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The Impact of Family Structure on Risk Attitudes and Financial Decisions during the Financial Crisis

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The Impact of Family Structure on Risk Attitudes and Financial Decisions during the Financial Crisis

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Abstract

Family structures have changed profoundly in most developed countries in recent decades. Declining fertility and marriage rates and increasing divorce rates, together with longer life expectancies, make financial planning more challenging. Our study analyzes the impact of family structure on individuals' attitudes toward risk and on their savings and investment decisions based on data from the German Socio-Economic Panel Study (SOEP) over the period 2004-2010. Using panel data analysis, marital status is found to be a key variable affecting risk attitudes and savings and investment decisions. Compared to people who are single, married individuals report being less willing to take risks, but more likely to invest in risky assets. Our findings indicate that while the recent financial and economic crisis has influenced individuals' attitudes, it has not–with the exception of investments in risky assets–affected the savings and investment decisions of individuals.

Keywords: Household portfolios, risky asset holding, risk aversion, family formation, marriage

JEL Classifications: D14; D81; G11; J11; J12

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1   Motivation

Family structures have changed profoundly in recent decades. Marriage rates have dropped and divorce rates have increased. Fertility rates have fallen far below the replacement level of 2.1 children per women in most OECD countries (see Figure 1), and an increasing share of women remain childless. Couple households have become less common: 28% of OECD households are single-person households, and 9% are single-parent households (OECD, 2012). These trends, in combination with increases in life expectancy of about 2.5 years per decade (Oeppen and Vaupel, 2002; Vaupel, 2010), directly affect individuals' life-cycle financial planning. With longevity rising, individuals have to plan for longer periods of retirement. Yet because of government budget constraints, people are increasingly expected to rely on private savings to finance their retirement needs, even in social welfare states (Bongaarts, 2004; Börsch-Supan *et al.*, 2006). Households with few or no children tend to have higher disposable incomes, and may therefore be able to save more for retirement at younger ages. But these households are less able to rely on old-age support and care provided by family members. Decreased marriage rates and higher divorce rates result in more background risk, and can shorten individuals' investment planning horizons (Christiansen *et al.*, 2013).

These demographic trends and financial planning challenges motivated us to investigate the impact of family structure on individuals' savings and investment decisions. Previous research has found that married individuals have higher savings rates (e.g., Lupton and Smith, 2003), are more likely to invest in the stock market (Xiao, 1996; Guiso *et al.*, 2003; Badunenko *et al.*, 2009; Bertocchi *et al.*, 2011; Christiansen *et al.*, 2013), and have portfolios with higher risk levels (e.g., Love, 2010; Christiansen *et al.*, 2013). The presence of children has been shown to have a negative effect on stock market participation (e.g., Christiansen *et al.*, 2013; Xiao, 1996; Love, 2010).

The link between marital status and portfolio choices can be explained through different channels. Bertocchi *et al.* (2011) and Christiansen *et al.* (2013) showed that income risk-sharing is an important factor in the effect of marital status on financial risk-taking.

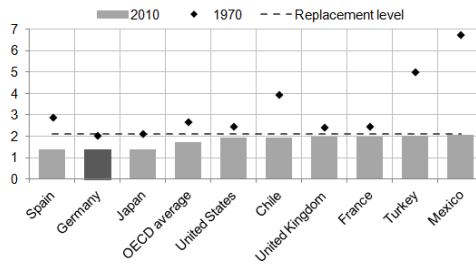Figure 1: Marriage, divorce and fertility rates in selected OECD countries.

(a) Crude marriage rates (number of marriages per 1,000 population).
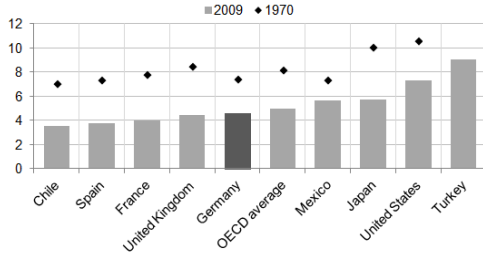
(b) Crude divorce rates (number of divorces per 1,000 population).
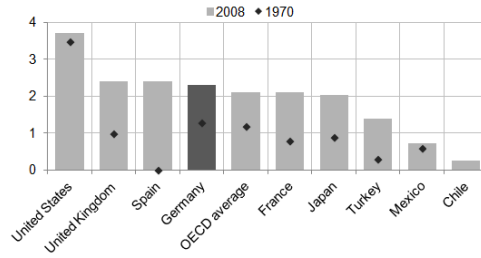
(c) Total fertility rates (number of children born to women aged 15 to 49).

Data source: OECD (2012).

Married couples also benefit from economies of scale and face lower participation costs when investing in the stock market (Lupton and Smith, 2003; Christiansen *et al.*, 2013). We focus on risk preferences as a third factor. Previous studies have argued that married couples solve a joint maximization problem, as the risk aversion levels of both partners are taken into account, and the partners show altruism towards each other (see, e.g., Love, 2010; Christiansen *et al.*, 2013).

We analyze the impact of family structure on individuals' savings and investment decisions based on a dataset that contains information about individuals' self-assessed willingness to take risks, and about their actual financial decisions. We focus on the following research questions: What is the effect of family structure on individuals' savings and investment decisions? How do marital status and the presence of children affect individuals' willingness to take risks? Did married individuals and individuals with children react differently to the recent financial and economic crisis?

We use micro-level data from the German Socio-Economic Panel Study (SOEP) over the

Figure 2: Gross domestic product (GDP) growth rates and unemployment rates in selected OECD countries.

(a) Real GDP growth rates.

