Ice your dice: risk aversion and insurance demand during adverse economic events

Abstract

Previous strand of literature has used self-reported or proxy measure of risk aversion to explain the nexus between risk aversion and non-life insurance demand. Furthermore, it showed that risk aversion alone cannot sufficiently determine insurance demand. Therefore, we can imply that insurance buying behavior cannot be adequately explained by economic utility theories. Considering this, we used actual risk-taking behavior demonstrated by real financial market participants as a measure of risk aversion and examine the link between risk aversion and demand for non-life insurance in three (03) contextual settings: 1) when economy is functioning normally; 2) when economy is impaired and 3) when negative market condition is witnessed. We used initial dataset of thirty-three (33) OECD countries over the period from 2007 to 2016 and employ bias-corrected bootstrapping technique to create a big dataset with 11,731 observations. We argue that big dataset derived from bias-corrected bootstrapping technique will generate unbiased and efficient regression estimates. We found that when economy is functioning normally, risk averse individuals/corporations will seek non-life insurance to cushion themselves from transactions and bankruptcy costs. Our results also showed that in the event of economic impairment, individuals' confidence in the financial system will decline making them seek private arrangements. Our results are robust to different estimation methods and control for the potential endogeneities.

Keywords Behavioral insurance, insurance demand, risk aversion, OECD, economic scenario, financial market, sovereign outlook.

JEL classification D14, D81, G22

1. INTRODUCTION

Literature on insurance economics is unanimous on the view that peoples' risk attitudes change during their life span and a simple model consisting of risk aversion only will miss several factors that could explain insurance buying behavior (see Sinaiko and Hirth, 2011). Individuals buy insurance products to protect against adverse events in uncertain situations. Empirical literature has shown that insurance purchases are determined by people's willingness to take risks, price, and insurers' ability to keep up their promise. However, most of these studies have adopted self-reported or proxy measures of risk aversion to explain insurance demand. In this study, we use actual risk-taking behavior demonstrated by financial market participants as a measure of risk aversion to explain the nexus between risk aversion and non-life insurance demand.

In economic literature, the individual risk-taking behavior has been framed as a value maximization decision during uncertain situations (von Neumann and Morgensten, 2007). Conversely, studies also found that individuals are not perfectly rational and they under different situations can also make biased choices. For instance, individual decision making can also be affected by the way a problem is presented (Tversky and Kahneman, 1981) and insurance purchases do not necessarily adhere to rational economic behavior (Friedman, 1957; Tennyson, 2010). Contextually, to ascertain if insurance purchases are determined by stable risk attitudes, we further investigate the relationship during three (03) contextual settings: 1) when economy is functioning normally; 2) when economy is impaired and 3) when negative market condition is witnessed.

Preceding literature has followed the practice of using structural models to measure the individual risk attitudes and insurance demand (see Jaspersen et. al, 2021 for details). However, they are subject to few limitations: 1) notwithstanding the theoretical implications of these model are correct, they tend to empirically underestimate insurance demand; 2) they are more susceptible to price changes; and 3) use of structural model to predict the risk aversion measures willingness to take risk not actual risk-taking behavior. Conversely, empirical studies using insurance choices derived from experimental studies showed promising results. For instance, Jaspersen et. al, (2021) fitted insurance data on structural insurance-risk attitude model and found robust results with different economic fundamentals. Furthermore, most of these studies used lottery choices to measure risk attitudes after incorporating classic risk aversion only.

We use State Street® Investor Confidence Index (Froot and O'Connell, 2003) (hereafter, ICIR)[1] and Credit Suisse® global risk appetite index[2] (hereafter, CSGRAI) to measure the risk aversion. We use investor risk appetite as a proxy measure of risk aversion for the following reasons: 1) individual risk-taking behavior does not necessarily involve classic risk aversion but individual risk perceptions as well. Our risk aversion measure takes a macroeconomic approach, first it measures the risk-taking behavior of sophisticated investors by capturing the proportion of investments made in risky assets (i-e equity and fixed income securities). Second, it also simultaneously measures the market risk perceptions by capturing the share of risky investments made in an economy; 2) Property-casualty insurance constitutes bigger share of non-life insurance product lines and firms are the major client of PC insurance. Similarly, our risk aversion measure considers the demand for risky assets by institutional investors thereby it can serve as a proxy for risk-taking behavior of firms[3]; 3) the data on individual risk-taking behavior is rarely available.

