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Market Reaction to Transparency: An Empirical Study on Life Insurance Demand in Europe

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Abstract

This article explores life insurance consumption in 31 European countries from 2003 to 2012 and aims to investigate the extent to which market transparency can affect life insurance demand. The cross-country evidence for the entire sample period shows that greater market transparency, which resolves asymmetric information, can generate a higher demand for life insurance. However, when considering the financial crisis period (2008-2012) separately, the results suggest a negative impact of enhanced market transparency on life insurance consumption. The mixed findings imply a trade-off between the reduction in adverse selection under greater market transparency and the possible negative effects on life insurance consumption during the crisis period due to more effective market discipline. Furthermore, this article studies the extent to which transparency can influence the reaction of life insurance demand to bad market outcomes: i.e., low solvency ratios or low profitability. The results indicate that the markets with bad outcomes generate higher life insurance demand under greater transparency compared to the markets that also experience bad outcomes but are less transparent.

Keywords: Life insurance demand, transparency, market discipline
JEL classification: G14; G22

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1 Introduction

Enhancing market transparency is one of the building blocks in financial regulatory reforms in response to the recent financial crisis.[1] Enhanced transparency can generate two positive effects on the market: Firstly, greater market transparency can resolve asymmetric information, and consequently reduces the adverse selection issue.[2] Secondly, the improved information environment can foster more effective market discipline, since it enables outside stakeholders, such as stock investors and policyholders, to assess the riskiness of companies.[3] At a result, risk-averse outside stakeholders may adjust their investing decisions or influence the prices of securities/contracts accordingly, given a competitive market setting.[4] Consequently, enhanced market discipline under greater transparency can be detrimental for the external financing of the companies with high-risk policy or that have hit hard times.[5] Therefore, while enhanced market transparency might provide outside stakeholders with better information for their decision-marking, it is less clear whether greater transparency is certainly a beneficial thing for all types of companies and at different periods of time.

When considering insurance companies, their major external financing resource is insurance premium income. The influence of improved market transparency on insurance premium income has, to my best knowledge, not yet been studied in an empirical format. This article attempts to fill this gap by investigating empirically the relationship between the level of market transparency and insurance demand. In particular, I ask whether insurance markets that are more transparent might generate higher/lower insurance demand than do markets that are less transparent. Additionally, I test whether the influence of market transparency on insurance demand changes at different periods of time, particularly during the financial crisis period, and whether transparency has an impact on the reaction of insurance demand to bad market outcomes.

I focus on the life insurance market and explore its consumption across 31 European countries over the period of 2003 to 2012. The life insurance demand is measured by both life insurance density and life insurance penetration. The key-interest variable – market transparency – is a self-defined dummy variable based on the percentage of listed life insurance undertakings to total life insurance companies in each market. I employ both the country-level and the year-level

[1] For example, the Pillar 3 of the New Basel Accord on banking supervision requires that bank capital adequacy must be reported through public disclosure. The Pillar 3 of Solvency II on insurance regulation aims to improve market transparency though both public and regulatory (private) reporting.

[2] Grossman and Stiglitz (1980) find that information asymmetries among investors induces adverse selection, an issue that can be resolved through disclosure according to Verrechia (2001). See also the speech on "Simplicity, Transparency, and Market Discipline in Regulatory Reform" by Plosser (2014).

[3] Nier and Baumann (2006) study the interactions between market discipline, disclosure and bank risks and indicate that one of the prerequisites for effective market discipline is that the market must have adequate information to gauge the riskiness of the bank.

[4] For example, Zimmer et al. (2009) find, in an experimental study, that the awareness of insurers' default risk affects policyholders' willingness-to-pay extensively and consequently their demand for insurance contracts.

[5] See, for example, Horton and Serafeim (2010) study the market reaction to IFRS reconciliation adjustments in the UK. They find that companies suffer from negative abnormal returns when reporting negative earnings reconciliation.

fixed effects estimation to control for the time-invariant differences across countries and the time effect on demand. In addition, I control for country-specific characteristics such as banking development, secondary school enrollment ratio, gross national income, institutional development, inflation, interest rate, life expectancy, old dependency ratio, young dependency ratio, social expenditure, urbanization ratio and wealth. In specific, I first test the relationship between the level of market transparency and life insurance demand for the entire sample period. Then, I interact the market transparency proxy with a time dummy variable which specifies the financial crisis period (2008-2012). By incorporating this interaction term, the estimation results show the effect of high market transparency on life insurance demand relative to the case under low market transparency during the crisis period. Finally, I test the influence of transparency on the reaction of life insurance demand to bad market outcomes. The indicator of a bad market outcome is a self-defined binary dummy variable which specifies low solvency ratios or low profitability. By interacting the transparency proxy with this binary dummy variable, the regression model compares the impact of transparency on life insurance demand in the markets with bad outcomes to the markets that also experience bad outcomes but are less transparent.

I study the life insurance business and focus on the European markets for several reasons. Firstly, life insurers provide long-term contracts and typically have much higher leverage ratios compared to non-life insurers. These features of the life insurance business might induce stronger risk sensitivity of outside stakeholders, and thus exert more effective market discipline.[6] Secondly, in light of the envisaged Solvency II, of which the third pillar aims to enhance the market transparency of European insurance markets, the results of this article aim to provide relevant policy implications by concentrating the analysis on the European markets.

The results of the fixed effects estimation for the entire sample period demonstrate that greater market transparency leads to higher life insurance demand, particularly for the measurement of life insurance density. However, when considering the financial crisis period (2008-2012) separately, the results suggest that the markets under greater transparency generate less life insurance demand relative to the markets that are less transparent. In other words, enhanced transparency during the financial crisis can have a negative impact on life insurance consumption. The mixed findings imply a trade-off between the reduction in adverse selection under greater market transparency and the possible negative effects on life insurance consumption during the crisis due to more effective market discipline. Furthermore, by comparing the markets with bad outcomes under greater transparency to the markets that also experience bad outcomes but are less transparent, enhanced transparency is advantageous in generating higher life insurance demand. Generally speaking, the findings of this article imply that the implementation of Solvency II, against the background of the ongoing Eurozone crisis, might result in mixed influences on life insurance consumption in Europe.

This article contributes to the existing literature examining the determinants of life insurance

[6] See Eling (2012, p.17). In addition, previous studies provide empirical evidence that market discipline takes effect in the life insurance market. See, for example, Zanjani (2002), Baranoff and Sager (2007), and Eling and Schmit (2008).

consumption by providing empirical evidence based on a European database over a recent period of time. Furthermore, it tackles an important question whether transparency plays a role in stimulating or diminishing life insurance demand based on the theory of adverse selection and market discipline. In addition, it extends the existing studies examining the capital market impacts of disclosure by analyzing the consumption reaction to transparency in the insurance field. Finally, the findings of this article are interesting for both policymakers and life insurers. The findings imply that improving market transparency might have inconsistent influences on the life insurers with different risk profiles or at different periods of time.

The remainder of this article is organized as follows. Section 2 first provides the conceptual background by reviewing the related previous literature on the impact of mandatory disclosure, and then develops the testing hypotheses. In Section 3, I describe the research design and define the variables. Section 4 explains the data and empirical methodologies. In Section 5, I present the empirical findings and discuss the results. Section 6 concludes and provides policy implications.

2 Conceptual Background and Hypotheses

The existing literature examining the effects of increased market transparency mainly focuses on the capital market reaction to different levels of disclosure. This article measures the market transparency by the percentage of listed life insurance undertakings to the total number of life insurance companies in each market. The idea behind it is that listed companies face higher mandatory disclosure requirements from the exchange market regulations, compared to non-listed companies. Therefore, in the following, I review the previous literature on the capital market effects of the changes in the mandatory disclosure.

Previous empirical studies demonstrate that companies under higher mandatory disclosure standards obtain higher liquidity and abnormal returns on their stocks. For example, Leuz and Verrecchia (2000) show that the increased mandatory disclosure level through changing to the international accounting standards leads to higher stock liquidity for the listed companies. Greenstone et al. (2006) investigate the influence of the 1934 Securities Exchange Act on the stock returns of companies. Their results suggest that increased mandatory disclosure requirements allow firms to gain abnormal excess stock returns. However, enforced extended disclosure by regulation can also be detrimental, particularly for small companies without relevant reporting experience. For example, Bushee and Leuz (2005) examine the impact of the increased mandatory disclosure due to the 1934 Securities Exchange Act on companies. They find that enhanced mandatory disclosure can be extremely costly for small companies according to the return outcomes of these companies, in which case small companies would even prefer to leave the OTC Bulletin Board. In contrast, companies with previous experience in reporting under the SEC requirements obtain positive stock returns and a permanent increase in their stock liquidity. According to these prior findings, I expect that policyholders react to different levels of market transparency in the life insurance industry, observed by cross-country variations in life insurance demand.

