explained above. Thus, losses might feel worse for households with children than for households without children. Hence, parents should choose certainty over uncertainty and, therefore, become more risk averse due to the birth of a child (Chaulk et al., 2003; Klein & White, 1996; White, 1991).

5. Data

This study is based on survey data from a large, representative database of the German population with more than 20,000 individuals participating annually. Survey data allows the empirical representation of real life processes and is characterised by high external validity. To ensure the best possible causality, longitudinal data will be used (Giesselmann & Windzio, 2013). The data that will be used to find evidence for the hypotheses and research question are retrieved from the German Socio-Economic Panel Study (SOEP) and includes the years 2004-2016. The SOEP is an annual survey of households and individuals within households which has been carried out since 1984 (Wagner, Frick, JR, & Schupp, 2007).

The sample includes individuals aged 16 to 105 with a mean age of 49 years. It is limited to individuals who have participated in at least two waves and is unbalanced due to attrition. In total, 44,487 individuals participated in the survey. Taking all waves together, the sample includes 245,424 observations of which 114,128 are male observations and 131,296 observations are female individuals.

147,294 observations are married individuals and 98,130 observations are not married while 20,670 observations are divorced observation and 224,754 are non-divorced observations. 15,317 observations are individuals who have experienced a loss of a spouse and are, thus, widows or widowers. 230,107 individual observations in the sample did not report having experienced such a loss. The sample includes 85,674 individual observations that reported being a parent and 159,750 observations that did not report being a parent.

Table 1 - Description of observations

Characteristics	Frequencies
Gender	
Male (1)	114,128
Female	131,296
Marital status	
Married (1)	147,294
Non-married	98,130
Divorced (1)	20,670
Non-divorced	224,754
Widowed (1)	15,317
Non-widowed	230,107
Parenthood	
Parent (1)	85,674
Non-parent	159,750

Table 1. Description of observations

During the sample period, 3,448 individuals got married, 1,215 got divorced, 1,047 individuals experienced the death of a partner and 5,245 individuals became parents.

Table 2 - Life-events summary statistic

Explanatory variables	Frequencies
Marriage	3,448
Divorce	1,215
Death of the partner	1,047
Child birth	5,245

Table 2. Life-events summary statistic

The risk preferences were distributed as follows: 13,077 observations for which the individuals reported risk category zero, 12,278 reporting the first risk category, 26,434 reporting the second risk category, 32,670 reporting the third risk category, 24,856 the fourth, 50,736 the fifth, 27,858 the sixth, 29,311 the seventh, 19,709 the eighth, 5,103 the ninth and 3,392 the tenth category. The mean risk preference is 4.88402 and the standard deviation is 2.357634.

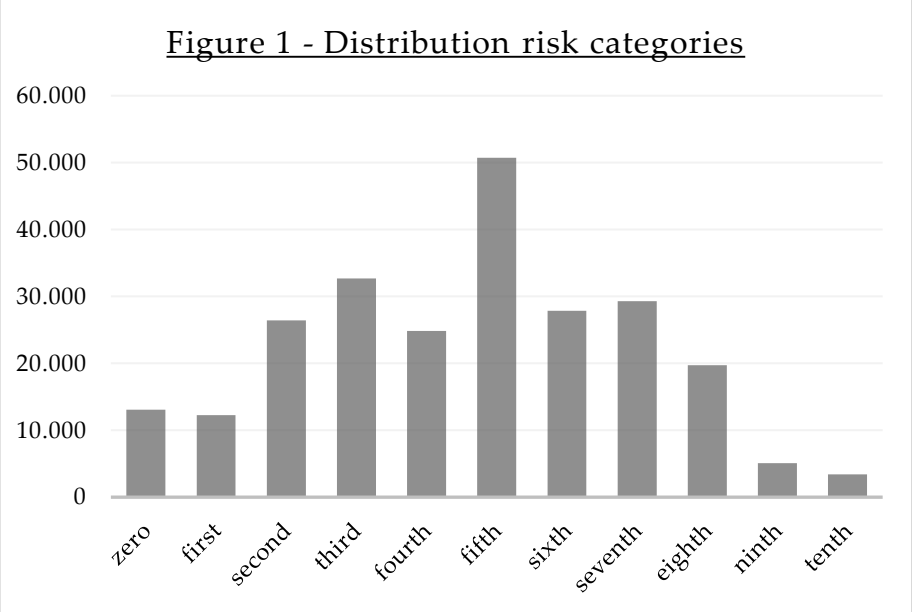

Figure 1. Distribution risk categories

6. Methodology

To test for individuals' risk preferences, the SOEP includes one question which asks for the individual's willingness to take risks (Appendix 1, Figure 1):

> *How do you see yourself: are you generally a person who is fully prepared to take risks or do you try to avoid taking risks? Please tick a box on the scale, where the value 0 means: 'not at all willing to take risks' and the value 10 means: 'very willing to take risks'.*

Based on the above-mentioned question to measure risk preferences, the participants of the survey can be separated into eleven risk categories. Hence, the dependent variable of the regression is a categorical variable that reflects the individual's risk preferences in eleven categories. The survey further asks for the participants' marital status which contains statuses such as married, divorced and widowed. In the other survey questions, participants were also asked how many children they have in their household which will be used to determine whether a participant is a parent, thus the variable takes a value of one if there is at least one child in the household. These indications allow us to observe a change in the family situation of an individual. Thus, the explanatory variables will be dummy variables that take a value of 1 if the subject is married, divorced, widowed or a parent and 0 if a specific family state does not apply to the subject.

As risk preferences can likely be explained by a large number of personal characteristics, other life-cycle events or the financial situation of the individuals participating in the survey, control variables will be added to the regression (Barsky et al., 1997; Botti, Conte, Di Cagno, & D'Ippoliti, 2008; Post, van den Assem, Baltussen, & Thaler, 2008). The regression consists of a control for the age of the individual and the relationship of the individual with the head of the household. Additionally, education, health status and the log of income of individuals are added to the regression as these are known drivers for risk preferences (Barsky et al., 1997; Botti et al., 2008; Post et al., 2008). The logarithm of income is defined as the post-government income of a household. The measure includes income from employment of any kind, private transfers, net return on assets and imputed rental

earnings minus taxes and social security contributions plus public transfers and pensions (Frick, Jenkings, Lillard, Lipps, & Wooden, 2007). As some life-events as getting divorced, the death of the spouse or the birth of a child are not only accompanied by an eventual change in income but also by exclusive alimonies or earnings due to the specific life-events, this specific income measure is appropriate for controlling for such additional income. Divorce alimonies, bereavement benefits or child benefits are taken into account in the post-government income. A 5-point Likert scale is used to report on the health status of the participants, with one being very good health and five being bad health. Furthermore, controls for the annual work hours, whether a participant has a disability, the education of a participant and whether the participant lives in west or east Germany are included. Education could either be reported as less than high school (1), high school (2) or more than high school (3). The above-mentioned control and explanatory variables result in the following regression equation:

$$Risk\_Pref_{it} = \alpha_0 + \alpha'_1 X_{i,t} + \alpha'_2 I_{i,t} + \alpha'_3 Z_{i,t} + \gamma_i + \mu_t + \varepsilon_{i,t}$$

Where $X_{i,t}$ is a vector of the following life-events that are to be analysed in the regression: getting married, getting divorced, losing a spouse and becoming a parent. $I_{i,t}$ is a vector of the following socio-economic characteristics: the natural logarithm of post-government income, age, being disabled, education, west Germany (dummy), number of children in the household and employment status. The self-reported health status is represented by vector $Z_{i,t}$.

With a sample size as large as 245,424, a normal distribution can be assumed which makes it possible to use parametric tests to observe if family events have a direct effect on risk preferences. Another assumption of using a parametric test is that the sampling is random, thus ensuring that there is no selection bias. As the SOEP is representative of the German population in which households are randomly assigned to participate in the survey, selection bias is not an issue. A further assumption is that the observations are independent. Since the SOEP is a study where answering questions regarding risk preferences and the family status have no consequences on others or on the individual or household in a later period, the observations are independent. Additionally, heteroscedasticity is a concern when

using parametric tests. All estimations will therefore report robust standard errors which correct for possible correlations of the error terms among individuals. According to Dohmen et al. (2011), the underlying interval structure of the risk preferences retrieved from the SOEP risk preference question justifies the use of a parametric model.