Our proxy measure will serve as a representative of risk-taking behavior demonstrated in the concerned region. We use ICIR and CSGRAI as a proxy measure for risk aversion in an economy. Differences may exist in individual and institutional risk-taking behavior, nevertheless theoretically they are ordinally consistent based on two rationales: i) corporate risk-taking behavior represents managerial risk aversion which closely corresponds to individual risk aversion, notwithstanding it is more sophisticated and rational than layman's understanding of risk. (e.g. Krummaker, 2017); ii) empirical implications of our risk aversion measure are consistent with classical economic theories of risk aversion.[4]

[1] "An index that calculates the investor's confidence or risk appetite by analyzing the actual levels of risk taken by institutional investors of 45 economies around the world. If the investors around the world are getting attracted to equities (riskier asset) then their risk appetite is rising causing an upward shift in the State Street Investor confidence index or vice versa. We will use regional State Street investor confidence index (hereafter as ICIR) as proxy for investor sentiment in Australia, Canada, USA and UK. For instance, ICIR EU as proxy for UK, ICIR North America as proxy for Canada and USA, and ICIR Asia-Pacific for Australia." (Ahmed et. al, 2021, p. 23)

[2] "Credit Suisse global risk appetite index (hereafter as CSGRAI) compares risk adjusted return across the wide spectrum of securities offered worldwide. During higher investor sentiment period the returns on risky investment are higher, the CSGRAI will be positive and report 'Euphoria'. On the contrary, when investor sentiment is low, the returns on risk-free (or less risky) assets will be high, then CSGRAI will be negative and report 'panic'." (Ahmed et. al, 2021, p. 23)

[3] According to Swiss Re Sigma (2021) personal and commercial lines constitutes 52% share of the global non-life insurance premiums whereas, firms being the major client of personal lines as well.

[4] ICIR and CSGRAI implies that there will be a rise in investor risk appetite if rate of return and proportion of investments in risky assets are rising respectively. Empirically, higher risk appetite is associated with decline in risk aversion.

Accordingly, in this paper, we refer to sovereign debt impairment as an economic impairment period because decline in a country's sovereign rating will bring negative repercussions to the whole economic activity. We use decline in S&P's, Moody's and Fitch's sovereign ratings as a measure of sovereign debt impairment. Literature has shown that in the event of sovereign downgrades people will form lower or negative expectations and will refrain from making risky investments. Similarly, this will hinder firms' growth opportunities by raising the cost of capital and limiting investments (Mclean et. al, 2014) thereby making the whole economic activity stagnant.

Motives behind non-life insurance purchase depend on beneficiary characteristics. Individual demand for insurance can be adequately explained by the theory of risk aversion. On the other hand, the majority of property-casualty / non-life insurance policy holders are corporate clients (OECD, 2012) and their demand for insurance cannot be sufficiently explained by a single theory (see section 2 for details). However, the literature unanimously agreed that hedging against transaction and bankruptcy costs is a common motive behind individual and corporate non-life insurance demand.

Literature has shown that individual risk attitudes are highly correlated with insurance choices (Jaspersen et. al, 2021). To probe if non-life insurance demand is influenced by a set of stable risk attitudes, we further investigate the relationship between non-life insurance demand and risk aversion during negative economic and financial market conditions. We argue that current economic and financial market conditions will play a catalyst role in the non-life insurance demand and risk aversion relationship.

Negative economic or financial market condition will pose an unambiguous situation. During economic impairment period people's risk appetite might get low causing them to react in two possible ways: i) demand more non-life insurance to safeguard against transaction and bankruptcy costs. Literature has shown that consumer psychological characteristics such as emotional arousal to losses, fear of unknown and impulsivity play a vital role in insurance buying decisions, (Brighetti, 2014). In the event of economic impairment, it is more likely that people will buy more insurance in anticipation of fear of losses; ii) their confidence in the financial system might get compromised, thus the demand for non-life insurance products will decline. Previous studies found that individual behavioral traits (e.g. sentiment) has positive relationship with

financial product valuation (Huang et al., 2015). Economic impairment scenario might depict an uncertain and ambiguous situation, making people unable to predict the probability of future outcomes. Hence, they will resist buying non-life insurance products and make private arrangements. We argue that negative economic situation or impairment period of a country is a critical factor in triggering the consumer's demand for non-life insurance policies (Brighetti et. al., 2014). Such an economic impairment scenario is prone to negative sentiment and leads to a decline in confidence in the economy (Mclean et. al., 2014).[5]