The fundamental idea for developing the first testable hypothesis is that enhanced transparency can reduce the adverse selection issue in the life insurance market. In specific, asymmetric information causes difficulties for policyholders in separating low-risk companies from high-risk ones, and policyholders might thus reduce their demand for life insurance. Signaling from low-risk companies through enhanced disclosure can distinguish themselves from high-risk peers, and consequently reduce adverse selection.[7] Based on this argument, I form the following hypothesis (stated in the alternative form) to test the causal effect of market transparency on life insurance demand. This hypothesis compares the life insurance demand in the markets under high transparency levels to the markets under low transparency levels for the entire sample period.

H_1 *The markets with greater transparency generate higher life insurance demand.*

Furthermore, previous empirical studies in the banking field suggest that increasing transparency can result in procyclical effects on banks which suffer from an exogenous macroeconomic shock during a financial crisis.[8] In specific, a bank can exhibit high risks due to an exogenous macroeconomic shock during the financial crisis regardless of its initial risk policy. Under greater transparency, investors are more informed about the increase in the risks of the bank, and consequently demand for higher investment returns or sell the bank assets in response to the shock. In addition to the procyclical effect, the disclosure of the unhealthy banks' risk situations can lead to spillover effects on other sound banks. Therefore, one can see that enhanced transparency during the financial crisis period might generate negative impacts on the market, despite the fact that greater transparency can reduce adverse selection. Based on the evidence from the banking literature, I develop the second hypothesis (stated in the alternative form in the following) to test whether greater market transparency can have a negative impact on life insurance consumption during the recent financial crisis. This hypothesis compares the life insurance demand during the financial crisis period in the markets under high transparency levels to the markets under low transparency levels.

H_2 *The markets with high transparency levels generate lower life insurance demand during the financial crisis period (2008-2012) relative to the markets that are less transparent.*

Finally, the third testing hypothesis (stated in the alternative format) suggests that transparency can positively affect the reaction of life insurance demand to bad market outcomes. Epstein and Schneider (2008) build a theoretical framework and show that when the profiles of companies are opaque, ambiguity-averse investors react to the vague information as if they were facing the worst scenario. Consequently, investors demand compensation for low information quality or withdraw their investments if they cannot receive higher rates of returns. Based on their theoretical

[7] See, for example, Spence (1973).

[8] For example, Cordella and Yeyati (1998) find, in an empirical study, that when banks are hit by an exogenous macroeconomic shock, greater transparency reduces the stability of banks. Furman and Stiglitz (1998) also point out that greater transparency would have aggravated the U.S. banking crisis in the 1980s.

findings, I hypothesize that greater transparency should be advantageous in receiving higher life insurance demand by reducing the ambiguity of the market, when comparing the markets with bad outcomes to the other markets that also experience bad outcomes. Different from H_2 which includes both the markets with good outcomes and the ones with bad outcomes during the financial crisis period, H_3 focuses only on the comparison within "bad" markets but for the entire sample period.

H_3 *The markets with bad outcomes under high transparency levels generate higher life insurance demands relative to the markets that also experience bad outcomes but are less transparent.*

3 Research Design

3.1 Regression Models

I start with the investigation of the extent to which market transparency can affect life insurance demand by estimating the following linear regression model:

$$L_{it} = f(TRANS_{i,t}, C_{i,t}) + u_{i,t}, \tag{1}$$
$$(+)$$

where $L_{i,t}$ denotes life insurance demand, $TRANS_{i,t}$ is the proxy of market transparency, and $C_{i,t}$ is a vector of control variables which have partial effects on life insurance demand. u is the error term, including the unobserved effects on life insurance demand. i and t indicate country and time respectively.

Secondly, I form a dummy variable which specifies the financial crisis period and interact it with the market transparency proxy. By incorporating this interaction term, the regression model (Eq. (2)) can estimate the relationship between market transparency and life insurance demand during the financial crisis period.

$$L_{it} = f(TRANS_{i,t}, CRISIS_{i,t}, TRANS_{i,t} \times CRISIS_{i,t}, C_{i,t}) + u_{i,t}, \tag{2}$$

where $CRISIS_{i,t}$ is a binary time dummy variable that equals 1 over the period of 2008 to 2012 and 0 otherwise, and $TRANS_{i,t} \times CRISIS_{i,t}$ is the interaction term consisting of market transparency and the crisis dummy.

Finally, in order to test the third hypothesis (H_3), I interact the market transparency proxy with a self-defined binary dummy variable that equals 1 if the markets experienced bad outcomes in the previous period, and 0 otherwise (denoted as $BAD_{i,t-1}$). I consider two indicators for bad outcomes based on either the solvency or the profitability of the market. In specific, the solvency of a market is measured by the available solvency margin divided by the required solvency margin, and the profitability of the market is captured by the profit/loss for the financial year divided by

the total balance sheet assets.[9] I calculate the average solvency or profitability of all the markets in the sample at an individual year, and the markets with bad outcomes are identified as the ones which perform worse than the average in the previous year. The regression model that includes the interaction term between $TRANS_{it}$ and $BAD_{i,t-1}$ can be written as:

$$L_{it} = f(TRANS_{i,t}, BAD_{i,t-1}, TRANS_{i,t} \times BAD_{i,t-1}, C_{i,t}) + u_{i,t}. \tag{3}$$

In the following, I explain the measurements for life insurance demand and the proxies for market transparency. Then, I describe the control variables in the regression models. Table 1 presents the detailed definitions and calculation methods of all the variables.

3.2 Dependent Variable – Life Insurance Demand

Following previous studies on the measurement of life insurance consumption, I use two indicators to capture life insurance demand: life insurance density and life insurance penetration. Life insurance density is defined as life insurance premiums per capita, denoted as L_{den}. Life insurance density is in real money terms and measures the average expenditure of each inhabitant on life insurance products. Life insurance penetration is calculated as life insurance premiums divided by the gross domestic product (GDP), denoted as L_{pen}. Life insurance penetration captures the importance of life insurance business relative to the size of the domestic economy.

3.3 Key Interest Variable – Market Transparency

The fundamental idea for forming the market transparency dummy variable is that listed companies encounter relatively higher regulatory disclosure requirements.[10] Hence, listed life insurance companies are usually more transparent than non-listed life insurers, when considering costly disclosure. There are several reasons behind the increase of the number of listed life insurers: (i) new listed companies entry into the market, (ii) private companies become public, and (iii) mutual companies change to be listed through demutualization. Regardless of the format, I assume that the higher the ratio of listed life insurance undertakings to the total number of life insurers is, the more transparent the insurance market is. In specific, the market transparency dummy variable divides countries into different groups according to the ratio of listed life insurance undertakings to the total number of life insurers (referring as R_{listed}) in an individual country at a specific time. The listing status of the life insurance companies in the sample markets are based on the Datastream database of Thomson Reuters. Additionally, I include multi-line insurers if their life insurance divisions are listed.

Furthermore, I form two market transparency indicators, denoted as $TRANS_1$ and $TRANS_2$. If

[9] The measurements for both the market solvency and the market profitability/loss are on the aggregated level, defined according to the EIOPA statistical dataset. The details of the data are in Section 4.

[10] For example, the International Financial Reporting Standards (IFRS), which is implemented in European Union in 2005, requires listed European companies to comply with higher global disclosure rules.

a market has no recorded listed life insurance company in a given year, both $TRANS_1$ and $TRANS_2$ count as 1.[11] I then calculate the average and the three quartiles of the R_{listed} across countries for each year. For $TRANS_1$, it counts as 2 if a given market has a R_{listed} below the average value, and 3 if above. As to $TRANS_2$, it counts as 2 if a given market has a R_{listed} below the first quartile value, 3 if it is between the first and the median, 4 if it is between the median and the third quartile, and 5 if it is above the third quartile value. Therefore, there are three country groups under the proxy of $TRANS_1$, whereas the $TRANS_2$ proxy splits off the sample countries into five groups with different levels of market transparency.

3.4 Control Variables

In order to examine the effect of market transparency on life insurance demand, one needs to control for other factors that might be related to the cross-sectional variation in life insurance demand. Several empirical articles study the determinants of life insurance demand, and based on their findings, I control for the following factors.

According to Beck and Webb (2003), banking sector development is positively related to life insurance consumption. The development of the banking sector not only increases the confidence and the trust of consumers in the financial sector, but also creates a more efficient payment system for life insurers to reimburse policyholders' claims.[12] Therefore, I control for banking sector development ($BANK$), measured by the ratio of domestic credit to private sector by banks to GDP. I expect $BANK$ to be positively correlated with life insurance demand.

Browne and Kim (1993) suggest that people with higher education levels have stronger incentives to purchase insurance, since they are usually relatively more risk-averse and are more aware of the necessity of insurance. Kjosevski (2012) finds that the level of education is one of the robust predictors for life insurance consumption, which confirms the argument of Browne and Kim (1993). Thus, I use the secondary school enrollment ratio as a proxy for the level of education ($ENROLL$). I expect a positive relationship between $ENROLL$ and life insurance demand.

Several previous empirical studies show that income has a significant positive impact on the use of life insurance.[13] National income is generally measured as GDP, GNI or some variations of them. In this article, I employ the gross national income (GNI) per capita as the proxy for income (GNI) and expect a positive relationship between GNI and life insurance demand.