To observe if the above-mentioned life-events can directly cause changes in risk preferences of individuals, this study will use a conditional fixed-effects ordered logit model as the time-invariant heterogeneity is not uncorrelated with all observed variables and thus a random effects model provides biased estimates while a fixed effects model provides unbiased estimates. When using the fixed effects model, group means will be fixed and, thus, the panel structure and the different individuals in the sample will be accounted for. Hence, one can observe the within-variation of individuals which means that individual risk preferences will be compared before a change in the family situation occurred and after that specific event occurred. The 'blow-up and cluster' estimator (BUC) will be used which allows an ordered logit model to be included in the fixed effects model structure (Baetschmann, Staub, & Winkelmann, 2015). At all possible cut points, the BUC estimator dichotomises the dependent variable and combines all dichotomisations which allows it to jointly estimate every obtained fixed-effects logit model in one likelihood function (Baetschmann et al., 2015). Hence, the BUC estimator accounts for the threshold values at which the risk categories change and uses these cut points to record the dependent variable into k-1 dichotomisations where k is the number of ordered outcomes of the dependent variable, which is eleven. The observations are then replicated k-1 times for each dichotomisation which is referred to as 'blowing-up' the data while the k-1 copies of each variable are then dichotomised at all different cut points (Baetschmann et al., 2015). Thereafter, a conditional logit estimator with clustered standard errors is used to regress the whole 'blown-up' sample. Standard errors are robust and are clustered at the individual level. Thus, standard errors are robust against heteroscedasticity and are hereinafter referred to as Huber-White standard errors.

The BUC is especially appropriate for large samples and is unbiased irrespective of the number of ordinal response categories (Baetschmann et al., 2015). As fixed effects do not estimate the effects of variables that do not change over time, such as gender, the regressions will be divided into the overall effect which leaves gender out of the regression since gender is fixed, a regression only including women and a regression only including men. As seen earlier in the literature review, it is likely that gender explains large parts of the variation across risk attitudes, meaning that there might be different effects between women and men that can be captured by performing gender-specific regressions. While the elimination of time-invariant variables, by within-transformation, might be a drawback of using a fixed-effects model, an advantage is that the fixed effects model accounts for omitted variable bias as long as omitted variables are constant over time. Therefore, the BUC accounts for unobserved heterogeneity that is constant over time. Using a fixed effects model requires the error term to be strictly exogenous. Hence, the idiosyncratic error term should be uncorrelated with the explanatory variables in each time period. In the fixed effects model, this would imply that a correlation between $\varepsilon_{i,t}$ and $X_{i,t}$ emerges only through the time invariant part of the error term γ_i.

$$E\left(X_{i,1,\dots,}X_{it},\gamma_i\right),=0$$

The validity of this assumption is further discussed in section 8.4.1 and will be assumed for the further analysis.

7. Results

7.1 Descriptive Results

In figures 2 to 5, the median risk preferences of individuals in each wave are presented. The individuals in the sample are split into married and non-married individuals, divorced and non-divorced, widowed and non-widowed and parents and non-parents respectively. Additional Mann-Whitney U-tests are conducted at each wave between the different groups to test if there is a statistical difference between the distribution of two samples (Appendix 2, Table 1). The Mann-Whitney U-test analyses if two independent samples come from the same population,

thereby it looks at differences in the medians of two groups and differences in shape. Thus, there is a statistical difference between two groups if two groups are not from the same population.

When comparing married and non-married individuals in the sample (figure 2), it becomes clear that married individuals in the sample are less risk tolerant than non-married individuals. However, the effect is relatively small. Figure 3 shows that there is no difference in medians between divorced and non-divorced individuals in the sample. Figure 4 shows widowed and non-widowed individuals and their general median risk preference. One can see that widowed individuals are less risk tolerant than individuals that did not lose a spouse. In wave five, individuals that are parents in the sample are more risk tolerant than individuals that are not parents, while they otherwise have the same median risk preferences as is shown in figure 5.

The Mann-Whitney U-tests show that in all waves, married and non-married individuals in the sample have statistically different risk preferences from each other. However, the direction of the effect runs in a different direction than expected based on the calculated medians. In each wave the Mann-Whitney U-test shows that married individuals in the sample are more risk tolerant, while in wave two to five unmarried individuals are more risk tolerant based on the medians in the sample. This implies that the group of non-married individuals might not only have a larger median but also a wider spread as the Mann-Whitney U-test also is a test of shape (Appendix 2, Figure 1). The results of the Mann-Whitney U-test regarding the difference between divorced and non-divorced individuals are in line with the calculated medians in the two groups. The results suggest that in nine out of eleven waves there is no significant difference between the two groups at the five percent significance level. In wave one and two, non-divorced individuals are more risk-tolerant than divorced individuals. Also, the results of the conducted Mann-Whitney U-tests regarding widowed and non-widowed individuals are in line with the medians presented. In each wave, there is a statistical difference between the two groups. Non-widowed individuals seem to be the more risk tolerant group in each wave. While the calculated medians of the parents and non-parents

show that parents have a tendency towards more risk taking in wave five, the Mann-Whitney U-tests shows a different picture. It suggests that in each wave, non-parents are the more risk tolerant group among the two and these results are statistically significant in each wave. This implies that among parents there is a wider spread of risk preferences that leads the Mann-Whitney U-test to conclude that parents are the more risk averse group (Appendix 2, Figure 2).

One must account for the fact that the indirect effects that accompany a specific change in the family situation are not controlled for. This means that the direct effect of life-events on risk preferences cannot be observed. Additionally, this is a between-subject comparison as the panel structure in those calculations and tests is not taken into account which means that no within-effect on individuals can be observed. To extract the direct effect from these events, one has to control for factors that could simultaneously influence risk behaviour when these events occur. Furthermore, within-individuals' effects have to be taken into account as one can only get a potentially causal effect when also comparing the same individuals before and after those events occurred. Thus, in the following, a regression analysis will be conducted to be able to take these factors into account.

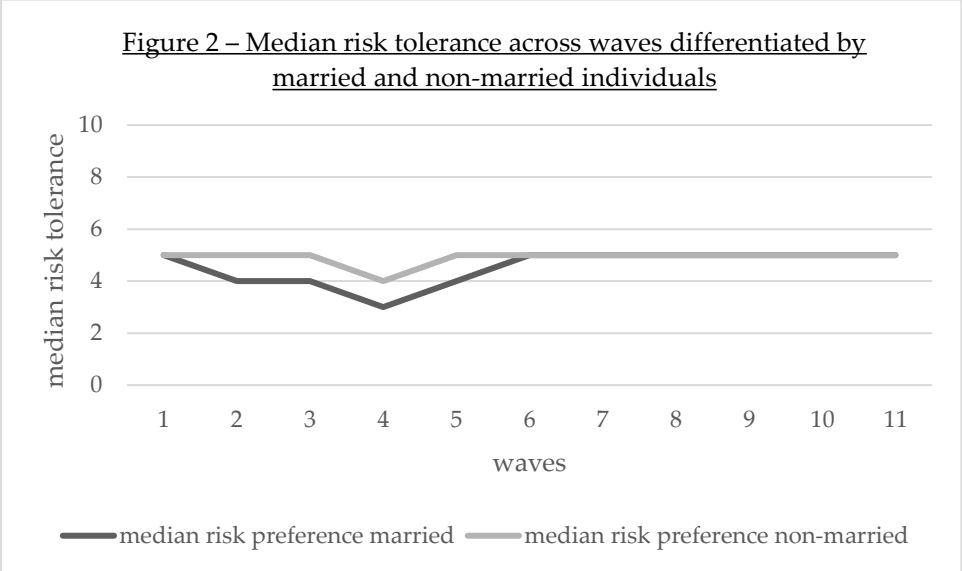

Figure 2. Median risk tolerance across waves differentiated by married and non-married individuals