We found that during normal economic environment, risk averse people will buy non-life insurance to protect themselves from transaction and bankruptcy costs and their demand for non-life insurance products is not much influenced by negative market condition (i-e interaction of decline in sovereign rating and risk appetite). However, during economic impairment period people will demand less non-life insurance instead focus on making private arrangements.

Despite extensive research has been conducted probing the impact of risk aversion on insurance policies evaluation (e.g. Brighetti, 2014), other financial products valuations (Huang et. al., 2015) and non-life insurance demand, (e.g. Dragos, 2014; Outreville, 2015). Discernibly, these studies are subject to certain limitations a) most of the studies infer risk aversion behavior through self-reported measures derived through risk surveys or lottery choices generated through lab/field experiments (e.g. Jaspersen, 2021). However, these methodologies are subject to a few limitations. For instance, self-reported risk aversion measures are derived in controlled environments and reflect perceived risk-taking behavior which could be quite deviating from actual risk behavior demonstrated in real financial markets. On the other hand, few studies opt for proxy measures of risk aversion such as tertiary education attainment (e.g. Outreville et. al, 2015). Similarly, consensus does not exist in the emerging literature regarding theoretical implications of the proxy measures adopted. For instance, some researchers present the view that education generates risk awareness in individuals thereby making them more risk averse. However, other stream of researchers disagrees with this perspective citing the reason that individuals opting for tertiary education have already forgone their current income therefore they are risk-takers (Outreville, 2015); b) Previous studies (e.g. Beenstock et al. 1988; Browne et al. 2000; Dragos 2014) previous

[5] For detailed discussion on influence of risk, ambiguity and utility in forming individual beliefs see Ghirardato and Marinacci, (2001).

strand of literature has relied on the notion that stable risk attitudes are the drivers of insurance demand. However, we argue that nexus between risk aversion and non-life insurance demand can be masked by market specific factors such as financial market condition.

Consequently, our study aims to extend the economic literature using the following ways: 1) we contribute to the insurance economics literature by introducing a robust measure of risk aversion (i-e risk appetite). We contend that risk aversion measures employed in this study captures the actual risk-taking behavior demonstrated by financial market participants in the real market; 2) our analysis of non-life insurance demand during economic impairment period will generate new insights into expected utility theory by providing contextual setting on how risk aversion during negative economic situation can influence insurance demand. Previous strand of literature found mixed relationship between risk aversion and insurance demand (e.g. Gottlieb and Mitchell, 2020), our finding will encourage future research to seek alternate theories (e.g. prospect theory) to explain this asymmetric relationship.

1.1. Contextual Background

Generally, individuals show three (03) types of risk behavior namely risk aversion, risk neutral and risk loving. Arrow (1965) & Pratt (1964) proposed the coefficient of risk aversion to measure risk attitude. However, the theoretical insights on non-life insurance demand initiated from the theory of risk aversion (Arrow 1965 & 1971; Mossin 1968; Pratt 1964) which proposed two types of risk aversion behavior namely: (i) increasing relative risk aversion (IRRA), and (ii) decreasing relative risk aversion (DRRA). If the proportion of investments made in risky assets decreases with increase in wealth, then individuals demonstrate IRRA and vice-versa. In the context of insurance demand, Arrow (1965 & 1971) found that demand for insurance increases if the risk aversion behavior is characterized by increasing relative risk aversion (IRRA). Contrarily, Mossin (1968) argued that the opposite might also be true. His argument is based on the intuition that supposedly if utility function for wealth involves decreasing absolute risk aversion (DARA), then greater entitlement to wealth will diminish both risk aversion and demand for insurance.