The studies by Beck and Webb (2003) and Kjosevski (2012) suggest that institutional indicators, such as political stability, control of corruption, government effectiveness and rule of law, are significantly related to life insurance demand. In this article, the institutional development variable (ID)

[11] There must be a certain level of market transparency even if all the players in a market are private companies. Hence, based on this logical reason, I choose the value "1" instead of "0" for the level of market transparency when there is no listed life insurance in the database.

[12] Kjosevski (2012) controls for financial sector development by using the ratio of quasi-money (M2-M1) to GDP respectively. His results also indicate a positive relation between financial development and life insurance demand.

[13] See, for example, Browne and Kim (1993), Enz (2000), Beck and Webb (2003), Kjosevski (2012).

is the average of six governance indicators based on the Worldwide Governance Indicators (WGI) project conducted by the World Bank reveals governance indicators for 215 economies over the period of 1996 to 2012. The six dimensions of governance of the WGI are: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. I expect that the better the ID is, the higher life insurance demand is.

I also control for the inflation rate (INF) and the real interest rate (INT). An increase in the inflation rate leads to a devaluation of future cash flows, and thus diminishes life insurance demand.[14] I thus expect INF to be negatively correlated with life insurance demand. Beck and Webb (2003) explain that increased real interest rates can reflect the higher investment returns of life insurers, in turn offering insurance policies with better profit participation to consumers, and consequently stimulate higher life insurance demand. In this article, I use annual money market interest rates to measure INT and expect that INT positively affects life insurance consumption.

An important issue in measuring life insurance consumption is that insurance premiums are the product of quantity and price. Lack of competition and costly regulation might increase insurance premiums by raising the price, without implying higher insurance demand in quantity.[15] To overcome this problem, Outreville (1996) as an example, suggests that life expectancy can be used as a proxy for the life insurance price, since it reflects the actuarially fair price for life insurance. Therefore, I control for life expectancy at birth (in years), which is denoted as EXP, to eliminate the influence of the price on life insurance consumption and focus on the quantity. In specific, the actuarially fair price of annuity contracts rises as the longevity risk increases, whereas the price of term life insurance and endowment insurance might decrease due to longer life expectancy. Furthermore, the sensitivity to life insurance prices varies for policyholders at different ages. For example, it is more likely that a 60-year old policyholder purchases annuity contracts, and he/she is thus less sensitive to the price of annuity contracts, compared to the policyholders who are at younger ages. Therefore, it is different to predict the impact of life expectancy on life insurance demand at the aggregated level, which depends, to some extent, upon the age of the majority of policyholders.

Dependency ratio is also considered as an important predictor for life insurance consumption. Previous studies[16] indicate that one of the main purposes of purchasing life insurance is to protect dependents against financial difficulties in case of the death of family wage earners. In this article, I control for both old and young dependency ratio. In specific, the old dependency ratio ($ODEP$) is defined as the ratio of older-than-64 dependents to the working-age population (those ages 15-64). The young dependency ratio ($YDEP$) is defined as the ratio of younger-than-15 dependents to the working-age population. I expect that both age dependency ratios are positively correlated with life insurance demand.

Social security expenditure is hypothesized to reduce the demand for life insurance for two

[14] See Hussels et al. (2005, p. 262).
[15] See Beck and Webb (2003, p. 53).
[16] See, for example, Hammond et al. (1967), Campbell (1980).

reasons: firstly, high private social security expenditures diminish the net income of households; secondly, high governmental social security expenditures are a disincentive for individuals to seek additional protection through purchasing life insurance. Empirical evidence from, for example, Browne and Kim (1993) and Beck and Webb (2003) indicate that private life insurance purchase declines as the government spends more on social security. In this article, I measure the social security expenditure by using the ratio of public health expenditure to GDP, denoted as $SOCIAL$. I expect that $SOCIAL$ exhibits a negative influence on life insurance consumption.

Countries with higher urbanization ratios are expected to have a relatively higher life insurance demand. Beck and Webb (2003) explain that the geographical concentration of consumers simplifies the distribution of life insurance by reducing costs related to marketing, underwriting and claims handling. The urbanization ratio is the share of urban population in the total, denoted as $URBAN$.

The last economic factor that I control for is the wealth level of each country ($WEALTH$), measured by gross domestic savings. Beck and Webb (2003) state that if households save a large portion of their income, they might or might not be willing to increase their purchase of life insurance policies. On the one hand, adequate savings contribute to the affordability of private life insurance products. On the other hand, a strong incentive for saving a large portion of income might rule out the potential of spending on life insurance. Therefore, I expect an ambiguous relationship between $WEALTH$ and life insurance consumption.

4 Data and Methodology

The testing sample of this article consists of 31 European countries over the period of 2003 to 2012. The sample countries include 28 European Union member states, Iceland, Norway and Switzerland. I use annual panel data, and the data are obtained from the following sources. Firstly, the data of life insurance gross written premiums are from the statistical publications by Insurance Europe.[17] The World Development Indicators (WDI) of the World Bank provide data for formulating country-specific variables such as banking development, secondary school enrollment ratio, gross national income, life expectancy, old dependency ratio, young dependency ratio, social expenditure, urbanization ratio and wealth.[18] Furthermore, the Worldwide Governance Indicators (WGI) of the World Bank contain the data for measuring the institutional development of countries.[19] I also obtain the data of inflation rates from the World Economic Outlook Databases (WEO) of the IMF.[20] The data of annual money market interest rates are from the Eurostat by the European Commission.[21] Finally, the data for capturing the solvency and the profitability of the sample life insurance markets are from the European Insurance and Occupational Pension Authority (EIOPA)

[17] Data can be retrieved from http://www.insuranceeurope.eu/publications/statistics.
[18] Data can be retrieved from http://databank.worldbank.org/data/home.aspx.
[19] Data can be retrieved from http://info.worldbank.org/governance/wgi/index.aspx.
[20] Data can be retrieved from http://www.imf.org/external/data.htm.
[21] Data can be retrieved from http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/themes.

Table 1: Variable Definitions

Variable	Notation	Definition
Life insurance density	$LN(L_{den})$	The natural logarithm of life insurance premiums per capita
Life insurance penetration	$LN(L_{pen})$	The natural logarithm of the ratio of life insurance premiums to GDP
Transparency proxy 1	$TRANS_1$	A three-scale dummy variable (explanations see below)
Transparency proxy 2	$TRANS_2$	A five-scale dummy variable (explanations see below)
Financial crisis	$CRISIS$	A binary time dummy variable (explanations see below)
Low solvency ratio	BAD_1	A binary dummy variable (explanations see below)
Low profitability	BAD_2	A binary dummy variable (explanations see below)
Banking sector development	$BANK$	The ratio of domestic credit to private sector by banks to GDP
Secondary school enrollment ratio	$ENROLL$	The ratio of secondary school enrollment to the population
Gross national income	GNI	GNI per capita
Institutional development	ID	The average of six governance indicators (explanations see below)
Inflation rate	INF	Inflation, average consumer prices
Real interest rate	INT	Money market interest rates (annual data)
Life expectancy	EXP	Life expectancy at birth, total (years)
Old dependency ratio	$ODEP$	The ratio of older dependents to the working-age population (details see below)
Young dependency ratio	$YDEP$	The ratio of young dependents to the working-age population (details see below)
Social securtiy expenditure	$SOCIAL$	The ratio of public health expenditure to GDP
Urbanization ratio	$URBAN$	The ratio of the number of people living in urban areas to total population
Wealth	$WEALTH$	Gross domestic savings, calculated as GDP less final consumption expenditure

This table presents the notations and definitions of all variables in the regressions. Additional explanations for the calculation methods of several variables are as follows. $TRANS_1$ is a three-scale dummy variable: 1–if the percentage of listed life insurance undertakings (R_{listed}) of a country is 0; 2–if the R_{listed} of a country is larger than the average R_{listed} of all countries; 3–if the R_{listed} of a country is smaller than the average. $TRANS_2$ is a five-scale dummy variable: 1–if the R_{listed} of a country is 0; 2–if the R_{listed} of a country is between 0 and the first quartile of the R_{listed} for all countries; 3–if the R_{listed} of a country is between the first quartile and the median of the R_{listed} for all countries; 4–if the R_{listed} of a country is between the median and the third quartile of the R_{listed} for all countries; 5–if the R_{listed} of a country is above the third quartile of the R_{listed} for all countries. $CRISIS$ is a time dummy variable that equals 1 for the period of 2008-2012 and 0 for other periods. BAD_1 is a binary dummy variable that equals 1 if the solvency situation of a market is worse than the average of all the markets in the previous year, and 0 otherwise. BAD_2 is a binary dummy variable that equals 1 if a market generates lower profitability than the average value of all the markets in the previous year, and 0 otherwise. ID is calculated as the average of six governance indicators: Voice and Accountability, Political Stability, Government Effectiveness, Regulatory Quality, Rule of Law and Control of Corruption. As to ODEP and $YDEP$, older dependents refer to people older than 64, whereas young dependents are people younger than 15, and the working age population are those ages 15-64.

statistics release.[22] Table 2 summarizes the descriptive statistics of all variables in the regressions based on the sample data.