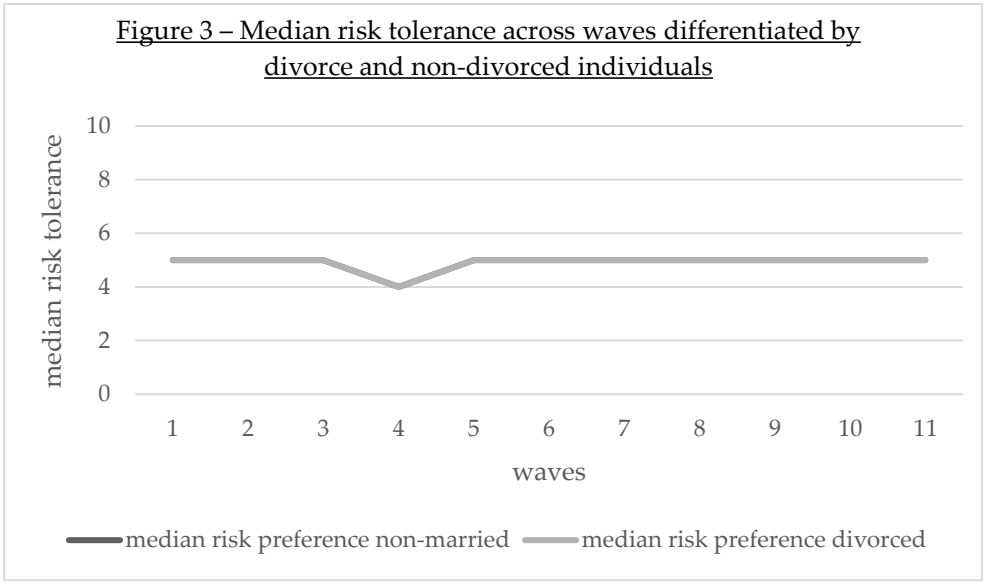

Figure 3. Median risk tolerance across waves differentiated by divorce and non-divorced individuals

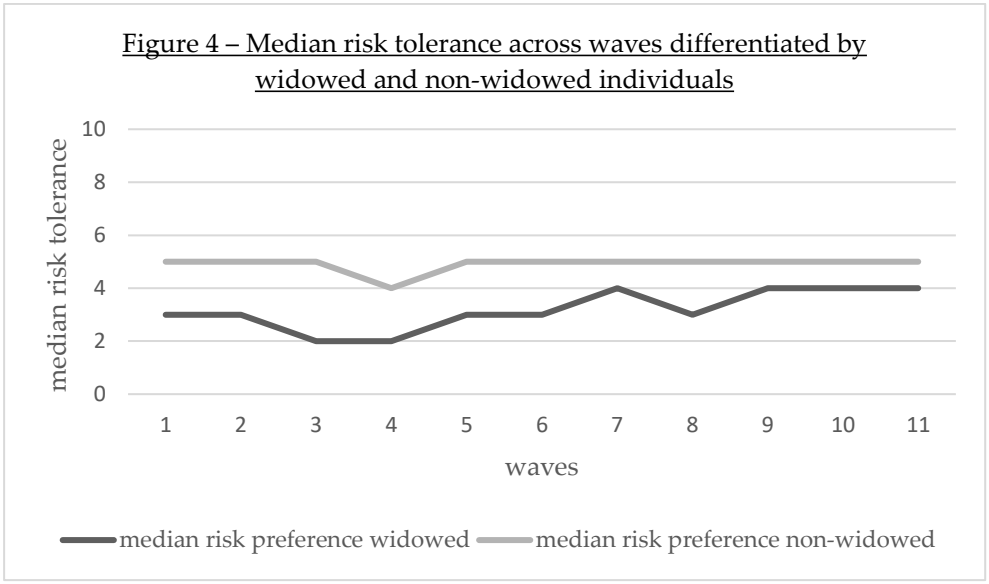

Figure 4. Median risk tolerance across waves differentiated by widowed and non-widowed individuals

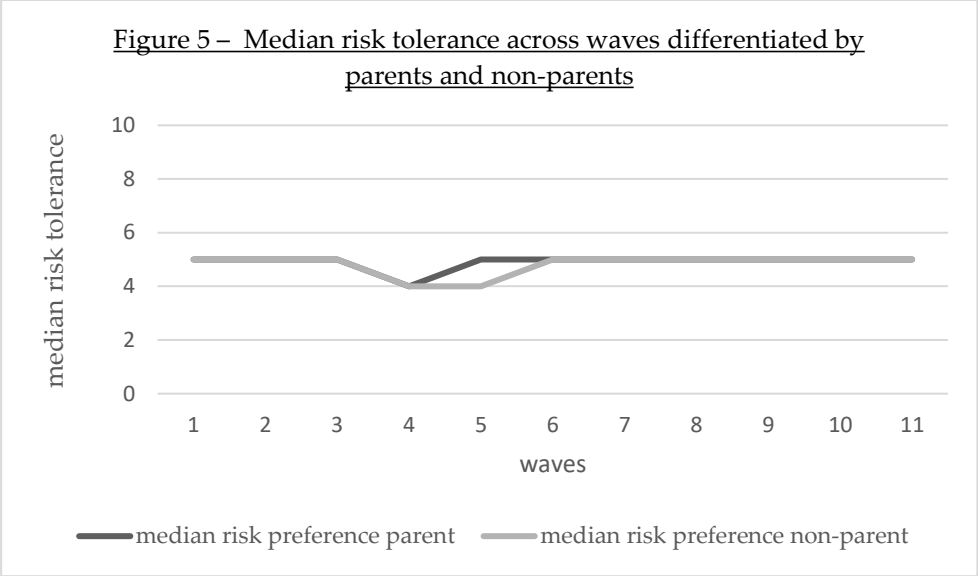

Figure 5. Median risk tolerance across waves differentiated by parents and non-parents

7.2 Regression Results

The purpose of this study is to observe if single life-events can directly influence a change in risk preferences on an individual level. Table 3 shows the results of the regressions. The results suggest that marriage, divorce and childbirth can be factors that directly alter risk preferences of individuals, keeping all other factors fixed. In particular, getting married and getting divorced increases risk tolerance, whereas the birth of a child decreases individuals' risk tolerance significantly. In table 3, these effects are shown as proportional odds ratios. Thus, being in the highest risk preference category, which is reported as 'very willing to take risk' is 1.18 times more likely when an individual gets married ($p < .01$), 1.27 times more likely when getting divorced ($p < .01$) and 1.11 times less likely when becoming a parent ($p < .01$), keeping all other factors fixed. When including only women in the regression, being 'very willing to take risk' is 1.18 times more likely when an individual gets married ($p < .01$), 1.29 times more likely when an individual gets divorced ($p < .01$) and 1.12 times less likely when becoming a parent ($p < .01$). The last column in table 3 reports the regression results with only men included in the regression. Men are also 1.18 times more likely to be in the highest risk category when they get married ($p < .01$), they are 1.26 more likely when they get divorced

($p < .01$) and 1.09 times less likely when they become a parent ($p < .05$). Experiencing the loss of a spouse does not significantly influence risk tolerance at conventional significance levels. The standard errors reported in table 3 are relatively small (.03; .06; .02) which provides support for the reliability of the mean, thus the results represent an accurate image of the population mean.