After 2007-2009 financial crisis and Euro zone debt crisis, economic impairment has gained considerable importance over time. Extensive research has focused on the effects of sovereign debt impairment on the financial market and the real economy. Nevertheless, research has produced conflicting results. In the recent literature, sovereign rating downgrades are used as

a proxy measure for economic impairment. Previous research has shown that sovereign downgrades lead to adverse effects in the aggregate stock and bond market, but no effect was witnessed in the event of upgrades (Brooks et al., 2004; Klimavičienė, 2011; Subaşı, 2008). On the other hand, some researchers argue that adverse effects in the aggregate stock and bond market are caused by firm level fundamentals not sovereign downgrades (e.g. Durbin and Ng, 1999). Furthermore, past research reported that sovereign risk has contagion effects (Ludwig, 2014) causing structural breaks (Basse, 2014) and spillover effects (Ludwig, 2014).

Studies focusing on the firm level consequences of sovereign debt impairment highlighted 'sovereign ceiling rule' phenomenon, which implies that firms having their credit rating greater than or equal to sovereign rating are more likely to be downgraded following sovereign downgrade (Almeida et. al, 2017; Ferri et. al, 2001). Scholars argue that sovereign debt impairment creates financial constraint for firms by limiting their capital generation (Almeida et. al., 2017; Carvalho, Ferreira, and Matos, 2015; Chava and Purnanandam, 2011; Chodorow-Reich, 2014), thereby affecting their decisions whether to finance from equity or debt (Kisgen, 2006) and cost of financing (Kisgen and Strahan, 2010; Baghai, et. al 2014), as well as their real decisions (Sufi, 2009; Chernenko and Sunderam, 2012; Harford and Uysal, 2014).

Scholars interested in finding out the consequences of economic and market conditions on the investor behavior argue that the central purpose for the asset pricing discipline is to investigate how expected returns are linked with risk and misvaluations (Campbell, 2000 and Cochrane, 2000). Previous strand of literature has shown that uncertainty and poor fundamental information in the market leaves space for psychological biases, making people form mistaken beliefs (Daniel et al., 1998, 2001; Hirshleifer, 2001). Scholars posit that information uncertainty makes investors form relatively higher expectations in the event of good news and relatively lower or negative expectations following bad news (Zhang, 2006). Similarly, in case of lower or negative expectations they will demonstrate 'flight to quality' behavior by selling riskier investments in anticipation of safer ones (Naes, Skjeltorp, and Odegaard, 2011).

The remainder of the article is structured as follows. Section 2 "literature review", presents the brief literature on our research topic; section 3 "variable description and hypothesis development", discusses variables used, their measurement and proposed relationship with insurance demand. Section 4 "data and Methodology" provides description regarding our sample and analysis strategy. In addition, the regression estimates are given in the section 5 "Empirical

Results and discussion". Finally, section 6 "Conclusion", summarizes finding, presents study limitations and future research directions.

2 Literature review

The non-life insurance business is segmented into two broad categories: 1) commercial lines, and 2) personal lines. The previous strand of literature presented different theoretical and empirical factors to explain the demand for each product line. First, we will discuss studies investigating the theoretical and empirical factors influencing commercial insurance demand.

The perfect market theory asserts that buying insurance contracts does not contribute towards the goal of the firm (e.g., Fama & Jensen, 1983; Jensen & Meckling, 1976; Mayers & Smith, 1982) because the owners have immense diversifying opportunities hence, they can avoid unsystematic and insurable risks (Fama & Jensen, 1983; Mayers & Smith, 1982). However, after considering several externalities such as imperfect markets, risk aversion of stakeholders, transaction, and bankruptcy costs etc. empirical studies argue that existence of risks incur costs to organizations. Furthermore, the proponents of usage of insurance as a hedging product argue that insurers have comparative advantage in assuming prevalent risks and transferring the risks to them will lead to efficient risk allocation (e.g. Eeckhoudt, Schlesinger & Gollier, 2005). On the other hand, commercial insurance purchases might also be motivated by additional services provided by them. For instance, risk estimation, insurance claims and loss avoidance etc. (Doherty & Smith, 1993; Mayers & Smith, 1982). Previous strand of literature showed that hedging, or insurance contracts lower the turbulence in the revenue, thereby reducing the likelihood of bankruptcy. Therefore, purchase of commercial insurance may also be associated with transaction cost of bankruptcy (e.g. Mayers and Smith, 1982; Smith and Stulz, 1985; and Froot, Scharfstein, and Stein, 1993). Moreover, Mayers & Smith (1982) and MacMinn (1987) argued that corporate tax benefits may also induce commercial insurance demand.