Figure 1 lists the sample countries (stated as the x-axis labels) and illustrates the average life insurance gross written premiums (€bn) of each country from 2003 to 2012. One can see that life insurance consumption varies largely across countries. The largest four countries according to the average life insurance consumption throughout years are United Kingdom, France, Germany and Italy. When considering the average life insurance gross written premiums per capita, northern and western European countries exhibit higher life insurance consumption than southern and eastern European markets (as shown in Figure 2). Furthermore, Figure 3 illustrates the average life insurance gross written premiums (€bn) of all sample countries at different periods of time. One can see that life insurance consumption gradually increases over the period of 2003 to 2007, followed by a dramatical drop in 2008 due to the financial crisis. Despite the moderate recovery in 2010, the average life insurance gross written premiums (€bn) remain at relatively lower levels (compared to 2007) during 2008-2012.

Table 2: Summary Descriptive Statistics of Country-specific Variables

Variable	Notation	Mean	Std. Dev.	Min.	Max.	Obs.
Life insurance density	$LN(L_{den})$	962.854	971.855	3.595	4816.72	307
Life insurance penetration	$LN(L_{pen})$	0.035	0.033	0	0.184	307
Transparency proxy 1	$TRANS_1$	1.937	0.745	1	3	303
Transparency proxy 2	$TRANS_2$	2.257	1.212	1	5	303
Low solvency ratio	BAD_1	0.658	0.475	0	1	228
Low profitability	BAD_2	0.631	0.484	0	1	222
Banking sector development	$BANK$	1.123	0.594	0.137	3.195	300
Secondary school enrollment ratio	$ENROLL$	1.03	0.101	0.799	1.591	276
Gross national income	GNI	21619.877	10530.967	3554.315	57332.841	310
Institutional development	ID	1.126	0.51	-0.046	1.986	310
Inflation rate	INF	0.03	0.024	-0.017	0.153	310
Real interest rate	INT	0.026	0.019	0	0.161	310
Life expectancy	EXP	78.121	3.16	70.866	82.937	310
Old dependency ratio	$ODEP$	0.235	0.038	0.153	0.321	310
Young dependency ratio	$YDEP$	0.243	0.033	0.193	0.343	310
Social securtiy expenditure	$SOCIAL$	0.086	0.017	0.049	0.124	310
Urbanization ratio	$URBAN$	0.726	0.122	0.499	0.975	310
Wealth	$WEALTH$	6392.361	7156.686	208.577	42120.187	302

The descriptive statistics of variables such as BAD_1 and BAD_2 are based on the data from 2005 to 2012, whereas the other country-specific variables are for the period of 2003 to 2012.

[22] The data for the solvency and profitability of life insurance markets are only available from 2005 to 2012. Data can be retrieved from https://eiopa.europa.eu/publications/financial-stability/statistics/index.html.

Figure 1: Average Life Insurance Gross Written Premiums (€bn) by Countries over the Period 2003-2012

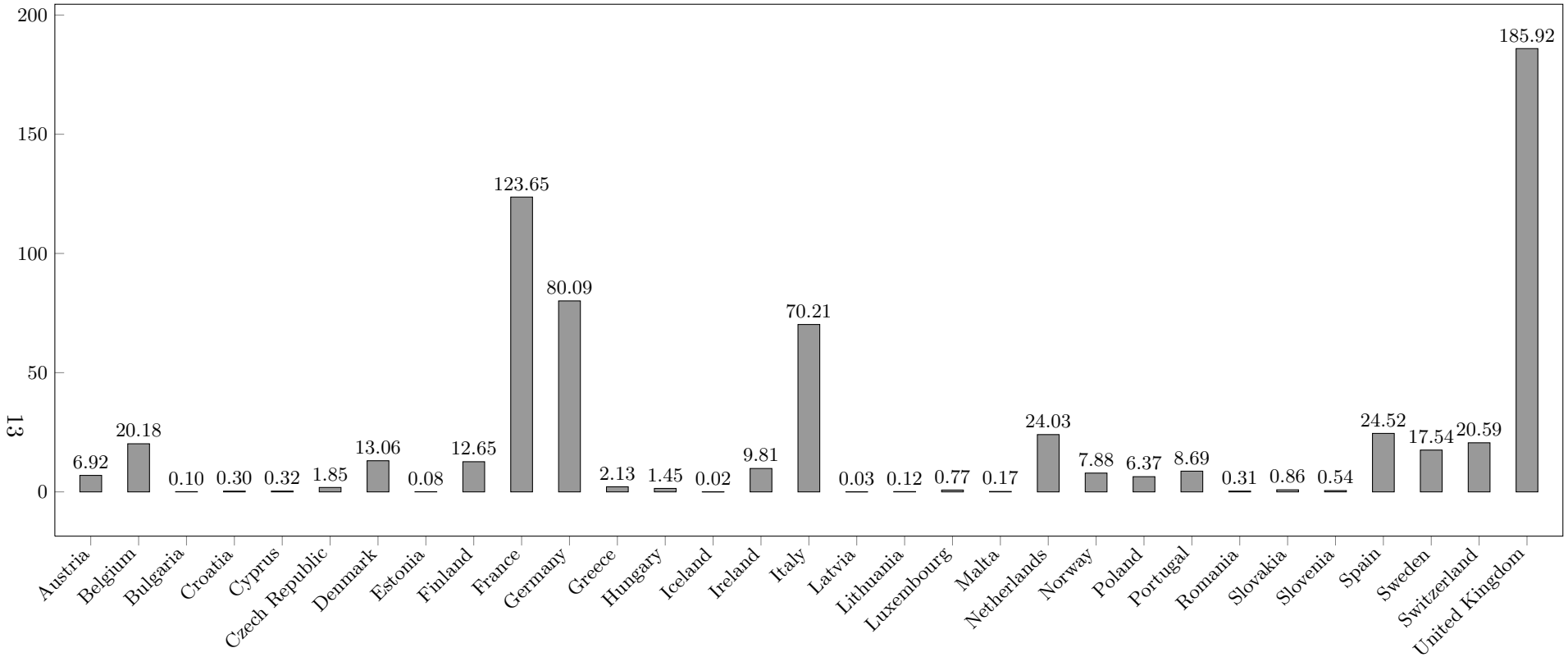


Figure 2: Average Life Insurance Gross Written Premiums per Capita by Countries over the Period 2003-2012

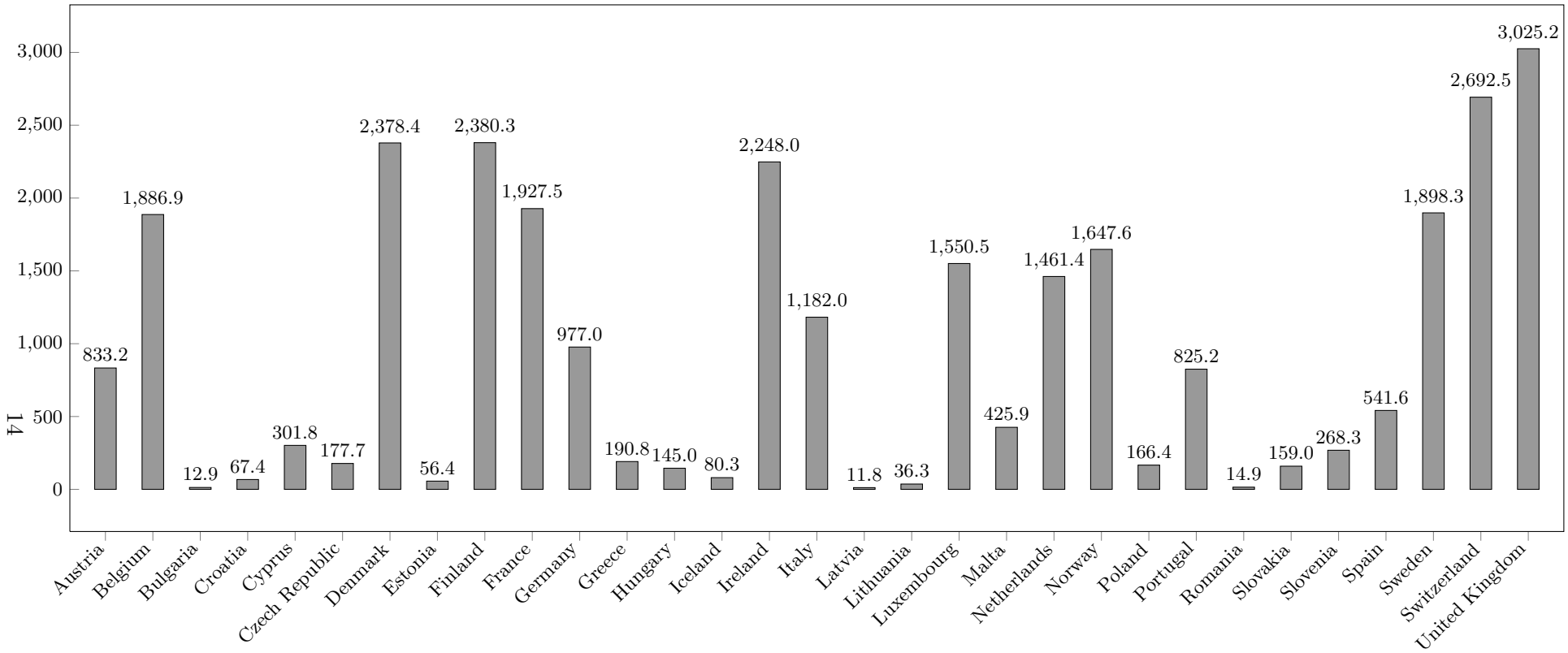
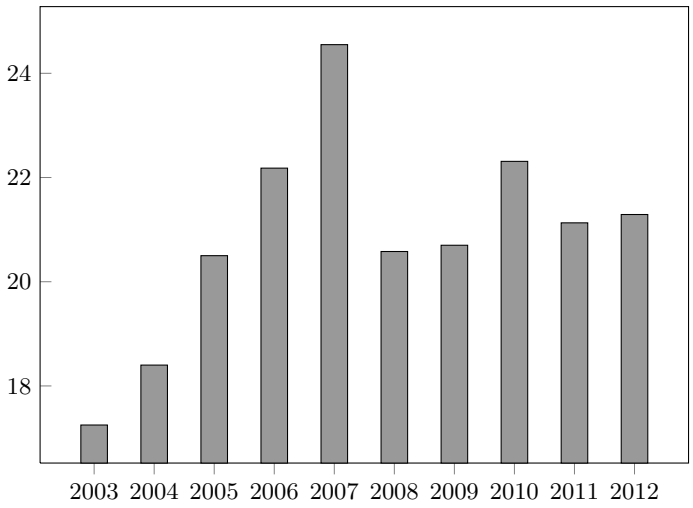