Table 3 - regression results - odds ratio

Regression models for marriage, divorce, death of the spouse and child birth on risk tolerance

	ordered logit overall	ordered logit women	ordered logit men
	β	β	β
Variables	(robust SE)	(robust SE)	(robust SE)
Explanatory:			
marriage	1.18***	1.18***	1.18***
	(.03)	(.04)	(.05)
divorce	1.27***	1.29***	1.26***
	(.06)	(.07)	(.09)
death spouse	1.10	1.14	1.09
	(.07)	(.09)	(.12)
child birth	.90***	.89***	.92**
	(.02)	(.03)	(.03)
Controls:			
age	1.01***	1.01***	1.01***
	(.00)	(.00)	(.00)
work hours yearly	1.00***	1.00***	1.00**
	(.00)	(.00)	(.00)
relationship to head	1.11***	1.17***	1.04
	(.02)	(.03)	(.03)
west Germany	1.19**	1.16	1.22
	(.10)	(.13)	(.16)
education	.82***	.78***	.88**
	(.03)	(.04)	(.05)
log income	.98	.96**	1.01
	(.02)	(.02)	(.03)
disabled	.91***	.89***	.93*
	(.03)	(.04)	(.04)
health status	.90***	.91***	.88***
	(.01)	(.01)	(.01)
Pseudo R^2	.0020	.0021	.0020
Log pseudolikelihood	-344,219.19	-186,265.86	-157,917.66

** p < .10, ** p < .05, *** p < .01*
Standard errors in parentheses
Source: SOEP

Table 3. Regression results

8. Discussion

8.1 Validity of the risk preference measure

The risk preference question in the SOEP survey should be an accurate predictor of the actual general risk preferences of the subjects in the survey. Using large field experiments, some studies have shown that self-reported risk preferences are a valid predictor of risk preferences (Dohmen et al., 2011; Jung & Treibich, 2015).

Dohmen et al. (2011) tested the validity of the SOEP risk question by having 450 individuals randomly take part in a behaviour validation study. In the study, individuals were asked to answer the general risk question of the SOEP panel on risk preferences, in a questionnaire similar to that of the SOEP. After that, the subjects took part in a paid lottery experiment with the intention of eliciting their true, incentivised, risk preferences (Dohmen et al., 2011). In the lottery task, individuals could choose to play the lottery with a 50 percent chance of winning €300 and a 50 percent chance of winning nothing. Otherwise, the subjects could choose to receive a certain payment, the amount of which differed among the tasks and ranged from €0 to €190. Risk neutral individuals should then be indifferent between a safe payment of €150 and the lottery, whereas risk averse individuals would prefer a safe payment of below €150 over the lottery and risk seeking individuals would prefer the lottery even over safe payments above €150 (Dohmen et al., 2011). One out of every seven participants were paid according to one of their choices in the lottery experiment with the choice to be paid out being selected randomly. Dohmen et al. (2011) then regressed the value of the switching point of the subjects from the safe amount of money to the lottery with the answer given to the SOEP question that measures risk preferences on an 11-point Likert scale.

The results indicate a significant positive relation between the general risk question in the SOEP and the incentivised lottery questions. Thus, the general risk question asked in the SOEP does predict actual risk behaviour. Dohmen et al. (2011) further showed that the general risk preference question in the SOEP corre-

lates highly with more domain-specific questions regarding risk preferences. Additionally, Dohmen et al. (2011) particularly stated that self-reported risk behaviour is a reliable predictor of not only the actual risk-taking behaviour in incentivised lottery experiments, but also of actual behaviour in regards to stock market investment, smoking, self-employment and sports.

8.2 Evaluation of the effects of control variables on risk preferences

Evaluating the effect which control variables have on risk preferences and comparing them to the previous literature could reveal possible vulnerabilities of the regression models used in this study. The literature review revealed some topics that were widely researched in the last decades, namely the influence of demographics such as age and education, the effect of health issues and the impact of income. The effect which age has on risk preferences was analysed by an extensive stream of literature. Many of these studies consistently find that getting older reduces risk tolerance among individuals. The results in table 3 show a different picture than that of the literature. In fact, the results show that risk tolerance significantly increases with age among all gender models ($p < .01$). However, the effect size is quite small as getting one year older makes being in the highest risk category 1.01 times more likely for individuals, keeping all other factors fixed.

Even though the study of Dohmen et al. (2017) is similar to the one conducted in this thesis, it finds contradicting results. In fact, they also use data from the SOEP. In their sample, they also include individuals from 16 years of age and older, representative of the German population. However, they restricted the maximum age to 80 while this study does not restricted age. Furthermore, they used a different question to elicit risk preferences and also used cross sectional data from the SOEP. The authors controlled their results with data from the DNB Household survey which is representative of the Dutch population while they also restricted their sample in this additional analysis to individuals in the ages from 16 to 80. Another difference between this study and that of Dohmen et al. (2017) is that they used a pooled linear OLS regression without including individual fixed effects to estimate the effect of age on risk preferences, while this study uses a conditional

fixed effects ordered logit model. The latter difference could be one reason why the results in this study differ from that of Dohmen et al. (2017).

When using a pooled model without accounting for individual fixed effects, all observations will be randomly accounted for when performing the regression. Whereas in fixed effect models individual differences are controlled for, thus differentiating between individuals in the sample (subject-specific means). Indeed, when performing a pooled ordered logit regression without including individual fixed effects (table 4, column 4) with the SOEP data, one would find the same pattern as in the study of Dohmen et al. (2017). This could be due to between-effects having a larger impact on the estimates than the within-effects that the conditional fixed effects ordered logit model takes into account. For instance, different generations can have different risk attitudes which play a larger role in estimating between-effects than within-effects. Another reason why the estimates could be different is that Dohmen et al. (2017) include conventional income measures in their regression while this study uses post-governance income as a control.

Thus, both factors discussed could have an impact on the effect of age on risk preferences. This means that both approaches could explain the differing results for age in this paper compared to the prior literature's findings, which is a further contribution to the literature. Nonetheless, more in-depth research is needed to fully understand the direction of the age effect on risk preferences. However, this does not affect the validity of the results and is not a shortcoming of the study as this study explicitly aims to identify changes within individuals caused by changes in the family situation.

Another difference between this study and prior literature is that of the effect of income on risk preferences. The regression results show that income has no effect on risk tolerance at conventional significance levels. However, prior literature results mostly suggest that with increasing income, individuals become more risk tolerant (Barsky et al., 1997; Dohmen et al., 2011; Donkers et al., 2001; Hopland et al., 2016). The most similar study to this one was conducted by Dohmen et al. (2011) and also finds contradictory results to this study. The authors used data

from the SOEP and also used the general risk preference elicitation question described above. They used interval regression techniques but also controlled their results by performing additional ordered probit models, OLS regressions and binary probit models, while they did not use individual fixed effects in any of the regressions performed (Dohmen et al., 2011).

When performing a regression without using individual effects and treating the dependent variable as categorical, similar to the interval approach used by Dohmen et al. (2011) in their main regression, results are in line with their study (table 4, column 4). Thus, the different results are due to the use of individual fixed effects in this study and the focus on the within-variation while Dohmen et al. (2011) does not use individual fixed effects and focuses on the individual's between-variation.

However, another difference between this study and that of Dohmen et al. (2011) is that income in this study is not a conventional measure of income but post-government income which is different from the income measure that was used by Dohmen et al. (2011). Dohmen et al. (2011) used the gross monthly income of households, while this study's income is a measure of income from employment of any kind, net return on assets, private transfers and imputed rental earnings plus public transfers and pensions minus taxes and social security contributions (Frick et al., 2007). Germany gives its citizens relatively large social benefits which results in lower wealth inequality in comparison to other countries (Bosch & Kalina, 2016). This can be explicitly captured by using post-governance income as this is the income after such benefits, tax, etc. Thus, another reason for the differing results could be the different measures of income.

Another explanation could be that of omitted variables. Dohmen et al. (2017) include a set of control variables that are not included in this regression. However, as this study is using a fixed effects regression, unobserved heterogeneity that is constant over time is already controlled for, meaning that an omitted variable bias can only occur if the omitted variable would be time-varying. To minimise the possibility of such time-varying omitted variables which may affect the results, an additional fixed effects regression is conducted including year dummies to control

for omitted variables that vary over time but are constant among units (table 4, column 3). The results of this additional regression show that year dummies do not influence the income results. When including year dummies the income effect is still insignificant at conventional significance levels which is in line with smaller streams of literature that find no significant results of income on risk preferences (Harrison et al., 2007; Tanaka et al., 2010).