(b) Harmonized unemployment rates.
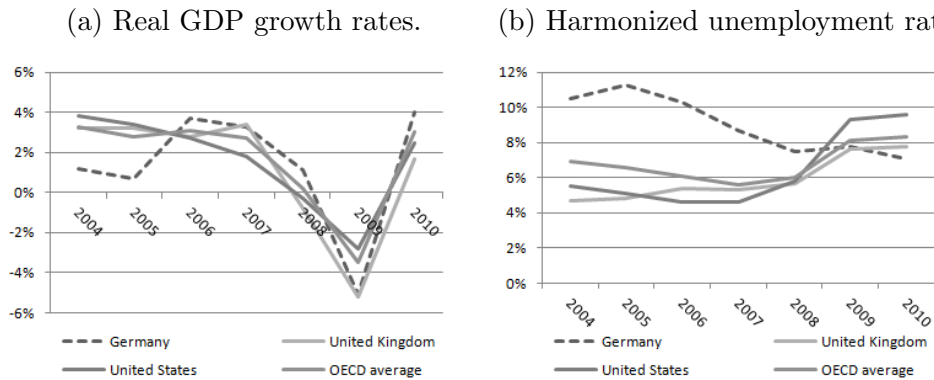
Data source: OECD (2013).

period 2004-2010. Germany is a country that is relatively advanced in the demographic transition. While the marriage and divorce rates in Germany are comparable to those of other OECD countries (see Figure 1), the country's fertility rates fell below replacement level as early as in the 1970s. Period and cohort fertility remain low in Germany, while childlessness has increased. The results provide valuable insights for other OECD countries.

The sample period covers the 2007-2008 financial crisis and the global recession that followed. The crisis had a substantial impact on the German economy: gross domestic product decreased 5.1% in 2009, which is well below the OECD average of -3.5% (see Figure 2a). The labor market response to the recession was, however, surprisingly moderate: unemployment rates increased only slightly in 2009, and continued their longer-term downward trend in 2010 (see Figure 2b). "Germany's jobs miracle" (e.g., Krugman, 2009) has been explained by a combination of employment protection regulation, wage moderation, short-time work schemes, the widespread adoption of working-time accounts, and other factors (see, e.g. Möller, 2010; Burda and Hunt, 2011). Our study contributes results for Germany to the growing body of literature that has analyzed the impact of the crisis on individuals' preferences and financial decisions (e.g., Roszkowski and Davey, 2010; Bateman *et al.*, 2011; Hoffmann *et al.*, 2013). Our findings show that the willingness of SOEP respondents to take risks varied significantly with macroeconomic indicators,

and that these changes in risk attitudes translated into changes in investment behavior.

The remainder of this paper is organized as follows. Section 2 reviews the literature. Section 3 describes the data and provides descriptive statistics. The methodology is presented in Section 4, and the results are discussed in Section 5. Section 6 concludes.

2 Literature review

Previous studies have analyzed individual strands of the complex interplay of individuals' family structure, risk attitudes, and financial decisions. Our study provides a comprehensive analysis based on a large panel dataset.

2.1 Family structure and savings and investment decisions

Variables describing family structure are often included as control variables in empirical studies on the financial decisions of households or investors, including asset ownership and mortgage choice (see, e.g., Guiso *et al.*, 2003; Badunenko *et al.*, 2009; Cardak and Wilkins, 2009; Coulibaly and Li, 2009; Barasinska *et al.*, 2012). The observed effects are often not analyzed separately, and vary across studies.

Three recent studies have focused on the effects of marital status on financial decisions (Love, 2010; Bertocchi *et al.*, 2011; Christiansen *et al.*, 2013). Love (2010) developed a life-cycle model that allows for exogenous shocks to an individual's marital status and number of children, labor income risk, medical expense risk, and the market for life insurance and risky assets. The model predicts that marital status transitions play an important role in savings and asset allocation decisions, and that the presence of children can amplify or dampen these effects. Love (2010) also tested the model's predictions using panel data from the U.S. Health and Retirement Study and the Panel Study on Income Dynamics. The estimation results confirmed the importance of family shocks, but some of the estimated effects differed in sign from the model's predictions.

Bertocchi *et al.* (2011) assessed the impact of gender and marital status on investment decisions using data from the 1993-2006 Bank of Italy Survey of Household Income and

Wealth. They found that married individuals were more likely to invest in risky assets than single people. The effect was stronger for women, but it also declined over time for women because of the evolution of gender roles in the family and in society.

Christiansen *et al.* (2013) used a large Danish dataset for the period 1997-2003 to study the impact of changes in marital status on investment decisions. Their results showed that marriage increased the likelihood of holding stocks among both men and women. However, gender differences were observed in terms of the share of wealth invested in stocks: women tended to invest more heavily in higher risk assets after marriage but less heavily after divorce, while men displayed the opposite investment behavior.

These studies show that the effect of family structure on financial decisions is complex and evolves over time. Our study contributes new findings based on a large German dataset. Our first research question is:

1. What is the effect of family structure on individuals' savings and investment decisions?

Based on the literature reviewed above, we expect to find that married individuals are more likely to invest in risky assets. We also analyze the impact of having children and of the children's ages on the individuals' financial decisions.

2.2 Family structure and willingness to take risk

Previous authors have suggested that family structure influences household-level saving and investment decisions through its effects on economic resources and household-level preferences (Love, 2010; Bertocchi *et al.*, 2011; Christiansen *et al.*, 2013). Our second research question examines the link between risk preferences and family structure:

2. How do marital status and the presence of children affect individuals' willingness to take risks?

A growing body of literature has analyzed the link between individuals' family structure and attitudes toward risk-taking. Several studies have found that married individuals are less willing to take risks (e.g., Halek and Eisenhauer, 2001; Yao *et al.*, 2004; Sahm,

2007; Dohmen *et al.*, 2011). Similar effects are found for the presence of children (e.g., Yao *et al.*, 2004; Dohmen *et al.*, 2011; West and Worthington, 2012).

Two recent studies have tested the impact of changes in family structure on individual's willingness to take risks (Gerrans *et al.*, 2012; Van de Venter *et al.*, 2012). Both studies looked at marital (or partnership) status transitions and at changes in the number of dependent family members. Gerrans *et al.* (2012) found no significant effects, while Van de Venter *et al.* (2012) reported that changes in the number of dependents were significantly related to changes in individuals' levels of risk tolerance.

Dohmen *et al.* (2011) discussed the potential endogeneity in the link between individuals' family structure and their attitudes toward risk-taking. In fact, several demographic and economic studies have analyzed how risk preferences translate into family structure. Individuals with higher levels of risk tolerance have been found to be more likely than their less risk-tolerant counterparts to delay marriage (Schmidt, 2008; Spivey, 2010) and to divorce (Light and Ahn, 2010). Risk preferences have also been shown to play a role in fertility timing decisions, but the observed effects have been found to vary with age, marital status, education, and other characteristics (Schmidt, 2008; Kreyenfeld, 2010; Schmitt, 2012). Brady and Mandal (2011) found significant evidence of a correlation between the risk preferences of spouses.