Studies focusing on theoretical explanations to commercial insurance demand found that corporate insurance purchases could also be triggered by information asymmetries. The segregation of ownership and control generates different diversification alternatives for managers and owners. This situation is normally termed by literature as *'risk differential'* between principal and agents (Beatty & Zajac, 1994). The conflict of interest between owners and managers, as well as risk differential creates business issues typically referred to as underinvestment and asset

substitution. This can be efficiently dealt with by commercial insurance (Froot et al., 1993; MacMinn, 1987; Mayers & Smith, 1982, 1987; Myers, 1977). Furthermore, several studies found that size of the company and ownership structure also influences commercial insurance demand (Froot et al., 1993; MacMinn, 1987). The studies focusing on link between insurance purchases and size of the firm argue that larger firms demand less insurance as compared to smaller ones. However, the reasons behind this phenomenon are difficult to analyze because corporations report minimal data on insurance purchases and risk management. In addition, the findings regarding the size effect and insurance purchases may be influenced by ownership structure because the data available on insurance purchases is often provided by larger publicly held firms. Hence, smaller or firms with different ownership structure are often excluded from the sample. On the other hand, managerial risk aversion also plays a significant role in corporate insurance purchases. However, no studies have focused on managerial risk aversion as a possible determinant of corporate insurance demand (Hoppe, Gatzert & Gruner, 2017).

Empirical studies on the factors influencing personal lines insurance demand are based on two approaches. A microeconomic approach using the microdata variables or household surveys to assess heuristically conceptual models presented by life cycle and permanent income theories. The other one, macroeconomic approach, consider the aggregate macro variables maybe from one country, cross-section or panel and checks the influence of a set of variables. Because our study is based on macroeconomic aggregate data, we will cover our studies based on the second approach.

Beenstock et al. (1988) analyzed a cross-section of 45 countries, they observed a strong and positive correlation between property-liability insurance revenue and income, however, other determinants were excluded. Furthermore, they also analyzed 12 developed countries, and found that income and real interest rates positively influenced property-liability insurance, they argued that opposite relationship might be due to a greater supply of underwriting capital motivated by expected higher returns. Moreover, Outreville (1996) analyzed a sample of 55 developing countries and found a positive link with income and financial development. He argued that lower insurance development was caused by higher inflation, although the relationship was not significant. Contrarily, he found literacy was negative and minutely significant. In addition, Grace and Skipper (1991) included analyzed the sample of developed countries and found that non-life insurance demand was positively influenced by income and literacy. They observed that Muslim economies had marginal values and the share of government spending as a percentage of GDP was

linked with higher insurance density. They also estimated the monopoly and other institutional factors and witnessed the expected relationship. They also estimated income elasticities for developed and developing countries and found that the developed countries had higher elasticities. Focarelli et al. (2004) probed the likelihood of purchasing health and property and casualty insurance products separately. They observed that income, wealth, education and dwelling in the north or center positively influenced both insurance classes. Moreover, they also observed that male, self-employed, and homeowners have a higher likelihood of buying property-liability-casualty insurance while managers have both. Dragos (2014) collated various variables to analyze the life and non-life insurance demand in emerging economies from Europe to Asia. The study found that non-life insurance demand was significantly affected by urbanization in Asia but not Europe. In addition, literacy only affected non-life insurance demand significantly. Preceding literature investigating the antecedents of non-life insurance demand has focused on different macroeconomic variables (such as education, income, inflation etc.) (e.g. Beenstock et al. 1988; Browne et al. 2000; Dragos 2014) and policy holders' behavioral traits (e.g. Brighetti, 2014, Huang et. al, 2015).