The regression results are in line with prior literature findings regarding education. Other streams of literature mostly find that risk tolerance decreases with higher education (Dohmen et al., 2011; Harrison et al., 2007; Tanaka et al., 2010). This study also finds that risk tolerance decreases significantly when individuals obtain a higher education level ($p < 0.01$), which is also valid when including only women ($p < 0.01$) and only men ($p < 0.01$) in the regression. Health issues were also a widely discussed topic in the literature. However, there were no consistent findings regarding the impact of health issues on the individuals risk tolerance (Sahm, 2012; Tison et al., 2012). In the SOEP questionnaire, subjects self-reported their health condition. In this case the self-reported health status has a significant impact on the individuals risk preference. Reporting a worse health condition reduces risk seeking behaviour, keeping all other factors fixed for all groups of subjects ($p < .01$).

Other regression results are that the relationship of a household member to the head of the household has an impact on risk preferences ($p < .01$). This is true for women ($p < .01$), while there was no significant effect found when including only men in the regression. An additional finding not yet discussed by the literature is that becoming disabled leads to less risk tolerant behaviour ($p < .01$). This is significant for both women ($p < .01$) and men ($p < .01$). Furthermore, whether individuals live in west or east Germany influences risk tolerance. Moving to west Germany increases risk tolerance significantly ($p < .10$), which is only valid when including both gender types in the regression. When looking at the impact of the place of residence jointly, results become insignificant at conventional significance levels.

8.3 Robustness of results

In the previous section, some additional regressions were run to shed light on the validity of the control variables estimates. In this section additional regressions will be performed and compared with one another. Since only directions and significance will be compared and some models discussed in this section do not allow the estimates to be displayed as odds ratios, the following estimates will not be discussed as odds ratio coefficients but as the original output. Table 4 reports results of the additional analyses conducted in comparison to the previous regression results.

Specifically, the first column presents the outcomes of the main regression, namely the conditional fixed effects ordered logit regression. Hence, the dependent variable is included as a categorical variable which is modelled by the ordered logit approach in the regression while using individual fixed effects.

The second column treats the dependent variable as continuous while using fixed effects. As can be seen, the results do not change in terms of the significance level and the directions of the effects are robust when comparing the two models.

Column three reports the results of a fixed effects regression, once again treating the dependent variable as continuous but additionally including year dummies to control for year effects. As seen before, treating the dependent variable as continuous has no significant effect on the estimates. Thus, including year dummies should lead to similar results when including them in regressions in which the dependent variable is continuous or categorical while they can technically only be included in a model in which the dependent variable is treated as continuous. When including year dummies, the life-events marriage and divorce do not have a significant impact on risk preferences anymore, while becoming a parent still decreases risk tolerance significantly ($p < .01$). This suggests that only parenthood is a robust estimate as the significant results from the prior regressions also captured time effects that are now controlled for.

In column four a pooled ordered logistic regression is reported. Thus, the dependent variable is treated as categorical again, however this time no individual fixed effects are included in the regression. Hence, in comparison to the fixed effects models used earlier, the observations are now treated as random whereas in the fixed effects models the individual demeaned risk tolerance is regressed on the individual demeaned variables in the regression. As can be seen, some of the variables become significant or the effect direction changes. However, one must take into account that this regression method leads to biased estimates as linear regression analysis without individual fixed effects does not fit the purpose of this research. It is only appropriate for comparing general approaches used in previous literature, for instance to evaluate different directions of controls as done in the previous section.

In the last column, column number five, the dependent variable is split into a risk seeking part (1) and a non-risk-seeking part (0). As reported in the descriptive results, individuals would be risk seeking if their self-reported risk category was between 6 and 10 while they would be non-risk-seeking when their reported risk categories were 0-5. This division allows us to use a binary approach and thus a logit model using individual fixed effects. A drawback of this approach is that standard errors are not robust and that, due to the definition of the general risk preference question in the SOEP, there is no explicit risk neutral option which is why individuals may perceive the risk categories as different in terms of their riskiness which makes it harder to make predictions about risk categories as risk seeking or risk averse. Nevertheless, the results in table 4 show that the estimates are similar to that of the conditional fixed effects ordered logit model in column one. While some significance levels change, using the binomial logit model, effect directions stay the same.

Conclusively the robustness checks results in only the childbirth result being robust when including year fixed effects in the regression while getting married and divorced turn from significant to insignificant when including year dummies.

Table 4 - Robustness of Regression results

Regression models for marriage, divorce, death of the spouse and child birth on risk tolerance

	(1) ordered logit	(2) OLS	(3) OLS	(4) ordered logit	(5) logit
	β	β	β	β	β
Variables	(robust SE)	(robust SE)	(robust SE)	(robust SE)	(SE)
Explanatory:					
marriage	.16***	.14***	-.03	-.07***	.15***
	(.03)	(.02)	(.02)	(.02)	(.03)
divorce	.24***	.21***	.04	.14***	.21***
	(.04)	(.04)	(.04)	(.03)	(.09)
death spouse	.10	.08	-.08	-.32***	-.08
	(.06)	(.06)	(.06)	(.05)	(.08)
child birth	-.10***	-.08***	-.07***	-.02***	-.11***
	(.02)	(.02)	(.02)	(.00)	(.03)
Controls:					
age	.01***	.01***	.02***	-.02***	.03***
	(.00)	(.00)	(.00)	(.00)	(.00)
work hours yearly	.00***	.00***	.00***	.00***	.00***
	(.00)	(.00)	(.00)	(.00)	(.00)
relationship to head	.10***	.09***	.08***	-.03**	.13***
	(.02)	(.02)	(.02)	(.01)	(.02)
west Germany	.18**	.15**	.14*	.20***	.15*
	(.08)	(.07)	(.07)	(.02)	(.09)
education	-.20***	-.16***	-.17***	.09***	-.20***
	(.04)	(.03)	(.03)	(.02)	(.05)
log income	-.02	-.02	-.02	.14***	-.04*
	(.02)	(.01)	(.01)	(.01)	(.02)
disabled	-.10***	-.09***	-.09***	-.07***	-.06
	(.03)	(.03)	(.03)	(.02)	(.04)
health status	-.11***	-.10***	-.10***	-.15***	-.12***
	(.01)	(.01)	(.01)	(.01)	(.01)
individual fixed effec	yes	yes	yes	no	yes
year fixed effects	no	no	yes	no	no
clustering	Huber-White	Huber-White	Huber-White	Huber-White	Huber-White
No. of observations	235,471	235,471	235,471	235,471	141,873

* p < .10, ** p < .05, *** p < .01

Standard errors in parentheses

Source: SOEP

Table 4. Robustness of regression results

8.4 Evaluating causality of results

One factor that builds the foundation for a causal relationship is the use of panel data. Panel data enables the detection of changes in variables at the individual level on the same examination object. Furthermore, this allows us to observe a relationship timewise, for which the explanatory variable causes a change in the dependent variable, and thus the effect originates from the explanatory variable if the effect is causal. Additionally, to be able to determine causality, one must control for all the factors that could possibly have an impact on the dependent variable at the same time. The aim of this research is to observe a change in the explanatory variables that directly causes a change in the dependent variable. Childbirth is the explanatory variable that shows a significant effect on risk preferences and is robust when including year dummies. Thus, this section will focus on the evaluation of the causal effect of this variable on risk preferences.

8.4.1 Omitted variables

Omitted variables are variables that are not in the regression but in the error term and are related to an explanatory variable. They also have an impact on the dependent variable, thus they influence risk behaviour in this case. Research based on survey data can never completely rule out the possibility of omitted variables as to test for any kind of exogeneity one must be able to control for all variables that might correlate with childbirth and risk preferences or conduct a controlled experiment. Omitted variables in the fixed effects model only bias the results if they are time-varying, as the fixed effects model already accounts for omitted variables that are constant over time.

One example that could potentially correlate with childbirth and with risk preferences is that of income or money available in a household. When a child is born, parents might get financial support from the government to be able to better support their child. However, this type of income is already controlled for through the post-government income measure which is included as a control in the regression shown in table 3. Also changes in income due to parents staying at home can

be observed due to the income measure which is also captured through the variable that controls for individuals being employed or not.