Based on these previous studies, we expect to find significant links between individuals' willingness to take risks (WTR) and their family structure. In particular, we anticipate that married individuals will have reported lower levels of WTR. We also expect to find that individuals with children will have reported lower levels of WTR. In addition, we study the impact of the partner's risk preferences on savings and investment decisions.

2.3 The impact of the financial crisis

The sample period covers the global financial crisis of 2007-2008 and the economic downturn that followed. The crisis triggered intensive research on the impact of economic conditions on individuals' financial decisions (e.g., Chai *et al.*, 2012) and risk preferences.

Most of these studies have analyzed the risk attitudes of investors surveyed during or before and after the financial crisis (e.g., Roszkowski and Davey, 2010; Gerrans *et al.*, 2012; Guiso *et al.*, 2013; Hoffmann *et al.*, 2013; Weber *et al.*, 2013). Only a few studies have examined the risk attitudes of the general population (e.g., Bateman *et al.*, 2011; West and Worthington, 2012).

The findings of this literature are mixed. Several studies have found that risk tolerance has increased only modestly (Bateman *et al.*, 2011; Gerrans *et al.*, 2012; Roszkowski and Davey, 2010) or not at all (Weber *et al.*, 2013; West and Worthington, 2012). Roszkowski and Davey (2010) distinguished between risk tolerance and risk perception. They argued that risk tolerance was relatively unaffected by the financial crisis, while investors' risk perceptions were severely impacted. This view has been challenged by Hoffmann *et al.* (2013), who analyzed monthly brokerage records and survey data on individual investors in the Netherlands. Their results indicated that the risk tolerance levels and the perceptions of risk of investors fluctuated significantly during the crisis period, but were relatively stable over longer time intervals. Guiso *et al.* (2013) analyzed survey data on Italian investors, and also reported large increases in risk aversion between 2007 and 2009.

Most of the studies on the impact of the financial crisis on risk attitudes included marital status and the number of children as control variables and found no significant effects. Only Gerrans *et al.* (2012) found that being partnered significantly affected the level of (financial) risk tolerance.

We contribute to the literature by analyzing the impact of the financial and economic crisis on risk preferences and on individuals' financial decisions. In particular, we focus on the following question:

3. Did married individuals and individuals with children react differently to the financial crisis?

3 Data and descriptive statistics

3.1 Description of the SOEP

Our analysis is based on risk attitudes and socio-demographic data collected in the German Socio-Economic Panel Study (SOEP). SOEP data have been used in several related studies analyzing the links between family structure, risk preferences, and financial decisions (Barasinska *et al.*, 2012; Badunenko *et al.*, 2009; Dohmen *et al.*, 2011; Kreyenfeld, 2010).

The SOEP is a representative household panel study dating back to 1984 in which all of the adult household members over age 17 are interviewed on an annual basis. In the first wave, 12,000 respondents were interviewed. A number of subsets were later added, including a subset of eastern Germans in 1990 and subsets of immigrants in 1998, 2006, and 2009. "Refreshment" samples have also been included. The participating households are followed over time. The SOEP contains information about individuals, including their working histories, income parameters, and household structures. For detailed descriptions of the panel design and the data, see Wagner *et al.* (2007) and Haisken-DeNew and Frick (2005).

SOEP data are organized into a number of different datasets. We have matched the data elicited in individual-level questionnaires with biographic data, information about children, and household-level income and wealth data. Table 1 describes the SOEP variables used in this study. The sample period is 2004-2010.

3.2 Willingness to take risk

In the literature a number of different measures have been used to describe risk attitudes. Some of these measures were based on responses to hypothetical gambles, while others were derived from individuals' actual risk-taking behavior. Our study is based on individuals' self-reported willingness to take risks (WTR) collected in the SOEP survey. Similar data have been collected in the U.S. Survey of Consumer Finances and in the

Household, Income and Labour Dynamics in Australia Survey.

Every year since 2004 (except 2005 and 2007), SOEP respondents were asked to report their willingness to take risks (WTR) in general.[1] In 2004 and 2009 the respondents also provided information on their WTR in specific contexts, including their willingness to take risks related to their finances, their occupation, and their health.[2]

Dohmen *et al.* (2011) assessed the behavioral validity of self-reported WTR as a measure of risk attitudes. They compared the information on individuals' WTR gathered in the 2004 SOEP wave with other types of information on risky behavior, such as information on stock market participation and data collected in a complementary real-stakes lottery experiment. These comparisons showed that self-reported WTR is a reliable predictor of actual risk-taking behavior, even after controlling for a large number of demographic and economic variables. Furthermore, Dohmen *et al.* (2011) found that risk attitudes are strongly correlated across contexts, with general WTR being the best "all-round" explanatory variable for risky behavior. Using 2004-2007 SOEP data, Barasinska *et al.* (2012) showed that WTR in financial matters is significantly linked to individuals' portfolio choices. Most of our analysis is based on WTR in general because this variable is available in most years of the sample period.

Previous studies have distinguished between risk tolerance and risk perception (e.g., Roszkowski and Davey, 2010; Hoffmann *et al.*, 2013, see Section 2.3). SOEP participants responded to questions in which they were asked to report how concerned they were about their personal economic situation, their job security, and the general state of the economy. We included these data to control for changes in risk perception during the financial crisis.

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[1]The exact wording of the question is: "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: "risk averse" and the value 10 means: "fully prepared to take risks." You can use the values in between to make your estimate."

[2]" This information was collected using the following set of questions: "People can behave differently in different situations. How would you rate your willingness to take risks in the following areas? How is it ... - in financial matters?, - in your occupation?, - with your health?" The scale for the responses ranged from zero for risk averse to 10 for fully prepared to take risks.

3.3 Socio-demographic and macroeconomic variables

We also used the rich socio-demographic and financial data available for each year of the sample period. Data on income and on saving and investment decisions are collected in the SOEP at the household level. We therefore chose to focus in our analysis on household heads only, while also using information on the head's marital status, the number of children in the household, and the head's partner. We took into account some of the partner's specific characteristics, including his or her WTR. The sample size increased almost linearly over the period 2004-2010, mainly because some respondents separated or because adult children started their own households. The sample consisted of 6,369 household heads in 2004 and of 7,188 household heads 2010.