Previous stand of literature also investigated the influence of risk aversion on insurance consumption, the studies hypothesized relative risk aversion (RRA) to be positively related with insurance consumption[6]. On the other hand, Guiso and Jappelli (1998) asserted that their findings corroborate decreasing absolute risk aversion (DARA) hypothesis. However, gathering country level data on RRA is an onerous task (Outreville, 2015). The only exclusion to the RAA measure across countries is the paper by Szpiro (1986), which drives the data from the aggregate insurance demand to elaborate the factors that may cause changes in RRA across countries (Szpiro and Outreville, 1988). To alleviate the burden, researchers opted to use proxies for the measures of risk aversion. Similarly, education has been used as a proxy measure to risk aversion (Beck and Webb, 2003, Browne and Kim, 1993; Ward and Zurbruegg, 2002; Zerria and Noubbigh, 2016). However, the effect of education on insurance demand remains controversial. Some studies found that education promotes insurance demand (Arena, 2008; Curak *et al.*, 2009 & 2013; Han *et al.*, 2010;

[6] After the seminal papers by Arrow and Pratt on theory of risk aversion. Researchers tried to drive theory of insurance demand by examining insurance purchases (Smith, 1968; Mossin, 1968) and the effect of risk aversion on optimized insurance purchase (Doherty and Schlesinger, 1983; Schlesinger, 1981); whereas, some combined expected utility theory and indifference curve analysis (Ehrlich and Becker, 1972).

Hwang and Gao, 2003; Hwang and Greenford, 2005; Li *et al.*, 2007; Lee and Chiu, 2012; Truett and Truett, 1990; Ward and Zurbruegg, 2002; Zerria and Noubbigh, 2016). While some researchers found that education discourages or does not influence insurance buying at all (Beck and Webb, 2003; Feyen *et al.*, 2013; Millo and Carmeci, 2012; Outreville, 1996, Outreville, 2015).

Researchers favoring the usage of education as a proxy of risk aversion contend that attainment of higher education increases risk aversion and familiarity with insurance benefits (Browne *et al.*, 2000; Hwang and Gao, 2003). However, some present a contradicting argument that education is a risky investment on its own and less risk averse individuals sacrifice their current consumption to acquire education (Shaw, 1996; Outreville, 2015). Similarly, educated people have higher capacity to manage risks, they can diversify their portfolios better (Millo and Carmeci, 2012). Another proxy to measure risk aversion is the uncertainty avoidance index (UAI). Hofstede, (1995) developed UAI by using employee attitudes towards the extent to which company rules are strictly followed, the expected duration of employment with current employers, and the level of workplace stress. However, the UAI's relationship with insurance demand was found to be statistically insignificant (Park *et al.*, 2002; Esho *et al.*, 2004).

3 Variable description and hypothesis

We use aggregate measure for non-life insurance demand for following reasons: 1) aggregate demand for insurance is the collection of insurance demand in different product lines in the non-life insurance segment. Our aggregate measure for non-life insurance demand captures the effect of all product lines on non-life insurance demand; 2) significant share of non-life insurance products are bought by corporate clients, which represents collection of individual life insurance demands;[7] 3) to best of our knowledge, data measuring the individual level non-life insurance demand is not publicly available.

Our study will comprise of two different panel data regression models. The premise behind is that we measure insurance demand using two alternate measures of insurance demand i-e insurance density and penetration. In addition, the variables description, symbols, and data collection sources are outlined in table 1.

[INSERT TABLE 1 HERE]

[7] Generally, people are offered with different non-life insurance options by their employers. They are required to select the best alternative matching their risk appetites.

3.1 Insurance Density

Insurance density determines average spending by individuals on non-life insurance in a particular economy. We estimate insurance density using summation of direct non-life insurance business underwritten divided by the number of residents in a country (e.g. Ward and Zurbruegg, 2002; Li et al, 2007).

3.2 Insurance Penetration

It indicates the insurance activity in an economy. We estimate insurance penetration by dividing the total of non-life direct premiums written in a country by the GDP of each economy. Insurance Penetration in previous studies has been adopted by Ward and Zurbruegg (2002); Li et al (2007); and Sen and Madheswaran (2013).

3.3 Risk Aversion

Risk averse individuals seek insurance to hedge against transaction and bankruptcy costs in the event of adverse financial events. Previous empirical strand of literature has found positive relationship between risk aversion and insurance demand (see Outreville, 2015). To approximate risk aversion, we adopt variation in the *"State Street Investor confidence index regional (ICIR)"*[8] and *"Credit Suisse global risk appetite index (CSGRAI)"*[9] as an alternate for risk aversion level in a country. Similarly, we hypothesize that risk appetite as an alternate measure of risk aversion is negatively linked with insurance consumption.