However, parents might also spend a large amount of money on their child once it is born. A lot of money is required to, for instance, feed the child or provide it with new clothes as it grows (Lino, Kuczynski, Rodriguez, & Schap, 2017). This spending is not included in the regression above but could be one factor why becoming a parent might make individuals more risk averse as they need a more stable environment to care for the child. Other omitted variables not included could be that individuals that have children are looking for and finally may have safer jobs. This might be in the form of a larger or more stable company that is less likely to go bankrupt or lay-off employees. On the other hand, it could be a change to a more stable industry that is performing well now or is expected to perform better in the long-run. In fact, omitted variables could include all socioeconomic characteristics of individuals.

However, factors that have been shown to correlate with risk preferences can be controlled for. Thus, the regression includes, for instance, age and the health status of individuals as they have been shown to be correlated with risk preferences. One factor that is not controlled for in the regression is that of natural disasters or broader severe events that happen to individuals. On the one hand, these events are partly controlled for in the robustness checks by including time fixed effects. On the other hand, these variables are hardly time-varying as they generally only happen at one specific point in time such as earthquakes.

Thus, an important concern is that increased household spending or a change in the nature of a job which may occur when an individual becomes a parent could also correlate with risk behaviour to bias the estimates which has not yet been shown by prior literature. Hence, more research is needed to make a definitive statement about the causality of these results. In the meantime, this study has included most of the variables that were shown to be correlated with risk preferences.

8.4.2 Reverse causality

Reverse causality is often a problem when examining life-events and their impact on risk preferences. For instance, in the case of marriage, individuals tend to get married earlier when they are more risk averse which has already been shown in the literature (Spivey, 2010). Also, individuals could have children earlier or later or might have more or less children depending on their particular risk preference. However, as this study uses panel data and observes the changes in risk preferences within individuals, the reverse causality issue is different than it would be if between-individual differences were examined.

This study examines whether becoming a parent, meaning the change from a specific state of an individual to a different state, directly has an impact on risk preferences. Reverse causality would then imply that an individual experiences a spontaneous change in risk preferences which causes him or her to become a parent. However, until recently, risk preferences have been assumed to be constant over time. In the last decades, studies have begun to research if specific events can cause risk preferences to change, thus a change without a trigger that causes this change is unlikely (Schildberg-Hörisch, 2018). This implies that causality can only result from childbirth having an effect on risk preferences and not the reverse direction. This is also an important distinction between this study and other streams of literature that mostly use approaches without including individual fixed effects to observe if life-events cause changes in risk behaviour (Chaulk et al., 2003; DeLeire & Levy, 2004; Sung & Hanna, 1996; Yao & Hanna, 2005).

8.5 Attrition

Attrition occurs if individuals drop out from a sample over time, which can be due to several reasons, such as moving to another city or country. However, attrition could also be due to non-random reasons, such as becoming a parent. As long as attrition is random, it does not bias the results and the explanatory power of said results. However, if attrition is non-random, it could potentially lead to biased estimates.

In this sample, approximately 50% of the participants of the SOEP survey participated in at least five waves of the sample. About 5% participated in only two of the waves. Since the sample is restricted to individuals that participated in at least two waves, there are no individuals participating only once. However, this also implies that this sample suffers from attrition. The explanatory variables, getting married, getting divorced and becoming widowed have 6,663 missing values as they were all included in the identical question in the SOEP survey while the variable parent and thus becoming a parent has no missing values.

To test if the described attrition is random, a dummy variable was created that takes a value of one if a specific individual is in the sample in the following year, meaning they participate in the next wave. The regression results show that the created variable is multicollinear with at least one of the variables in the regression and thus cannot be estimated. Thus, one cannot completely rule out the possibility of the attrition being non-random in this sample. When an individual participates in the next wave, there is the possibility that this individual could be less likely or more likely to be in a higher risk preference category. Hence, the regression results could be biased by the married, divorced and widowed individuals who drop out being more or less risk seeking. However, it could also be that individuals who drop out generally earn less or more. Thus, it cannot be definitely determined if there is attrition bias and, if there is, whether the attrition bias influences the results in the regression. If the sample suffers from attrition bias, the estimated results may not be representative. This is only a possibility for the getting married, getting divorced and being widowed variables as becoming a parent cannot be affected by attrition bias because this variable does not have missing values.

8.6 Delayed effect

In this study, the results of getting married, getting divorced, becoming widowed and becoming a parent and their impact on risk preferences are examined. However, longer-term results of such life-events might also be of interest. The reason why results could change are that emotions can be short-lived (Levenson, 1994). Wilson and Gilbert (2005) argue that rationalisation and adaptations to certain events can bring the emotional state back to the baseline state which existed prior to the event occurring. To test if risk preferences also change in such cases, another conditional fixed-effects ordered logit regression was conducted. The explanatory variables used for this additional regression are lagged. Thus, the events occurred in t-1. This allows us to observe the effects of life-events on risk preferences in a one-year time-span from period t-1 to period t which means that the life-events that occurred in the year prior to participating in the study are regressed against risk preferences. An additional question from the SOEP is used for this regression. The subjects were asked if a particular life-event occurred to them in the year prior to the one in which they took the survey. The life-events are similar to that of the previous events, i.e. getting married, getting divorced, becoming a parent and losing a partner who is not necessarily the spouse.

The additional regression results in table 5 show that becoming a parent decreases risk tolerant behaviour in the year after the event occurred, keeping all other factors fixed ($p < .01$). This effect is valid when including only females in the regression ($p < .01$) and only males ($p < .01$). This suggests that the birth of a child also has an impact on the risk preferences of individuals one year after the event occurred. However, in this regression, getting married, getting divorced and becoming a parent do not change risk preferences significantly at conventional significance levels. Hence, these events have no impact on the risk preferences of individuals in the year after the occurrence of a marriage, a divorce and the loss of a partner.

Table 5 - delayed regression results - odds ratio

Regression models for marriage, divorce, death of the partner and child birth on risk tolerance

Variables	ordered logit overall β (robust SE)	ordered logit women β (robust SE)	ordered logit men β (robust SE)
Explanatory:			
marriage	.99	.98	1.00
	(.04)	(.05)	(.06)
divorce	1.07	1.02	1.17
	(.07)	(.09)	(.12)
death partner	.92	.89	1.00
	(.06)	(.07)	(.13)
child birth	.85***	.85***	.86***
	(.03)	(.04)	(.04)
Controls:			
age	1.01***	1.01***	1.01***
	(.00)	(.00)	(.00)
work hours yearly	1.00***	1.00***	1.00**
	(.00)	(.00)	(.00)
relationship to head	1.09***	1.15***	1.02
	(.02)	(.03)	(.03)
west Germany	1.17*	1.15	1.19
	(.10)	(.13)	(.16)
education	.83***	.78***	.90*
	(.04)	(.04)	(.06)
log income	.97	.95**	1.00
	(.02)	(.02)	(.03)
disabled	.92***	.90**	.95
	(.03)	(.04)	(.04)
health status	.89***	.91***	.88***
	(.01)	(.01)	(.01)
individual fixed effects	yes	yes	yes
year fixed effects	no	no	no
clustering	Huber-White	Huber-White	Huber-White
No. of observations	886,059	466,307	399,752
Pseudo R^2	.0017	.0019	.0018
Log pseudolikelihood	-332,250.34	-179,066.26	-153,144.44

** p < .10, ** p < .05, *** p < .01*
Standard errors in parentheses
Source: SOEP

Table 5. delayed regression results

8.7 Validity of results in different regions

The life-event that was found to have an influence on risk preferences and is robust when including year fixed effects is that of childbirth. It was argued that with the birth of a child, parents become more protective, have more responsibilities for the child and thus try to avoid risk to be able to establish a safe environment for the child. However, parental behaviour across countries could differ and countries itself could offer different amounts of certainty.