Figure 3: Average Life Insurance Gross Written Premiums (€bn) of the Sample Countries by Years



As to the empirical method, I first plot the dependent variable(s) (i.e., life insurance density and life insurance penetration) and find that their histograms are right-skewed. Therefore, I apply the logarithmic transformation to the original dependent variable(s) to generate the new regressand(s), denoted as $LN(L_{den})$ and $LN(L_{pen})$, respectively. As a result, the predicted result, for example, β_x will be interpreted as an approximate $\beta_x * 100$ percentage change.

I employ both the country-level and the year-level fixed effects estimation and adjust standard errors for clustering by country to test the relationship between market transparency and life insurance demand.[23] The country fixed effects model aims to eliminate unobserved effects due to time-invariant differences across countries (for example, variations in culture), and the year fixed effects model controls for the unobserved effects of certain events that occur in a specific year. Furthermore, I interact the market transparency proxy with the crisis time dummy variable. This interaction term allows me to investigate the extent to which the relationship between market transparency and life insurance demand can vary at different periods of time. Finally, I incorporate the interaction term between market transparency and a dummy variable that indicates bad market outcomes into the regression model. The estimation demonstrates the extent to which transparency can affect the policyholder reaction to different life insurance market conditions.

[23] In specific, I first check the possible violations of the OLS regression assumptions, and the result of the Breusch-Pagan Lagrange Multiplier (LM) test indicates the presence of the endogeneity issue. I then conduct the Hausman test, of which the result indicates that the fixed effects model is preferred over the random effects model. Furthermore, the modified Wald test for group-wise heteroskedasticity in the fixed effects model demonstrates the presence of the hereoskedasticity. I thus correct the standard error, which at the same time resolves the serial correlation problem, in order to obtain robust estimators.

5 Empirical Results

5.1 Bivariate Correlations

In advance of the multi-variate regressions, Table 3 provides the bivariate correlations between the two measurements of insurance demand and the two proxies of market transparency, and control variables. Both measurements of market transparency – $TRANS_1$ and $TRANS_2$ – positively correlate with life insurance density ($LN(L_{den})$) and life insurance penetration ($LN(L_{pen})$), and the correlations are significant at the 1% level. Furthermore, control variables such as banking sector development, secondary school enrollment ratio, gross national income, institutional development, life expectancy, old- and young-dependency ratio, social security, urbanization ratio and wealth have significant positive correlations with life insurance density and life insurance penetration, whereas variables such as inflation rate and real interest rate exhibit negative correlations. The correlations between life insurance demand and control variables are consistent with findings in prior empirical studies.

5.2 Fixed Effects Estimation and the Interaction with $CRISIS$

Table 4 and 5 present the results of the fixed effects estimation by using different proxies for market transparency ($TRANS_1$ and $TRANS_2$), respectively. In both results tables, Column (1)-(3) demonstrate the estimated relationship between market transparency and life insurance density ($LN(L_{den})$), whereas Column (4)-(6) are the results for life insurance penetration ($LN(L_{pen})$).

In specific, Column (1) of Table 4 shows a basic regression model excluding any country-specific control variables, of which the result demonstrates a positive relationship between market transparency and life insurance density at the 1% significance level. Column (2) adds country-specific control variables into the estimation, and the result identifies the positive impact of market transparency on life insurance density, despite a decrease in the statistical significance. In specific, the result in Column (2) shows that one unit increase in market transparency generates an approximate 5.51% higher life insurance density (at the 10% significance level). Column (3) presents the result of testing the second hypothesis (H_2) by interacting the market transparency variable with the financial crisis term. First of all, the coefficient of $TRANS_1$ in Column (3) indicates that one unit increase in market transparency leads to an approximate 13% higher life insurance density (at the 1% significance level) during the pre-crisis period (2003-2007). This result confirms the previous findings in Column (1) and (2) for the entire sample period (2003-2012). Secondly, the sum of the coefficients of $TRANS_1$ and $TRANS_1 \times CRISIS$ in Column (3) specifies the relationship between market transparency and life insurance density during the financial crisis period (2008-2012). The markets with high transparency levels experience an approximate 5.4% reduction (calculated as 0.130+(-0.184)) in life insurance density relative to the markets with low transparency levels. This result indicates that enhanced market transparency negatively affects life insurance density over the crisis period. In other words, the effect of market transparency on life insurance density varies at the different periods of time.

Table 3: Correlation Matrix

	$LN(L_{den})$	$LN(L_{pen})$	$TRANS_1$	$TRANS_2$	$BANK$	$ENROLL$	GNI	ID	INF	INT	$LEXP$	$ODEP$	$YDEP$	$SOCIAL$	$URBAN$	$WEALTH$
$LN(L_{den})$	1															
$LN(L_{pen})$	0.986 (***)	1														
$TRANS_1$	0.360 (***)	0.355 (***)	1													
$TRANS_2$	0.233 (***)	0.239 (***)	0.956 (***)	1												
$BANK$	0.557 (***)	0.508 (***)	0.253 (***)	0.170 (**)	1											
$ENROLL$	0.448 (***)	0.424 (***)	-0.0647	-0.148 (*)	0.413 (***)	1										
GNI	0.746 (***)	0.639 (***)	0.275 (***)	0.129 (*)	0.491 (***)	0.369 (***)	1									
ID	0.766 (***)	0.695 (***)	0.110	0.000556	0.556 (***)	0.500 (***)	0.756 (***)	1								
INF	-0.544 (***)	-0.557 (***)	-0.246 (***)	-0.195 (***)	-0.272 (***)	-0.255 (***)	-0.346 (***)	-0.390 (***)	1							
INT	-0.144 (*)	-0.193 (***)	-0.194 (***)	-0.152 (**)	0.0349	0.0846	0.0344	0.109	0.420 (***)	1						
$LEXP$	0.794 (***)	0.746 (***)	0.404 (***)	0.290 (***)	0.627 (***)	0.382 (***)	0.704 (***)	0.637 (***)	-0.441 (***)	-0.0186	1					
$ODEP$	0.134 (*)	0.160 (**)	0.133 (*)	0.0775	-0.122 (*)	0.0755	0.137 (*)	-0.0669	-0.108	-0.257 (***)	0.158 (**)	1				
$YDEP$	0.412 (***)	0.346 (***)	0.00904	-0.0303	0.469 (***)	0.480 (***)	0.479 (***)	0.620 (***)	-0.148 (**)	0.331 (***)	0.404 (***)	-0.400 (***)	1			
$SOCIAL$	0.693 (***)	0.679 (***)	0.235 (***)	0.126 (*)	0.460 (***)	0.417 (***)	0.563 (***)	0.598 (***)	-0.411 (***)	-0.0727	0.729 (***)	0.351 (***)	0.265 (***)	1		
$URBAN$	0.440 (***)	0.386 (***)	0.0427	-0.0247	0.357 (***)	0.442 (***)	0.486 (***)	0.623 (***)	-0.170 (**)	0.172 (**)	0.482 (***)	0.0697	0.498 (***)	0.410 (***)	1	
$WEALTH$	0.516 (***)	0.389 (***)	0.143 (*)	0.0278	0.412 (***)	0.211 (***)	0.850 (***)	0.601 (***)	-0.205 (***)	0.0144	0.457 (***)	-0.0964	0.404 (***)	0.230 (***)	0.353 (***)	1