A time series on German GDP per capita (in current prices) was obtained from the German Federal Statistical Office. The growth rates of GDP per capita were calculated as percentage changes. The resulting variable "GDP growth" was used as a proxy for macroeconomic conditions.

3.4 Descriptive statistics

Table 2 provides the descriptive statistics for key variables. Values for 2004, the first year of the sample period, were compared with values for 2009, when the German economy was most affected by the financial and economic crisis (compare Figure 2a).

Panel A of Table 2 reports the summary statistics for the socio-demographic variables. In 2004, the respondents were on average 51 years old; 60% were married and 34% still had children under age 18. Five years later, only 26% of the respondents had children under age 18. Between 2004 and 2009, the unemployment rates decreased in the sample and in the general population (compare Figure 2b).

Panel B of Table 2 reports SOEP respondents' attitudes toward risk-taking. Willingness to take risks (WTR) in general varied across household types. Married individuals and respondents with children under age 18 had above-average WTR scores, while individuals with children aged 18 or older had below-average WTR scores. As these differences may

Figure 3: Risk attitudes and concerns of SOEP respondents, 2004-2010.

(a) Willingness to take risks (WTR).

(b) Concerns.
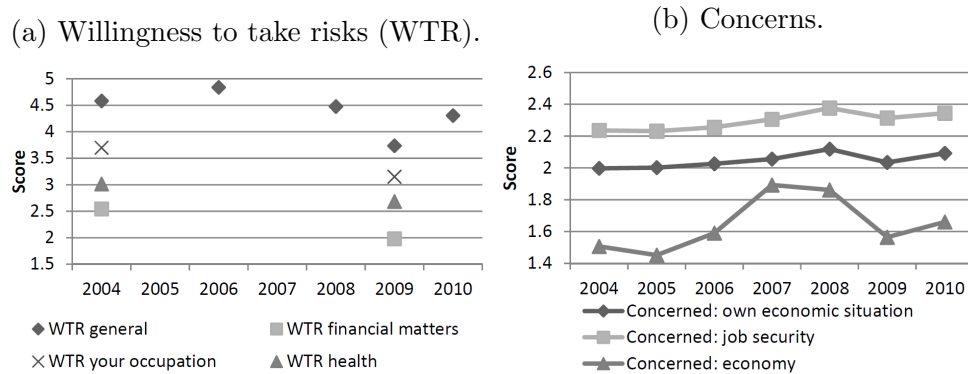
Data source: German Socio-Economic Panel Study (SOEP).

be caused by age effects, we developed panel data models to control for these effects. The models are presented in Section 4.

Individuals' WTR decreased substantially between 2004 and 2009, with the average score for general WTR declining 18%. This trend was observed across household types. Figure 3 shows the average WTR scores over time. The WTR had a hump-shaped pattern over the period 2004-2009, followed by an increase in 2010. The pattern is similar to that of the German GDP growth rates shown in Figure 2a. Figure 3 also shows individuals' WTR in specific contexts. These scores were reported in 2004 and 2009 only. All of the scores decreased over the period. The largest decrease in WTR was in financial matters (-22%), but there were also substantial declines in the respondents' willingness to take risks in their occupation (-15%) and with their health (-11%). These figures suggest that individuals' WTR was affected by the recent financial and economic crisis. Panel data models were used to test whether this effect was still significant when other factors, such as income and age, are controlled for.

Panel B of Table 2 also reports SOEP respondents' concerns about their own economic situation, their job security, and the general state of the economy. The levels of concern increased over the period 2004-2009, but only slightly.

Panel C of Table 2 displays information on the SOEP respondents' saving and investment choices. The most commonly held asset classes were savings accounts, life insurance

contracts, and homes. There were some interesting trends over the period 2004-2009. Monthly savings increased by 9%. The ownership rates of all asset classes except real estate decreased. The largest decline, of -15%, was found for "other securities," which includes stocks and funds. Ownership rates of life insurance contracts and of fixed interest rate securities also decreased substantially (-13% and -12%, respectively). These investments became unattractive because interest rates fell sharply over the period 2004-2009. These figures suggest that individuals' saving and investment decisions were affected by the recent financial and economic crisis.

4 Methodology

To answer the research questions formulated in Section 2, we estimated two types of panel data models: one for individuals' willingness to take risks (WTR) and one for their investment decisions.

4.1 Modeling risk attitudes

Our empirical analysis of individuals' WTR builds on the work by Dohmen *et al.* (2011), who provided a detailed analysis of the determinants of individuals' risk attitudes based on the 2004 wave of the German Socio-Economic Panel Study (SOEP). We extend this research in several ways. Importantly, we use the panel structure of the SOEP data, and we include additional variables, such as information on the individual's partner and the GDP growth rates as an indicator of macroeconomic conditions. We estimate a random-effects generalized least squares (GLS) model of the following form:

$$WTR_{it} = \left(X_{it}^{(1)}\right)' \beta^{(1)} + \alpha_i^{(1)} + e_{it}^{(1)}, \quad t = 1, ..., T, \ i = 1, ..., n, \tag{1}$$

where WTR_{it} is individual i's WTR in general at time t, $X_{it}^{(1)}$ is a vector of explanatory variables and $\beta^{(1)}$ is a vector of unknown regression coefficients. $\alpha_i^{(1)}$ is an individual-specific random effect and $e_{it}^{(1)}$ is a within-individual measurement error. Model 1 is estimated using GLS estimation with robust standard errors that allow for clustering at

the individual level (e.g., Fitzmaurice *et al.*, 2011, Ch. 7).

Model (1) is stepwise extended to include additional explanatory variables. We are mainly interested in the impact on self-reported risk attitudes of variables describing the individual's family situation, such as the number of children and marital status. However, as Dohmen *et al.* (2011) pointed out, these variables are potentially endogenous. We follow the approach of these authors and model risk attitudes in a first step only on plausibly exogenous variables. Model (1a) includes gender, age, height, and parental education; which Dohmen *et al.* (2011) identified as being exogenous determinants of risk attitudes. Model (1b) includes GDP growth rates as an additional exogenous variable. Model (1c) adds detailed information about the individual's marital status and children, as well as additional control variables, such as household income and wealth. Model (1d) also includes information about the partner's WTR, age, education, and employment status; and contains interaction effects between family structure variables and GDP growth.