In Germany, the societal expectations for parents encourage families to follow the breadwinner husband and female caregiver family model (Trzcinski, 2000). This means that it is anchored in German society that the female family member stays home at least part-time and takes care of the child while the man works to earn the majority of the income for the family (Trzcinski, 2000). This view is supported by the fact that there is an undersupply of childcare facilities in Germany and that 46% of all female, married parents work only part-time (Joesch & Spiess, 2006). Another characteristic of Germany is that it has one of the highest rates of childless women and one of the lowest birth rates across Europe (Kohler, Billari, & Ortega, 2002). German economic indicators are close to the OECD average with GDP and child poverty slightly above average. Thus, when comparing Germany to other European countries, one can see that Germany might offer more financial support for families than the European average, while Germany does not offer much assistance in terms of childcare support.

By using post-government income in the regression analysis, the estimates capture effects which account for financial matters, as this measure controls for the impact of financial support for families. However, what is not taken into account is the impact of childcare support. The estimates could change if this factor has an impact on parental behaviour. Germany provides less support for parents than other European countries. This could explain why the parents themselves become more risk averse in order to provide the child with a stable and safe environment. Since no study has yet examined whether such influences affect parental behaviour, more research is required to determine whether this factor influences parents and, thus, also risk preferences.

8.8 Factors influencing risk preferences theory and results

The factors determining risk preferences were separated into the emotional influence and the influence according to family development theory. Emotions were assumed to affect risk preferences in a risk averse direction when they were considered to be negative due to a change in a family state. Getting divorced and losing a spouse were therefore assumed to have a negative influence on risk tolerance when only taking the emotional influence into account. Family development theory considers factors that have an influence on risk preferences from a different perspective. As stated by family development theory, family states that have more responsibilities and that require someone to take care of another person are assumed to trigger more risk averse behaviour. Thus, according to family development theory, getting married and becoming a parent should lead the individual who experiences the life-event to become more risk averse, while a divorce and the loss of a partner is assumed to lead to more risk tolerant behaviour.

The aforementioned insights lead to the assumption that getting married and becoming a parent directly decrease the risk tolerance of individuals. While, this analysis demonstrates that getting married increases risk tolerance, the effect becomes insignificant when including year fixed effects. Thus, one cannot say that this event directly influences risk preferences of individuals. However, the effect of becoming a parent in the regression analysis is in line with the predictions of family development theory. An explanation of why a change in the family situation significantly influences risk preferences in the case of a child but not in the case of marriage could be due to the nature of the change in the family situation. While individuals can adapt to a new situation when getting married, individuals have no prior adaption period when becoming parents. In Germany in the past decades, couples generally already live together by the time they get married (Sassler & Miller, 2011). On the other hand, the nature of getting married and becoming a parent is different, as childbirth results in the addition of a new family member that must be supported and cannot take care of itself. This might be a crucial difference between the life-events examined as this explains both the long-term and the short-term differences between the results. Thus, family development

theory only predicts risk preferences accurately when there is a child involved which requires a change in responsibility or care-giving behaviour.

The other life-events examined, i.e. the loss of a partner and a divorce, could either make the individual more risk averse according to the emotional influence of the new family state or more risk tolerant according to family development theory. In the regression results, no significant effect of getting divorced and becoming widowed was found when year fixed effects were included. In this case, the negative impact of negative emotions on risk tolerance and the positive impact on risk tolerance of having less responsibilities according to family development theory could have cancelled each other out. However, another explanation that could explain why these life-events have no impact on risk preferences comes from the 'setpoint theory' (Lykken & Tellegen, 1996). This psychological theory predicts that individuals adapt very quickly and completely to changes in life circumstances such as divorce, marriage and the loss of a partner (Lykken & Tellegen, 1996; Myers, 2000). However, the setpoint theory is mainly based on life-satisfaction and well-being, meaning that the effect of negative emotions as predicted in the case of a divorce or the death of a partner might not have a long-lasting effect, meaning that it is not observable for longer than one period after the event.

8.9 Deviation of descriptive results from regression results

Some results presented in the descriptive results section deviate from the ones presented in the regression analysis section. As mentioned before, the descriptive results include indirect effects whereas the aim of the regression analysis is to observe the direct effects of life-events on risk preferences.

As seen in the descriptive results section, divorce had no effect on risk preferences which is in line with the results in the regression analysis after year dummies were included in the regression. Besides the difference in medians in one wave of parents and non-parents which went in a different direction than the regression results, the Mann-Whitney U-test conducted was in line with the regression results in each wave.

However, getting married and becoming widowed has a noticeable effect on risk preferences when only taking the descriptive results into account. According to the Mann-Whitney U-test in the descriptive results section, becoming widowed should decrease risk tolerance while getting married should increase risk tolerance. In the regression analysis, becoming widowed and getting married did not significantly influence risk preferences once year dummies were included. When looking at the pooled ordered logit regression in table 4 column 4, the regression results are in line with the descriptive results regarding the effect of becoming widowed. This is because the observations are randomly taken into account and thus the focus is on the between-variation between estimates without including individual fixed effects in the regression. Thus, the differences between the descriptive results and the regression results in table 3 regarding widowed and non-widowed individuals are likely caused by the described difference between the within-individual and the between-individual comparison approaches. This implies that when subjects are randomly taken into account, there are large between-individual differences in how individuals react to changes in the family situation in terms of becoming widowed. The effect of marriage on the other hand was in line with the regression results before including year dummies in the regression. This suggests that the yearly effects are larger than the marriage event itself.

9. Conclusion

The main aim of this study was to examine whether life-events can directly alter individuals risk preferences. Life-events were defined as changes in the family situation. Four specific events and their impact on risk preferences were tested using a large panel dataset which is representative of the German population. In particular, getting married, getting divorced, becoming widowed and becoming a parent were the life-events that were expected to reveal if changes in the family situation have a direct impact on individuals' risk preferences. While getting married, getting divorced and becoming widowed were found to have no impact on risk preferences, becoming a parent had a significant impact on risk tolerance even after controlling for year fixed effects.

A limitation of these results is that the possibility of omitted variables could not be completely ruled out. If there is omitted variable bias, this could possibly affect the causality in this study. Despite this potential bias, this study controlled for most of the factors that were shown to have an impact on risk preferences in prior literature streams. Thus, there is strong evidence that becoming a parent influences and even leads to a change in risk preferences.

The majority of other studies which address similar research questions primarily examine between-individual variation. In contrast, this study examines the within-variation of individuals that occurs due to changes in the family situation. This contribution to the literature is not just important for researchers, but also for practitioners as the results suggest that risk behaviour can change due to having children in the household. This means that individuals, especially in a position of power are subjects to changes in their investing, strategic or political behaviour which can therefore affect societies and economies. In order to test whether these implications for practitioners are valid in business and political environments, further research could be conducted that focuses on whether individuals in those environments and in positions of power react to parenthood in the same way as the representative sample of the German population in the SOEP did.

In conclusion, this study provides evidence for single life-events having an influence on risk preferences and contributes to the growing stream of literature on the heterogeneity of risk preferences, which challenges the assumption that risk preferences are stable over time.