This table reports the correlation coefficients among regression variables. $LN(L_{den})$ and $LN(L_{pen})$ are dependent variables, specifying the natural logarithm of life insurance density and of life insurance penetration respectively. $TRANS_1$ and $TRANS_2$ are dummy variables measuring market transparency. *BANK* denotes the banking sector development. *ENROLL* is the ratio of secondary school enrollment. *GNI* is the gross national income. *ID* represent the institutional development, which is a indicator calculated as the average of six governance indicators. *INF* is the inflation rate. *INT* is the interest rate. *LEXP* denotes the life expectancy. *ODEP* and *YDEP* are the old and young dependency ratio respectively. *SOCIAL* specifies the social expenditure. *URBAN* is the urbanization ratio. *WEALTH* is the gross domestic savings per capita. Statistical significance is indicated by *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Furthermore, Column (4)-(6) present the results for testing the impact of market transparency on life insurance penetration by using the same regression models as in Column (1)-(3), respectively. Differently, the result in Column (5) fails to show a significant relationship between market transparency and life insurance penetration, when analyzing the entire sample period (2003-2012). However, Column (6) still identifies a statistically significant positive impact of market transparency on life insurance penetration during the pre-crisis period (2003-2007) and a negative influence during the financial crisis period (2008-2012) (both at the 1% significance level). The explanation is that the positive (during the pre-crisis period) and negative (during the crisis) response of the market to transparency causes an ambiguous relationship (shown as the statistical insignificance) between market transparency and life insurance penetration over the entire sample period.[24] However, one can conclude that the market does react and responds differently to transparency at different periods of time.

Table 5 replaces the 3-scale market transparency proxy with the 5-scale transparency dummy variable ($TRANS_2$), and the results confirm the previous findings with higher statistical significance levels. In specific, I find significant positive correlations between market transparency and life insurance consumption over the entire sample period (see Column (1), (2), (4) and (5)). When including the interaction term ($TRANS_2 \times CRISIS$), market transparency exhibits significant positive impacts on life insurance consumption during the pre-crisis period but negative influences over the crisis period. The explanation for higher statistical significance levels is that the market transparency proxy 2 ($TRANS_2$) captures the transparency levels of the sample countries by introducing more scales, and thus generates a more continuous dummy variable compared to $TRANS_1$.

Finally, control variables such as banking sector development ($BANK$) and secondary school enrollment ratio ($ENROLL$) are found to be positively related to both life insurance density and insurance penetration. Real interest rate (INT) has a significant negative influence on life insurance consumption. Institutional development (ID), which is an indicator of governance conditions, has a weak positive relationship with life insurance density. These findings are consistent with the results of prior studies.

5.3 Fixed Effects Estimation and the Interaction with BAD Outcomes

The analysis in the previous sub-section assumes that the financial crisis hits all markets equally. In other words, the conditions of all markets deteriorate in terms of either worsened solvency situations or lowered profitability during the financial crisis period. One issue arises in the case that this assumption does not hold: when comparing the high-transparent markets group with the low-transparent one, each group may consist of both the markets with good outcomes and the markets with bad outcomes (as illustrated in Figure 4). As discussed earlier, policyholders might perceive all the markets (on the left-hand side) to be "bad" markets due to the spillover effect during the

[24] The same explanation applies to the result in Column (2) which only identifies a weak relationship between market transparency and life insurance density.

Table 4: Fixed Effects Estimation for H_1 and H_2 with the Market Transparency Proxy 1 ($TRANS_1$)

	(1) $LN(L_{den})$	(2) $LN(L_{den})$	(3) $LN(L_{den})$	(4) $LN(L_{pen})$	(5) $LN(L_{pen})$	(6) $LN(L_{pen})$
$TRANS_1$	0.0903***	0.0551*	0.130***	0.0663**	0.0441	0.110***
	(0.009)	(0.090)	(0.000)	(0.018)	(0.155)	(0.001)
$TRANS_1 \times CRISIS$			-0.184***			-0.164***
			(0.001)			(0.002)
$BANK$		0.284**	0.368***		0.305***	0.380***
		(0.026)	(0.001)		(0.005)	(0.000)
$ENROLL$		0.644***	0.630**		0.463***	0.451**
		(0.005)	(0.015)		(0.004)	(0.015)
GNI		1.1E-05	8.54E-06		-2E-06	-3.4E-06
		(0.636)	(0.667)		(0.937)	(0.840)
ID		0.577*	0.608*		0.434	0.462
		(0.068)	(0.059)		(0.126)	(0.110)
INF		-0.431	-0.613		-0.769	-0.93
		(0.692)	(0.507)		(0.390)	(0.226)
INT		-5.095***	-5.757***		-5.237***	-5.827***
		(0.001)	(0.000)		(0.000)	(0.000)
$LEXP$		-0.0232	-0.0674		-0.0002	-0.0396
		(0.721)	(0.374)		(0.998)	(0.564)
$ODEP$		1.705	2.504		2.961	3.674
		(0.727)	(0.562)		(0.501)	(0.342)
$YDEP$		-6.154	-6.439		-4.277	-4.532
		(0.287)	(0.218)		(0.395)	(0.326)
$SOCIAL$		-5.067	-4.703		-5.785	-5.46
		(0.411)	(0.395)		(0.342)	(0.324)
$URBAN$		-6.913	-6.36		-5.165	-4.673
		(0.135)	(0.112)		(0.227)	(0.214)
$WEALTH$		2.5E-06	6.90E-06		2.2E-06	6.06E-06
		(0.845)	(0.553)		(0.851)	(0.553)
Constant	5.470***	12.24*	14.93**	-4.396***	-0.773	1.621
	(0.000)	(0.063)	(0.041)	(0.000)	(0.895)	(0.803)
Obs.	302	259	259	302	259	259
R-sq.	0.42	0.592	0.637	0.332	0.496	0.548
Adj. R.sq.	0.401	0.554	0.602	0.309	0.449	0.504

This table shows the fixed effects estimation for the first (H_1) and the second hypothesis (H_2) with the market transparency proxy 1 ($TRANS_1$). Column (1) presents the result from the regression of life insurance density ($LN(L_{den})$) on market transparency ($TRANS_1$) following Eq.(1) excluding control variables. Column (2) shows the estimation of Eq.(1) with country-specific control variables. Column (3) demonstrates the result of including the interaction term ($TRANS_1 \times CRISIS$) following Eq.(2). The crisis term ($CRISIS$) drops out of Eq.(2) due to multicollinearity, when applying the year-fixed effects model. Column (4), (5) and (6) are the estimations of the relationship between market transparency and life insurance penetration ($LN(L_{pen})$), when regressing $LN(L_{pen})$ only on market transparency ($TRANS_1$), including control variables and applying the interaction term ($TRANS_1 \times CRISIS$), respectively. Statistical significance is indicated by *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

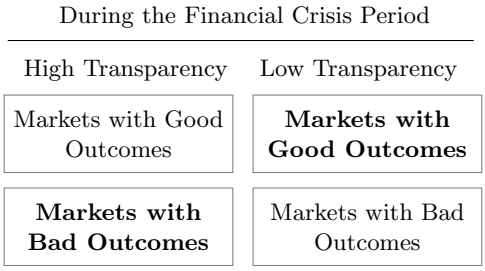
Table 5: Fixed Effects Estimation for H_1 and H_2 with the Market Transparency Proxy 2 ($TRANS_2$)

	(1) $LN(L_{den})$	(2) $LN(L_{den})$	(3) $LN(L_{den})$	(4) $LN(L_{pen})$	(5) $LN(L_{pen})$	(6) $LN(L_{pen})$
$TRANS_2$	0.0514***	0.0416**	0.0898***	0.0388***	0.0343*	0.0767***
	(0.003)	(0.033)	(0.000)	(0.006)	(0.062)	(0.000)
$TRANS_2 \times Crisis$			-0.113***			-0.0999***
			(0.0002)			(0.004)
BANK		0.295**	0.366***		0.315***	0.377***
		(0.016)	(0.000)		(0.003)	(0.000)
ENROLL		0.631***	0.595**		0.453***	0.421**
		(0.006)	(0.022)		(0.005)	(0.022)
GNI		1.06E-05	1.20E-05		-1.59E-06	-4.22E-07
		(0.633)	(0.542)		(0.934)	(0.980)
ID		0.551*	0.575*		0.411	0.432
		(0.087)	(0.080)		(0.156)	(0.144)
INF		-0.402	-0.553		-0.741	-0.874
		(0.713)	(0.547)		(0.407)	(0.254)
INT		-5.193***	-5.831***		-5.320***	-5.882***
		(0.001)	(0.000)		(0.000)	(0.000)
LEXP		-0.0208	-0.0641		0.00185	-0.0363
		(0.749)	(0.367)		(0.975)	(0.571)
ODEP		1.838	1.597		3.087	2.875
		(0.706)	(0.704)		(0.482)	(0.445)
YDEP		-6.604	-7.197		-4.657	-5.18
		(0.240)	(0.148)		(0.343)	(0.241)
SOCIAL		-5.176	-5.414		-5.867	-6.076
		(0.399)	(0.338)		(0.333)	(0.283)
URBAN		-6.927	-6.908*		-5.174	-5.157
		(0.133)	(0.289)		(0.225)	(0.177)
WEALTH		2.14E-06	4.66E-06		1.86E-06	4.09E-06
		(0.867)	(0.674)		(0.870)	(0.678)
Constant	5.525***	12.21*	15.59**	-4.358***	-0.805	2.167
	(0.000)	(0.064)	(0.029)	(0.000)	(0.891)	(0.732)
Obs.	302	259	259	302	259	259
R-sq.	0.419	0.596	0.642	0.332	0.501	0.552
Adj. R.sq.	0.399	0.559	0.607	0.309	0.454	0.508