4.2 Modeling savings and investment decisions

SOEP respondents provided information on the amount of household-level savings per month and on the types of assets owned by the household members. We analyze these data using two different types of panel models.

We estimate the following random-effects model for the amount of monthly savings, $Savings_{it}$, reported by individual i in year t:

$$Savings_{it} = \left(X_{it}^{(2)}\right)' \beta^{(2)} + \alpha_i^{(2)} + e_{it}^{(2)}, \quad t = 1, ..., T, \ i = 1, ..., n, \tag{2}$$

where $X_{it}^{(2)}$ denotes the vector of explanatory variables and $\beta^{(2)}$ is a vector of unknown regression coefficients. As in Model (1), $\alpha_i^{(2)}$ is an individual-specific random effect and $e_{it}^{(2)}$ is a within-individual measurement error. Equation (2) is estimated as a GLS random-effects model with robust standard errors that allow for clustering at the individual level.

Information on the ownership of an asset class is provided as a binary variable. We use Y_{it} to denote a binary variable indicating whether the household of individual i owns a given

asset class at time t. We model the probability, $\Pr(Y_{it} = 1) = \mu_{it}$, that the household holds this investment as a logistic function (e.g., Fitzmaurice *et al.*, 2011, Ch. 10):

$$\log\left(\frac{\mu_{it}}{1 - \mu_{it}}\right) = \mathrm{logit}(\mu_{it}) = \left(X_{it}^{(3)}\right)' \beta^{(3)} + \alpha_i^{(3)}, \quad t = 1, ..., T, \ i = 1, ..., n, \quad (3)$$

where $X_{it}^{(3)}$ is a vector of explanatory variables, $\beta^{(3)}$ is a vector of unknown regression coefficients, and $\alpha_i^{(3)}$ is a random individual-specific effect. Several variants of Model (3) are estimated for different asset classes Y using random-effects logistic regressions.

Models (2) and (3) include several variables describing family structure and a large set of control variables. We also include individuals' WTR to test for additional effects of risk preferences on saving and investment decisions.

The asset classes considered are as follows: other securities, life insurance, mortgage savings contracts, and real estate (homeownership). These asset classes cover the spectrum of asset classes with respect to risk. Barasinska *et al.* (2012), who also studied SOEP data, rated mortgage savings plans as "low risk," life insurance policies as "moderate risk," and other securities as "high risk."[3] Homeownership is included as an important component of households' retirement financial planning.

5 Results

5.1 Determinants of risk attitudes: The impact of family structure and the financial crisis

The regression result for the different variants of Model (1) are given in Table 3.

The results for Model (1a) are directly comparable to the results reported by Dohmen *et al.* (2011), who used cross-sectional data for 2004. Our panel model estimates based on 2004-2010 data are very similar in magnitude and sign: gender, age, height, and the father's education were confirmed in Model (1a) as being significant determinants of

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[3]Most life insurance policies in Germany are endowment policies that pay a lump sum after a specified term, typically upon retirement or premature death.

individuals' levels of risk aversion. The same variables were also found to be significant in Model (1b), and (with the exception of the father's education) in Models (1c) and (1d).

GDP growth was shown to be highly significant and positively correlated with individuals' reported WTR in all three models containing this variable. The estimates indicated that, holding all other variables constant, an increase of one percentage point in GDP growth was on average associated with an increase of 0.07-0.09 units in the respondents' WTR. The finding that individuals' risk perceptions were affected by the recent financial and economic crisis is in line with the results of Guiso *et al.* (2013) and Hoffmann *et al.* (2013) based on Italian and Dutch data. These authors also reported significant increases in levels of risk aversion during the financial crisis.

Models (1c) and (1d) include several variables describing the family structure of SOEP respondents. Consistent with Dohmen *et al.* (2011), we found in both models that married individuals were significantly less risk-tolerant than others. The results of Model (1c) furthermore suggest that individuals with two or more children under age 18 and individuals with adult children were less risk-tolerant than others. However, these effects with respect to the number of children were not found in Model (1d), which also includes information on the individual's partner. Instead, the results for Model (1d) indicated that the partner's WTR was significantly positively related to the individual's WTR. This suggests that married couples tend to have similar risk attitudes.

Models (1c) and (1d) also included variables measuring individuals' concerns. No significant effects were found for concerns about the general economy, but concerns about job security were shown to be significantly related to individuals' WTR in both models.

Model (1d) contained four interaction effects to study whether the impact of macroeconomic conditions on WTR varied by family type. A significant effect was found only for individuals who had children aged 18 or older. Larger changes in risk attitudes in response to macroeconomic downturns or upswings were found for parents of adult children.

Table 3 also reports statistics on the goodness of fit of Models (1a)-(1d). Previous studies have noted that self-reported risk attitudes not only vary substantially across individuals

(Dohmen *et al.*, 2011), but also within individuals over time (Van de Venter *et al.*, 2012). Model (1d), which includes all of the control variables, explained 10.7% of the within-individual variations in WTR and 10.4% of the total variability.

The results confirmed our initial assumption that family structure plays a significant role in individuals' reported risk attitudes. Marital status and the presence of adult children, together with the partner's characteristics (WTR and age), were found to be important drivers of individuals' WTR. The numbers of people who are married and who are living with children are decreasing in most western countries, which could lead to changes in the willingness of individuals to take financial risks. Risk attitudes have been shown to be influenced by macroeconomic conditions. In the following section, we will investigate whether the observed variations in WTR were reflected in households' savings and investment decisions.

5.2 The impact of family structure on savings and investment decisions

The estimation results for Model (2) reported in Table 4 showed that the number of children is an important determinant of monthly savings: respondents who had children (both under and over age 18) saved significantly less than others. Marital status was not found to be significant. Previous research reporting that married couples save significantly more than other households (e.g., Lupton and Smith, 2003) was not supported. This finding may be attributable to the fact that Germany has relatively large shares of single-income households and of households in which the woman works part-time. For example, in 2009 the German female labor force participation rate was 53% (International Labour Organization, 2012), and 45% of the employed women worked part-time (Sandor, 2011). Individuals with unemployed partners were also found to save less. We found interesting interaction effects which suggested that saving behavior changed during the crisis. Married individuals did not save significantly less, but individuals with adult children saved more.