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Appendix 1

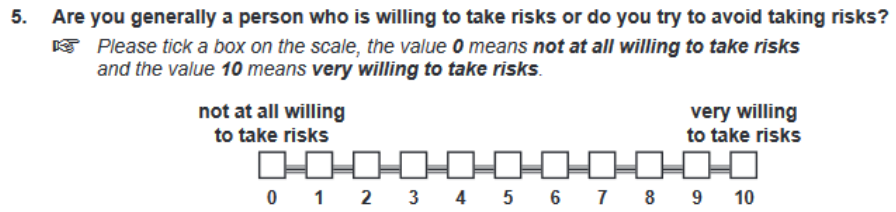

Figure 1. Risk preference Question

Appendix 2

Appendix 2 Table 1 - Mann-Whitney U-test results

Mann-Whitney U-tes for common distributions of marriage/divorce/death of the spouse/child birth and risk tolerance

Waves	Married/non-married			Divorced/non-dicorced			Widowed/non-widowed			Parent/non-parent		
	Married	Rank sum	P-value	Divorced	Rank sum	P-value	Widowed	Rank sum	P-value	Parent	Rank sum	P-value
(1)	no	69,867,145	0.00	no	163,600,000	0.01	no	169,000,000	0.00	no	114,200,000	0.00
	yes	106,800,000		yes	13,065,252		yes	7,429,655		yes	62,457,454	
(2)	no	87,966,084	0.00	no	205,900,000	0.00	no	212,900,000	0.00	no	153,400,000	0.00
	yes	135,900,000		yes	17,925,961		yes	10,885,872		yes	70,391,877	
(3)	no	75,803,879	0.00	no	174,700,000	0.15	no	179,600,000	0.00	no	134,900,000	0.00
	yes	114,100,000		yes	15,161,032		yes	10,250,231		yes	54,946,487	
(4)	no	82,122,691	0.00	no	182,400,000	0.80	no	187,900,000	0.00	no	141,100,000	0.00
	yes	116,300,000		yes	16,024,081		yes	10,544,927		yes	57,324,017	
(5)	no	160,800,000	0.00	no	270,800,000	0.71	no	277,100,000	0.00	no	160,300,000	0.00
	yes	128,800,000		yes	18,797,029		yes	12,506,748		yes	129,300,000	
(6)	no	81,254,898	0.00	no	181,800,000	0.08	no	188,700,000	0.00	no	145,300,000	0.00
	yes	118,000,000		yes	17,415,753		yes	10,536,723		yes	53,918,168	
(7)	no	141,100,000	0.00	no	326,800,000	0.93	no	345,000,000	0.00	no	201,500,000	0.00
	yes	220,200,000		yes	34,521,296		yes	16,245,366		yes	159,800,000	
(8)	no	74,059,875	0.00	no	164,800,000	0.39	no	170,100,000	0.00	no	134,900,000	0.00
	yes	107,200,000		yes	16,406,445		yes	11,119,054		yes	46,288,180	
(9)	no	139,300,000	0.00	no	312,900,000	0.06	no	330,400,000	0.00	no	198,600,000	0.00
	yes	205,900,000		yes	32,358,046		yes	14,829,997		yes	146,700,000	
(10)	no	145,900,000	0.00	no	309,300,000	0.14	no	326,500,000	0.00	no	197,600,000	0.00
	yes	194.900,000		yes	31,506,962		yes	14,302,273		yes	143,200,000	
(11)	no	110,600,000	0.00	no	254,700,000	0.67	no	268,800,000	0.00	no	166,800,000	0.00
	yes	171,100,000		yes	27,012,075		yes	12,896,718		yes	114,900,000	

Source: SOEP

Table 1. Mann-Whitney U-test results

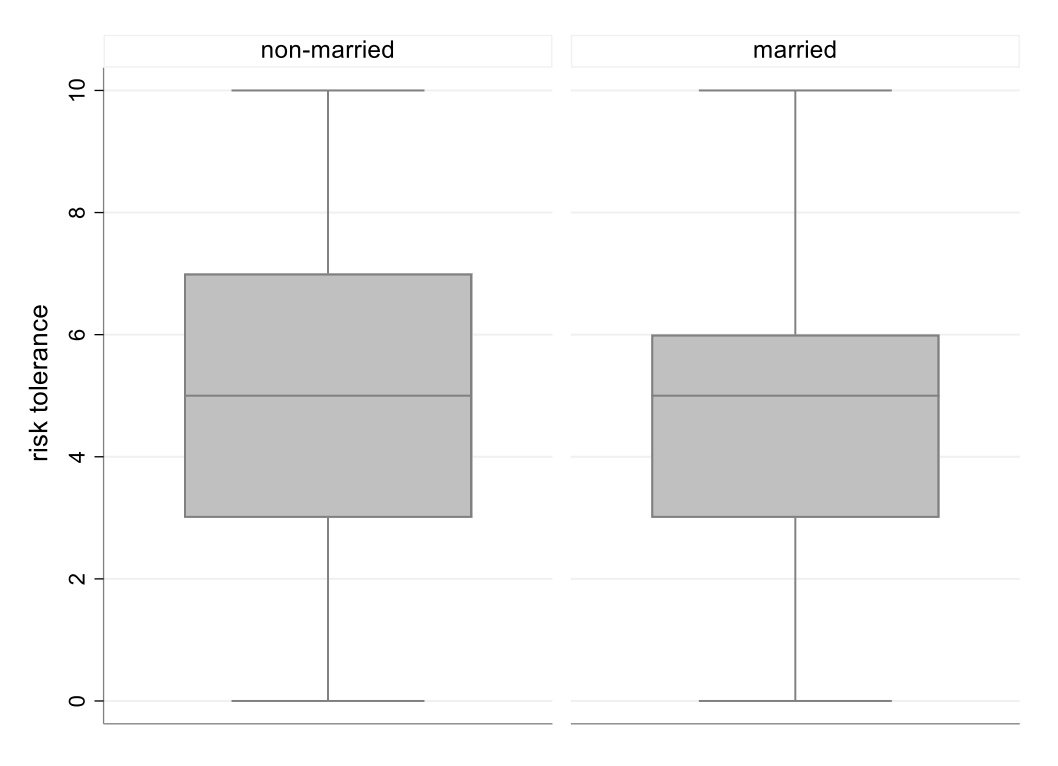

Figure 1. Box-plots risk preferences of married and non-married individuals

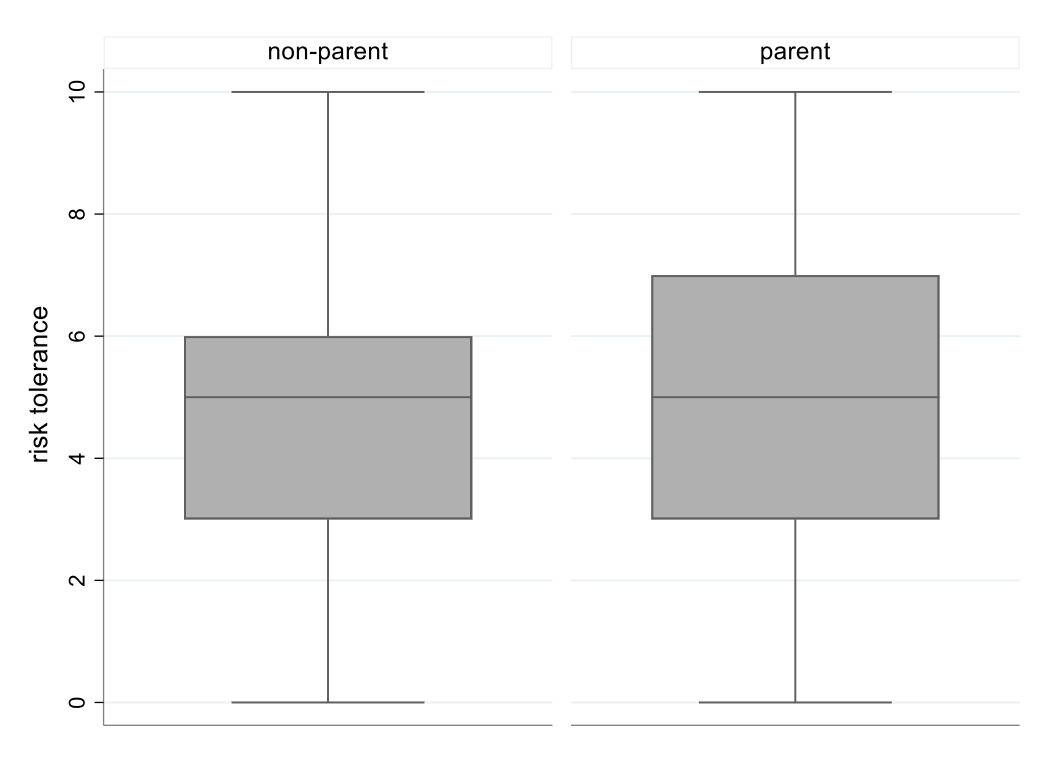

Figure 2. Box-plots risk preferences of parents and non-parents