This table shows the fixed effects estimation for the first (H_1) and the second hypothesis (H_2) with the market transparency proxy 1 ($TRANS_2$). Column (1) presents the result from the regression of life insurance density ($LN(L_{den})$) on market transparency ($TRANS_2$) following Eq.(1) excluding control variables. Column (2) shows the estimation of Eq.(1) with country-specific control variables. Column (3) demonstrates the result of including the interaction term ($TRANS_2 \times CRISIS$) following Eq.(2). The crisis term ($CRISIS$) drops out of Eq.(2) due to multicollinearity, when applying the year-fixed effects model. Column (4), (5) and (6) are the estimations of the relationship between market transparency and life insurance penetration ($LN(L_{pen})$), when regressing $LN(L_{pen})$ only on market transparency ($TRANS_2$), including control variables and applying the interaction term ($TRANS_2 \times CRISIS$), respectively. Statistical significance is indicated by *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

crisis period under greater transparency. Whereas low transparency (on the right-hand side) allows the markets with bad outcomes to pool with the "good" markets. Therefore, the previous analysis might actually compare the life insurance demand in "bad" markets to the case in "good" markets.

Figure 4: Illustration of the Issue in the Previous Comparison



To resolve this issue, I interact the transparency proxy with the indicator of bad markets, and this method allows me to compare the life insurance consumption in the markets with bad outcomes under high transparency levels to the markets that also experience bad outcomes but are less transparent. Table 6 and Table 7 present the estimation results.

The results in Table 6 demonstrate positive impacts of transparency on the market reaction to low solvency ratios. In specific, the sum of the coefficients of $TRANS_1$ and $TRANS_1 \times BAD_1$ in Column (1) indicates that the markets under high transparency levels have an approximately 1.93% higher (calculated as -0.0917+0.111) life insurance density relative to the markets with low transparency levels. Column (2) shows the testing result when using life insurance penetration as the dependent variable, which confirms the previous finding in Column (1). Both estimation results are at the 5% significance level. Furthermore, Column (3) and (4) also identify positive influences of enhanced transparency on the market reaction to low solvency ratios by switching the market transparency proxy to $TRANS_2$. Particularly, Column (4) demonstrates that the markets under greater transparency experience an approximately 2.22% higher (calculated as -0.0771+0.0993) life insurance penetration relative to the markets that are less transparent, in which the result is at the 1% significance level.

Additionally, I apply another proxy for "bad markets" based on the profitability of each market, and the estimation results are presented in Table 7. The findings in Table 7 confirm the previous results when using the low solvency margin as the proxy for "bad markets", and are more robust at the 1% statistical significance level. To sum up, when comparing the markets with low solvency ratios or low profitability to the other markets that also experience the same bad outcomes, greater transparency facilitates higher life insurance demand. This positive impact of enhanced transparency on life insurance demand results from the fact that greater transparency can reduce the market ambiguity. The advantage of reduced ambiguity outweighs the disadvantage of signaling bad outcomes.

Table 6: Fixed Effects Estimation for H_3 within the Markets with Low Solvency Ratios (BAD_1)

	(1) $LN(L_{den})$	(2) $LN(L_{pen})$	(3) $LN(L_{den})$	(4) $LN(L_{pen})$
BAD_1	-0.148	-0.178*	-0.118	-0.140
	(0.154)	(0.081)	(0.206)	(0.134)
$TRANS_1$	-0.0917**	-0.113**		
	(0.034)	(0.011)		
$TRANS_1 \times BAD_1$	0.111*	0.129**		
	(0.054)	(0.020)		
$TRANS_2$			-0.0629**	-0.0771***
			(0.025)	(0.009)
$TRANS_2 \times BAD_1$			0.0877**	0.0993***
			(0.012)	(0.004)
$BANK$	0.297***	0.307***	0.312***	0.323***
	(0.000)	(0.000)	(0.000)	(0.000)
$ENROLL$	0.239	0.0532	0.231	0.0435
	(0.693)	(0.929)	(0.694)	(0.940)
GNI	-1.41E-05	-2.50E-05*	-1.49E-05	-2.59E-05**
	(0.330)	(0.057)	(0.280)	(0.040)
ID	0.711***	0.563**	0.679***	0.535**
	(0.006)	(0.020)	(0.008)	(0.026)
INF	-0.908	-1,313	-0.901	-1,307
	(0.324)	(0.152)	(0.324)	(0.152)
INT	1.627	1.072	1.664	1.092
	(0.301)	(0.478)	(0.288)	(0.469)
$LEXP$	-0.0766	-0.0427	-0.0799	-0.0459
	(0.350)	(0.577)	(0.327)	(0.547)
$ODEP$	5.338	5.572	5.222	5.490
	(0.434)	(0.389)	(0.440)	(0.392)
$YDEP$	-6.530	-4.483	-7.005	-4.885
	(0.256)	(0.385)	(0.224)	(0.345)
$SOCIAL$	-10.18*	-10.15*	-9.912*	-9.946*
	(0.078)	(0.085)	(0.081)	(0.087)
$URBAN$	-12.07**	-12.04**	-12.05**	-11.92**
	(0.019)	(0.012)	(0.021)	(0.014)
$WEALTH$	2.87E-05	2.66E-05	2.75E-05	2.53E-05
	(0.126)	(0.119)	(0.136)	(0.131)
$Constant$	20.93**	8.372	21.29**	8.623
	(0.019)	(0.290)	(0.016)	(0.273)
Obs.	228	228	228	228
R-sq.	0.439	0.416	0.445	0.423
Adj. R-sq.	0.349	0.324	0.356	0.331

This table shows the fixed effects estimation of the extent to which transparency can affect the market reaction to low solvency ratios (BAD_1) based on H_3. Column (1) and (2) presents the results for estimating Eq.(3) with the Market Transparency Proxy 1 ($TRANS_1$), using life insurance density and life insurance penetration as the dependent variable, respectively. Whereas Column (3) and (4) are the results with the Market Transparency Proxy 2 ($TRANS_2$). All the regression include the interaction term between market transparency and low solvency ratios, denoted as either $TRANS_1 \times BAD_1$ or $TRANS_2 \times BAD_1$. Statistical significance is indicated by *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 7: Fixed Effects Estimation for H_3 within the Markets with Low Profitability (BAD_2)

	(1) $LN(L_{den})$	(2) $LN(L_{pen})$	(3) $LN(L_{den})$	(4) $LN(L_{pen})$
BAD_2	-0.247***	-0.248***	-0.204***	-0.203***
	(0.002)	(0.002)	(0.002)	(0.002)
$TRANS_1$	-0.0736*	-0.0823**		
	(0.058)	(0.045)		
$TRANS_1 \times BAD_2$	0.116***	0.119***		
	(0.007)	(0.004)		
$TRANS_2$			-0.0531*	-0.0591*
			(0.080)	(0.063)
$TRANS_2 \times BAD_2$			0.0855***	0.0871***
			(0.009)	(0.007)
BANK	0.374***	0.392***	0.386***	0.402***
	(0.000)	(0.000)	(0.000)	(0.000)
ENROLL	0.207	-0.0253	0.241	0.00480
	(0.704)	(0.962)	(0.664)	(0.993)
GNI	-2.34E-05**	-3.52E-05***	-2.23E-05**	-3.41E-05***
	(0.046)	(0.002)	(0.049)	(0.002)
ID	0.564**	0.402	0.547*	0.389
	(0.048)	(0.133)	(0.064)	(0.159)
INF	-0.666	-1,069	-0.689	-1,094
	(0.433)	(0.213)	(0.418)	(0.205)
INT	1.075	0.479	1.243	0.636
	(0.428)	(0.725)	(0.378)	(0.653)
LEXP	-0.0887	-0.0543	-0.0910	-0.0562
	(0.250)	(0.451)	(0.236)	(0.433)
ODEP	7.328	7.939	6.944	7.592
	(0.190)	(0.128)	(0.226)	(0.156)
YDEP	-6.505	-4.273	-7.585	-5.291
	(0.196)	(0.350)	(0.143)	(0.267)
SOCIAL	-7.826	-7.930	-8.027	-8.169
	(0.135)	(0.140)	(0.131)	(0.136)
URBAN	-11.49**	-11.09**	-11.96**	-11.51**
	(0.016)	(0.012)	(0.014)	(0.010)
WEALTH	2.31E-05	2.12E-05	2.09E-05	1.90E-05
	(0.113)	(0.150)	(0.141)	(0.189)
Constant	20.99**	8,057	21.79***	8,784
	(0.011)	(0.270)	(0.009)	(0.233)
Obs.	222	222	222	222
R-sq.	0.470	0.449	0.476	0.454
Adj. R-sq.	0.384	0.359	0.390	0.365