Model (3a) was estimated for "other securities," which include stocks, funds, bonds, and equity warrants. These securities have been classified by Barasinska *et al.* (2012) as risky

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assets. The estimation results confirmed the findings of several previous studies that married individuals are more likely to invest in risky assets (e.g., Xiao, 1996; Badunenko *et al.*, 2009; Bertocchi *et al.*, 2011; Christiansen *et al.*, 2013). In addition, the presence of three or more children under age 18 or of children aged 18+, as well as the partner's age and education, were found to be positively associated with holding more risky assets. The estimated interaction effects showed changes in investment behavior during the crisis only among individuals with children over age 18: these respondents were more likely to hold "other securities" than individuals living in other family arrangements.

We compared the results for the models estimated for life insurance (Model (3b)), mortgage savings contracts (Model (3c)), and homeownership (Model (3d)) focusing on the variables describing family structure. No significant effect of these variables was found for the ownership rates of life insurance contracts. For mortgage savings contracts, a significant effect was found only for the presence of children aged 18+. A number of significant effects were observed for homeownership rates. Married individuals and individuals with children under 18 were more likely to be homeowners. The effect increases with the number of children. Overall, these findings confirmed our assumption that family structure is an important determinant of individuals' decisions about whether to invest in these asset classes.

All of the models presented in Table 5 included a number of control variables. WTR was not found to be significant in any of the five models, which indicates that all of the major determinants of WTR were included as control variables in the model. WTR was found to be significant in a reduced version of Model (2) in which gender, age, height, and parental education were the only control variables.

GDP growth was a significant determinant of individuals' WTR in Models (1a)-(1d), but this variable was only significant in one of the five models for saving and investment decisions: holdings of "other securities" varied pro-cyclically over the observed sample period. Holdings of other asset classes did not vary pro-cyclically. As described above, the interaction effects between having adult children and GDP per capita growth were

found to be significant in Model (2), which was estimated for the savings level. No clear patterns were found for the interaction effects in Models (3a-d).

6 Summary and conclusion

Population aging and changing family structures can make life-cycle financial planning very challenging for individuals. The combination of lower fertility rates and increased live expectancy puts pressure on the finances of public pension systems, and increases the need for private retirement savings. As people are living longer, they have to plan for a longer retirement. Lower marriage rates and higher divorce rates mean that individuals are less able to rely on intra-family risk sharing and pooling of resources.

The aim of this study was to investigate the impact of family structure on individuals' attitudes toward risk and on their savings and investment decisions. We also analyzed whether family structure affected individuals' reactions to the financial crisis. Our study is based on panel data from the German Socio-Economic Panel (SOEP) for the period 2004-2010. We analyzed a broad range of possible asset classes, including risky assets, life insurance, and homeownership.

Our results, in combination with the findings of previous theoretical and empirical research, suggest the following links between individuals' risk preferences, family structure, and saving and investment decisions. Individuals' reported risk preferences are linked to exogenous variables such age, gender, and height; but they are also significantly related to family structure variables and macroeconomic conditions. Family structure, among other factors, is an important determinant of savings and investment choices. However, the reported changes in WTR during the financial crisis do not translate into changes in the savings and investment decisions of SOEP respondents-with the important exception of investments into risky assets, which were found to vary pro-cyclically.

The results of our study highlight the importance of family context and of the partner's characteristics for individuals' self-reported WTR and their saving and investment decisions. Variables describing family structure should be included in empirical studies

of individuals' and households' financial decisions. Given the trends toward population aging and changes in family formation occurring worldwide, we expect to see further significant changes in individuals' investment decisions in response to these demographic factors.

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Tables

Table 1: Definition of SOEP variables.

Variable	Description
Female	1 = female, 0 = male
Age	Age in years
Height	Height in centimeters
Education/mother/father /partner	Highest education level of the respondent/his or her mother/father/partner: 1 = less than high school, 2 = high school, 3 = more than high school
East 1989	1 = respondent lived in East Germany in 1989, 0 = otherwise
Log(Household income)	Log net annual income of all household members (after government transfers), in EUR
Household wealth 2007	Total net value of financial assets and real property owned by the household less of debt, 2007, in EUR
Unemployed	1 = respondent is unemployed, 0 = otherwise
Self-employed	1 = respondent is self-employed, 0 = otherwise
Married	1 = respondent is married, 0 = otherwise
1/2/3/>3/any child(ren) under 18	1 = Respondent has one/two/three/more than three/any children under 18, 0 = otherwise
Any children 18+	1 = respondent has any children age 18 or older, 0 = otherwise
Age partner	Age of the respondent's partner in years
Partner unemployed	1 = the respondent's partner is unemployed, 0 = otherwise
WTR general	Willingness to take risks in general, 0 = risk averse ... 10 = fully prepared to take risks
WTR financial matters	Willingness to take risks in financial matters, 0 ... 10
WTR occupation	Willingness to take risks in your occupation, 0 ... 10
WTR health	Willingness to take risks with your health, 0 ... 10
WTR partner	Respondent's partner's willingness to take risks in general, 0 ... 10
Concerned: own situation	Concerns about own economic situation: 1 = very concerned, 2 = somewhat concerned, 3 = not concerned at all
Concerned: job security	Concerns about own job security, 1 ... 3
Concerned: economy	Concerns about the general economic development, 1 ... 3
Savings	Amount of money usually left over at the end of the month that can be saved for larger purchases, emergency expenses or to acquire wealth, in EUR
Savings account	1 = household owns a savings account, 0 = otherwise
Mortgage savings contract	1 = household owns a savings contract for building a home, 0 = otherwise
Life insurance	1 = household owns life insurance, 0 = otherwise
Fixed interest securities	1 = household owns fixed interest securities (e.g. saving bonds, mortgage bonds, federal savings bonds), 0 = otherwise
Other securities	1 = household owns other securities (e.g. stocks, funds, bonds, equity warrant), 0 = otherwise
Company assets	1 = household owns company assets (own company, other companies, agricultural assets), 0 = otherwise
Homeowner	1 = household owns family home, 0 = otherwise

Table 2: Descriptive statistics for key variables.