We are also interested in investigating whether non-life insurance purchases are determined by stable set of risk attitudes. Barseghyan et al. (2013) and Collier et al. (2020) models considering probability distortions by people for decisions under ambiguous situation can better fit insurance purchasing patterns. Furthermore, Brighetti (2014) found the impact of behavioral traits on

[8] "An index that calculates the investor's confidence or risk appetite by analyzing the actual levels of risk taken by institutional investors of 45 economies around the world. If the investors around the world are getting attracted to equities (riskier asset) then their risk appetite is rising causing an upward shift in the State Street Investor confidence index or vice versa. We will use regional State Street investor confidence index (hereafter as ICIR) as proxy for investor sentiment in Australia, Canada, USA and UK. For instance, ICIR EU as proxy for UK, ICIR North America as a proxy for Canada and USA, and ICIR Asia-Pacific for Australia." (Ahmed et. al, 2021, p. 23)

[9] "Credit Suisse global risk appetite index (hereafter as CSGRAI) compares risk adjusted return across the wide spectrum of securities offered worldwide. During higher investor sentiment period the returns on risky investment are higher, the CSGRAI will be positive and report 'Euphoria'. On the contrary, when investor sentiment is low, the returns on risk-free (or less risky) assets will be high, then CSGRAI will be negative and report 'panic'." (Ahmed et. al, 2021, p. 23)

different insurance policies. He found that: (i) life and casualty policies were influenced by emotional arousal to losses, (ii) indemnity policies were triggered by fear of the unknown, whereas (iii) health insurance was affected by impulsivity. Moreover, Huang et al. (2015) found a positive relationship between sentiment and financial products valuation. We contend that in the event of economic impairment, people's risk appetite will get low, and they will be more risk averse. Thus, they will seek insurance to protect against transaction and bankruptcy costs. Similarly, to ascertain whether insurance purchases are influenced by the set of stable risk attitudes, we hypothesize that risk appetite as an alternate measure of risk aversion is negatively linked with insurance consumption during economic impairment period.

3.4 Economic Impairment

Sovereign rating downgrades are generally associated with negative effects on domestic stock and bond markets (Brooks et al., 2004; Martell, 2005; Pukthuanthong-Le et al., 2007; Subasi, 2008; Klimavicienė, 2011; Michaelides et al., 2012; Lee et al., 2013; Mateev, 2014). Insurance products are intended for savings, so sovereign downgrades are likely to make alternative saving opportunities less attractive. To measure economic impairment, we will use Standard & Poor's and Moody's sovereign rating downgrades as an indicator for economic impairment. We take average S&P and Moody sovereign rating dummy which assumes the value of 1 for decline in sovereign rating and 0 otherwise. Here, sovereign downgrades work like a treatment given to check the influence of risk appetite on life insurance demand when the poor economic condition is witnessed.

3.5 Income

We followed Li et al. (2007) and divide GDP of country calculated in international dollars by the total population to estimate the income per capita in an economy. Past studies by Truett and Truett (1990); Beenstock et al. (1986); Browne and Kim (1993); Outreville (1996) Beck and Webb (2003); found income level positively influenced insurance consumption. The justification for a positive relationship is backed by two premises. First, higher income levels will increase buying power. Second, economies with higher income levels are characterized by greater consumption. Hence, people will buy insurance products to protect the consumption. We anticipate a positive link between the level of income and insurance demand in OECD economies.

3.6 Inflation

To estimate inflation, we adopt annual GDP deflator represented in percentage (e.g. Kjosevski, 2012). Babel (1981) argued that inflation undermines the worth of insurance products by reducing their desirability. Because insurance offerings are termed as saving products rendering monetary fruits in the long run, higher inflation rate encourages monetary uncertainty while discouraging the people's savings incentives. Hence, higher inflation reduces demand for insurance products (Browne and Kim, 2003; Outreville, 1996; Ward and Zurbruegg, 2002; Beck and Webb, 2003; Li et al., 2007; and Kjosevski, 2012). We anticipate inflation negatively influences the demand for insurance products.