This table shows the fixed effects estimation of the extent to which transparency can affect the market reaction to low profitability (BAD_2) based on H_3. Column (1) and (2) presents the results for estimating Eq.(3) with the Market Transparency Proxy 1 ($TRANS_1$), using life insurance density and life insurance penetration as the dependent variable, respectively. Whereas Column (3) and (4) are the results with the Market Transparency Proxy 2 ($TRANS_2$). All the regression include the interaction term between market transparency and low profitability, denoted as either $TRANS_1 \times BAD_2$ or $TRANS_2 \times BAD_2$. Statistical significance is indicated by *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

6 Conclusion and Policy Implications

This article examines empirically the hypothesis that market transparency can have an effect on life insurance consumption. The basic idea is that greater market transparency can resolve asymmetric information, and consequently facilitates higher life insurance demand due to the reduced adverse selection issue. However, this positive relationship between market transparency and life insurance demand might vary at different periods of time. Particularly, the risks of life insurers might increase during the financial crisis period, and risk-averse policyholders might adjust their purchasing decision or willingness-to-pay accordingly based on the presence of market discipline. Consequently, greater market transparency might have a negative impact on the external financing of life insurers, particularly during the crisis period. Therefore, while enhanced market transparency might provide consumers with better information for their decision-marking, it is unclear whether greater transparency is beneficial for life insurers at different periods of time.

I explore the life insurance consumption in 31 European countries from 2003 to 2012 to investigate the relationship between market transparency and life insurance demand, measured by life insurance density and life insurance penetration. The main results indicate that market transparency can significantly affect life insurance consumption, and the effects change at different periods of time, i.e. there are positive effects in the absence of the crisis (2003-2007) and negative effects during the crisis period (2008-2012). The mixed findings imply a trade-off between the reduction in adverse selection under greater market transparency and the possible negative effect on life insurance demand during the financial crisis period. Nevertheless, when comparing the markets with low solvency margin or low profitability to the other markets that also experience these bad outcomes, enhanced transparency is advantageous in generating higher life insurance demand due to the reduced ambiguity of the market.

The findings of this article are important to both regulators and life insurance companies in Europe. The third pillar of the envisaged Solvency II regulation aims to improve market transparency through enhancing risk disclosure requirements in the insurance industry in Europe. According to the results of this article, the timing of implementing Solvency II needs to be considered carefully by regulators. Regulators might face a choice of fostering an efficient market with less ambiguity and stronger market discipline, but meanwhile generating possible adverse effects on the market due to too much transparency. Against the background of the ongoing Eurozone crisis, the implementation of Solvency II might cause procyclical effects on life insurers that are already in trouble, and might further lead to spillover effects on other sound life insurers. Therefore, it is crucial for life insurers to understand the possible impact of the changing mandatory reporting requirements on life insurance demand, and to adjust their ALM and risk strategies accordingly.

References

[1] Baranoff, E. G. and Sager, T. W. (2007). Market discipline in life insurance: Insureds reaction to rating downgrades in the context of enterprise risks. *Available at SSRN 971200*.

[2] Beck, T. and Webb, I. (2003). Economic, demographic, and institutional determinants of life insurance consumption across countries. *The World Bank Economic Review*, 17(1):51–88.

[3] Botosan, C. A. and Plumlee, M. A. (2002). A re-examination of disclosure level and the expected cost of equity capital. *Journal of Accounting Research*, 40(1):21–40.

[4] Browne, M. J. and Kim, K. (1993). An international analysis of life insurance demand. *Journal of Risk and Insurance*, 60(4):616–634.

[5] Bushee, B. J. and Leuz, C. (2005). Economic consequences of sec disclosure regulation: Evidence from the otc bulletin board. *Journal of Accounting and Economics*, 39(2):233–264.

[6] Campbell, R. A. (1980). The demand for life insurance: An application of the economics of uncertainty. *The Journal of Finance*, 35(5):1155–1172.

[7] Cordella, T. and Yeyati, E. L. (1998). Public disclosure and bank failures. *Staff Papers-International Monetary Fund*, 45(1):110–131.

[8] Easley, D. and O'hara, M. (2004). Information and the cost of capital. *The Journal of Finance*, 59(4):1553–1583.

[9] Eling, M. (2012). What do we know about market discipline in insurance? *Risk Management and Insurance Review*, 15(2):185–223.

[10] Eling, M. and Schmit, J. T. (2008). Is there market discipline in the European insurance industry? An analysis of the German insurance market. Working Papers on Risk Management and Insurance No. 60.

[11] Enz, R. (2000). The S-curve relation between per-capita income and insurance penetration. *Geneva Papers on Risk and Insurance. Issues and Practice*, 25(3):396–406.

[12] Epstein, L. G. and Schneider, M. (2008). Ambiguity, information quality, and asset pricing. *The Journal of Finance*, 63(1):197–228.

[13] Furman, J., Stiglitz, J. E., Bosworth, B. P., and Radelet, S. (1998). Economic crises: Evidence and insights from East Asia. *Brookings Papers on Economic Activity*, 1998(2):1–135.

[14] Greenstone, M., Oyer, P., and Vissing-Jorgensen, A. (2006). Mandated disclosure, stock returns, and the 1964 securities acts amendments. *The Quarterly Journal of Economics*, 121(2):399–460.

[15] Grossman, S. J. and Stiglitz, J. E. (1980). On the impossibility of informationally efficient markets. *The American Economic Review*, 70(3):393–408.

[16] Hammond, J., Houston, D. B., and Melander, E. R. (1967). Determinants of household life insurance premium expenditures: An empirical investigation. *Journal of Risk and Insurance*, 34(3):397–408.

[17] Hansen, L. P. and Sargent, T. J. (2006). Fragile beliefs and the price of model uncertainty. *University of Chicago and New York University*.

[18] Healy, P. M., Hutton, A. P., and Palepu, K. G. (1999). Stock performance and intermediation changes surrounding sustained increases in disclosure. *Contemporary Accounting Research*, 16(3):485–520.

[19] Horton, J. and Serafeim, G. (2010). Market reaction to and valuation of IFRS reconciliation adjustments: First evidence from the UK. *Review of Accounting Studies*, 15(4):725–751.

[20] Hussels, S., Ward, D., and Zurbruegg, R. (2005). Stimulating the demand for insurance. *Risk Management and Insurance Review*, 8(2):257–278.

[21] Kjosevski, J. (2012). The determinants of life insurance demand in central and southeastern europe. *International Journal of Economics and Finance*, 4(3).

[22] Leuz, C. and Verrecchia, R. E. (2000). The economic consequences of increased disclosure. *Journal of Accounting Research*, 38:91–136.

[23] Leuz, C. and Wysocki, P. (2008). Economic consequences of financial reporting and disclosure regulation: A review and suggestions for future research. *Available at SSRN 1105398*.

[24] Ng, J. (2011). The effect of information quality on liquidity risk. *Journal of Accounting and Economics*, 52(2):126–143.

[25] Nier, E. and Baumann, U. (2006). Market discipline, disclosure and moral hazard in banking. *Journal of Financial Intermediation*, 15(3):332–361.

[26] Outreville, J. F. (1996). Life insurance markets in developing countries. *Journal of Risk and Insurance*, 63(2):263–278.

[27] Plosser, C. I. (2014). Simplicity, transparency, and market discipline in regulatory reform. Technical report. Remarks at the conference on "Enhancing Prudential Standards in Financial Regulations".

[28] Sengupta, P. (1998). Corporate disclosure quality and the cost of debt. *Accounting Review*, 73(4):459–474.

[29] Spence, M. (1973). Job market signaling. *The Quarterly Journal of Economics*, 87(3):355–374.

[30] Verrecchia, R. E. (2001). Essays on disclosure. *Journal of Accounting and Economics*, 32(1):97–180.

[31] Welker, M. (1995). Disclosure policy, information asymmetry, and liquidity in equity markets. *Contemporary Accounting Research*, 11(2):801–827.

[32] Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data*. MIT press.

[33] Zanjani, G. (2002). Market discipline and government guarantees in life insurance. Working Paper, Federal Reserve Bank of New York.

[34] Zimmer, A., Schade, C., and Gründl, H. (2009). Is default risk acceptable when purchasing insurance? Experimental evidence for different probability representations, reasons for default, and framings. *Journal of Economic Psychology*, 30(1):11–23.