Variable	2004 Values			2009 Values			% change
	Obs.	Mean	Std. dev.	Obs.	Mean	Std. dev.	2004-09
Panel A: Socio-demographic variables							
Female	6,369	0.389	0.488	7,078	0.418	0.493	7%
Age	6,369	50.8	14.8	7,078	54.3	15.8	7%
Married	6,369	0.598	0.490	7,078	0.575	0.494	-4%
Any children under 18	6,369	0.341	0.474	7,078	0.256	0.436	-25%
Any children age 18+	6,369	0.446	0.497	7,078	0.505	0.500	13%
Household income	6,369	34,825	25,686	7,078	36,369	28,077	4%
Unemployed	6,369	0.033	0.178	7,078	0.016	0.124	-52%
Self-employed	6,369	0.077	0.266	7,078	0.075	0.264	-2%
Panel B: Risk attitudes and concerns							
WTR general	6,337	4.582	2.299	7,059	3.736	2.179	-18%
- Married	*3,794*	*4.617*	*2.260*	*4,061*	*3.781*	*2.161*	*-18%*
- Any children under 18	*2,163*	*4.877*	*2.173*	*1,810*	*4.089*	*2.104*	*-16%*
- Any children 18+	*2,821*	*4.309*	*2.394*	*3,565*	*3.485*	*2.197*	*-19%*
WTR financial matters	6,326	2.544	2.266	7,032	1.979	2.166	-22%
WTR occupation	5,767	3.699	2.712	6,071	3.151	2.692	-15%
WTR health	6,338	3.016	2.456	7,052	2.684	2.398	-11%
Concerned: own situation	6,352	1.997	0.702	7,058	2.034	0.693	2%
Concerned: job security	3,858	2.236	0.729	4,052	2.314	0.703	3%
Concerned: economy	6,355	1.506	0.575	7,059	1.564	0.580	4%
Panel C: Saving and investment choices							
Savings	3,851	450	656	4,312	493	785	9%
Savings account	6,369	0.746	0.435	7,078	0.707	0.455	-5%
Mortgage savings contract	6,369	0.446	0.497	7,078	0.405	0.491	-9%
Life insurance	6,369	0.564	0.496	7,078	0.490	0.500	-13%
Fixed interest securities	6,369	0.187	0.390	7,078	0.165	0.372	-12%
Other securities	6,369	0.346	0.476	7,078	0.293	0.455	-15%
- Married	*3,806*	*0.392*	*0.488*	*4,069*	*0.335*	*0.472*	*-15%*
- Any children under 18	*2,170*	*0.373*	*0.484*	*1,812*	*0.322*	*0.467*	*-14%*
- Any children age 18+	*2,839*	*0.313*	*0.464*	*3,573*	*0.268*	*0.443*	*-14%*
Company assets	6,369	0.056	0.230	7,078	0.054	0.225	-4%
Homeowner	6,369	0.499	0.500	7,078	0.548	0.498	10%

Notes: The sample size is 12,674. WTR denotes willingness to take risks.

Table 3: Determinants of individuals' willingness to take risks (WTR) in general.

Model	(1a)		(1b)		(1c)		(1d)	
Constant	3.237	***	2.839	***	2.878	***	-0.362	***
	(0.586)		(0.586)		(0.831)		(1.236)	
Female	-0.595	***	-0.580	***	-0.612	***	-0.878	***
	(0.058)		(0.058)		(0.073)		(0.103)	
Age	-0.029	***	-0.028	***	-0.053	***	-0.053	**
	(0.001)		(0.001)		(0.014)		(0.022)	
Age^2					3.45E-04	**	8.75E-05	
					(1.42E-04)		(2.12E-04)	
Height	0.016	***	0.016	***	0.011	***	0.017	***
	(0.003)		(0.003)		(0.004)		(0.005)	
Education mother	0.074		0.079		0.013		0.135	
	(0.056)		(0.056)		(0.061)		(0.091)	
Education father	0.141	***	0.142	***	0.067		0.014	
	(0.040)		(0.040)		(0.046)		(0.063)	
GDP growth			9.028	***	8.480	***	7.027	***
			(0.289)		(0.388)		(1.558)	
Education					0.033		-0.032	
					(0.047)		(0.066)	
East 1989					0.174	***	0.094	
					(0.058)		(0.082)	
Log(Household income)					0.111	**	0.185	**
					(0.044)		(0.076)	
Household wealth 50					-0.131	*	-0.245	**
					(0.074)		(0.112)	
Household wealth 75					-0.021		-0.132	
					(0.075)		(0.110)	
Household wealth 100					0.082		-0.094	
					(0.083)		(0.123)	
Unemployed					0.170		0.222	
					(0.213)		(0.257)	
Self-employed					0.575	***	0.473	***
					(0.068)		(0.089)	
Concerned: job security					0.062	**	0.090	***
					(0.025)		(0.033)	
Concerned: economy					0.017		-0.005	
					(0.026)		(0.034)	
Married					-0.267	***	-0.272	**
					(0.050)		(0.093)	
1 child under 18					0.076		0.002	
					(0.054)		(0.074)	
2 children under 18					0.162	**	0.099	
					(0.070)		(0.094)	
3 children under 18					0.242	**	0.104	
					(0.119)		(0.146)	
>3 children under 18					0.441	**	0.210	
					(0.219)		(0.266)	
Any children 18+					0.113	**	-0.064	
					(0.056)		(0.075)	
WTR partner							0.212	***
							(0.012)	
Age partner							0.036	***
							(0.006)	
Education partner							0.034	
							(0.066)	
Unemployed partner							0.098	
							(0.112)	
Married*GDP growth							-1.058	
							(0.933)	
Any children under 18*GDP growth							-0.679	
							(1.153)	
Any children 18+*GDP growth							3.051	***
							(1.145)	
R^2 within	0.025		0.048		0.046		0.107	
R^2 between	0.100		0.100		0.067		0.094	
R^2 overall	0.060		0.076		0.061		0.104	
Observations	30,681		30,681		17,325		9,816	

Variables are defined in Table 1. GLS random-effects model estimates with robust standard errors in brackets allowing for clustering at the individual level. ***, **, * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 4: Determinants of saving choices.

Model	(2)	
Dependent variable	Savings	
Constant	-5775.786	***
	(477.211)	
WTR general	-1.625	
	(3.466)	
Female	-51.398	**
	(24.295)	
Age	-53.316	***
	(8.598)	
Age2	0.581	***
	(0.100)	
GDP growth	-311.752	
	(605.223)	
Education	66.183	***
	(19.699)	
East 1989	152.026	***
	(24.144)	
Log(Household income)	679.631	***
	(54.807)	
Household wealth 50	14.490	
	(21.009)	
Household wealth 75	30.152	
	(24.094)	
Household wealth 100	233.514	***
	(31.021)	
Unemployed	-51.489	
	(49.846)	
Self-employed	16.113	
	(45.586)	
Concerned: job security	-0.701	
	(12.773)	
Concerned: economy	-0.800	
	(10.405)	
Married	-18.235	
	(27.938)	
1 child under 18	-77.611	***
	(21.912)	
2 children under 18	-119.760	***
	(27.545)	
3 children under 18	-206.037	***
	(52.387)	
>3 children under 18	-92.599	
	(109.848)	
Any children 18+	-96.539	***
	(22.861)	
WTR partner	-1.098	
	(3.421)	
Age partner	-0.971	
	(2.469)	
Education partner	27.996	
	(21.901)	
Unemployed partner	-79.428	***
	(26.514)	
Married*GDP growth	-102.008	
	(386.743)	
Any children under 18*GDP growth	343.340	
	(361.913)	
Any children 18+*GDP growth	8.37E+02	**
	(3.76E+02)	
R^2 within	0.036	
R^2 between	0.390	
R^2 overall	0.343	
Observations	7,302	

Variables are defined in Table 1. Model (2) was estimated as a GLS random-effects model with robust standard errors (in brackets) allowing for clustering at the individual level. ***, **, * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 5: Determinants of investment choices.

Model	(3a)		(3b)		(3c)		(3d)	
Dependent variable	Other securities		Life insurance		Mortgage savings contract		Homeowner	
Constant	1.84E-07	***	6.38E-08	***	0.010	**	6.83E-25	***
	(3.31E-07)		(1.12E-07)		(0.020)		(2.77E-24)	
WTR general	1.041	*	0.982		0.983		0.944	
	(0.023)		(0.021)		(0.022)		(0.042)	
Female	0.862		0.945		1.010		3.027	***
	(0.164)		(0.168)		(0.215)		(1.210)	
Age	0.760	***	1.401	***	1.079		3.788	***
	(0.037)		(0.067)		(0.058)		(0.370)	
Age2	1.002	***	0.996	***	0.998	***	0.990	***
	(0.000)		(0.000)		(0.001)		(0.001)	
GDP growth	4676.880	**	1.569		2.115		0.074	
	(15454.310)		(5.159)		(7.331)		(0.495)	
Education	2.593	***	1.277	*	0.740	*	0.429	**
	(0.392)		(0.178)		(0.124)		(0.143)	
East 1989	1.534	**	1.752		1.175		8.629	***
	(0.286)		(0.303)		(0.247)		(3.394)	
Log(Household income)	3.960	***	2.580	***	1.531	***	4.526	***
	(0.615)		(0.385)		(0.248)		(1.465)	
Household wealth 50	7.276	***	6.111	***	12.818	***	282.911	***
	(2.048)		(1.417)		(3.783)		(143.670)	
Household wealth 75	21.724	***	11.069	***	59.794	***	8.72E+08	***
	(6.184)		(2.609)		(17.848)		(5.10E+08)	
Household wealth 100	51.824	***	25.468	***	67.483	***	8.08E+09	***
	(15.917)		(6.658)		(21.471)		(5.34E+09)	
Unemployed	0.995		1.278		1.857		0.940	
	(0.574)		(0.668)		(1.006)		(0.900)	
Self-employed	0.647	**	0.688	**	0.263	***	0.606	
	(0.121)		(0.124)		(0.055)		(0.248)	
Concerned: job security	1.085		1.052		1.158	**	0.996	
	(0.076)		(0.072)		(0.082)		(0.144)	
Concerned: economy	1.053		0.841	**	0.822	**	1.195	
	(0.077)		(0.061)		(0.063)		(0.183)	
Married	0.555	***	1.243		0.892		4.508	***
	(0.121)		(0.258)		(0.206)		(1.925)	
1 child under 18	1.056		1.099		1.258		2.770	***
	(0.169)		(0.176)		(0.216)		(0.998)	
2 children under 18	0.973		1.350		1.122		11.385	***
	(0.204)		(0.283)		(0.259)		(5.441)	
3 children under 18	0.467	**	0.674		0.664		16.870	***
	(0.158)		(0.212)		(0.238)		(12.772)	
>3 children under 18	0.207	**	0.707		3.533	*	35.617	**
	(0.145)		(0.406)		(2.371)		(53.446)	
Any children 18+	0.543	***	0.862		1.649	***	1.277	
	(0.089)		(0.138)		(0.296)		(0.443)	
WTR partner	1.000		1.000		1.018		1.014	
	(0.022)		(0.021)		(0.022)		(0.043)	
Age partner	1.068	***	1.011		0.974	*	0.784	***
	(0.015)		(0.013)		(0.014)		(0.023)	
Education partner	1.857	***	1.052		0.961		0.460	**
	(0.277)		(0.146)		(0.162)		(0.146)	
Unemployed partner	1.309		0.330	***	0.470	***	1.592	
	(0.340)		(0.085)		(0.136)		(0.922)	
Married*GDP growth	0.014		4.612		2.066		0.514	
	(0.028)		(8.312)		(4.072)		(1.941)	
Any children under 18*GDP growth	1.214		0.040		0.107		0.680	
	(2.963)		(0.102)		(0.274)		(3.485)	
Any children 18+*GDP growth	0.000	***	8.45E-02		8.91E-02		5.16E+00	
	(1.10E-03)		(2.10E-01)		(2.28E-01)		(2.70E+01)	
Wald chi2	560.580		503.320		414.470		2254,16	
Prob>Chi2	0.000		0.000		0.000		0.000	
Observations	10,812		10,812		10,812		10,812	

Variables are defined in Table 1. Model (3) was estimated as a random-effects logistic model. The estimated coefficients in Model (3) are reported as odds ratios. Wald Chi2 denotes the Wald Chi-Square statistic and Prob>Chi2 denotes the corresponding probability. ***, **, * indicate significance at the 1%, 5%, and 10% level, respectively.