3.7 Interest rate

The influence of interest rate on insurance demand is mixed. Interest rate might include the rate of return on insurer's investments and greater interest rate may preclude higher returns on insurer's investment hence, higher profitability. This incentive may attract more buyers in expectation of greater profits. In contrast, Lenten and Rulli (2006) presented a contradictory argument that higher interest rates will deviate people from insurance offering due to attractive returns offered by alternative saving products. To measure real interest rate, we use the difference between lending/discount rate and inflation (see section 3.6) (Beck and Webb, 2003). Similarly, we predict the real interest rate is negatively associated with insurance demand in OECD economies.

3.8 Financial development

Beck and Webb (2003) reported that sound banking channels raises the consumer's confidence in other financial intermediaries, for instance, insurance firms. It also creates efficient payment systems. The efficient financial system also encourages insurance companies to invest vigorously. Thus, the price of insurance products is reduced. Li et. al (2007) argued that financial development enhances the cashflow securitization and increases people's ability for financial assets ownership with the objective of safer future income. So, the economies characterized by higher financial development will have larger insurance sales. Like Li et al. (2007), we calculate financial development variable by dividing broad money M2 by GDP of a country. Discernibly, financial development ratio represents the "circulation of the real money". Furthermore, we expect financial development has positive impact on non-life insurance demand.

3.9 Education

An individual's permanent income is constituent of both present value of non-human wealth and by human capital. Education attainment is linked with more earnings sustained pre-retirement period. Hence, it can be argued that enhancement in human capital through education is likely to increase insurance demand to protect potential income.

In several past studies, education level is substituted as risk aversion. These studies reported that education is significant and positively linked with life insurance demand. (e.g. Browne and Kim, 1993; Ward and Zurbruegg, 2002; Li et al., 2007; Hwang and Gao, 2003; Truett and Truett, 1990). They contended that the rise in education level leads more risk aversion and realization of insurance offerings significance. Thus, education attainment increases individual's understanding regarding risk management measures and saving products, leading to a rise in insurance products demand. Following the norm, we calculate the level of education in an economy by tertiary education gross enrolment rate (e.g. Browne and Kim, 1993). We expect education to positively influence non-life insurance demand.

3.10 Urbanization

Outreville (1996) asserted that higher consumer concentration in a particular area is likely to increase non-life insurance distribution. In addition, Beck and Webb (2003) reported that in more urbanized countries dependence on informal insurance contracts is discouraged, causing a rise in demand for formal non-life insurance products. Based on the previous discussion, we expect the level of urbanization to positively influence life insurance demand. We measure the level of urbanization by dividing the share of urban population in a country by to the total population.

4 DATA AND METHODOLOGY

We collected the data of 33 OECD countries covering the period from 2007 to 2016 (330 country-year observations). Discernibly, small number of observations may create inefficiency issue by under- or over-estimating the true populations statistic (Theil, 1971). Consequently, inefficiency may bias our regression results. To control this issue, we adopted bootstrapping technique. Bootstrapping technique will increase our sample size and most likely make our regression

estimates robust (Adèr, 2008).[10] Our paper adopted Steck and Jaakkola (2003) recommendation for generating bias-corrected bootstrapped sample.[11] The technique iterated 11,731 country-year observations.[i] In addition, the description of the variables employed in the regression estimation is given in table 2. We employ the following regression model to examine our proposed relationship:

$$\mathrm{DEN_{it}} or\ \mathrm{PEN_{it}} = b_0 + b_1 \mathrm{Risk\ Aversion}_{it} + b_2\ \mathrm{Controls}_{it} + \varepsilon_{it} \qquad \textbf{eq. (1)}$$

Finally, we employ two staged generalized method of moments (GMM) to control the potential issue of endogeneity[12]. To control for endogeneity, we followed Ahmed et. al (2021) procedure. They asserted that non-life insurance consumption and risk appetite can be explained by the same variables of interest. For example, people's earning's ability may influence both their insurance purchase and risk appetite involving other financial decisions. Joint explanatory variables may get our risk aversion and non-life insurance demand variables strongly correlated which will result in endogeneity problem. This correlation could generate from multiple roots e.g. simultaneity, omitted variables and unexplained heterogeneity. In addition, this could also make our error term ε_{it} and risk appetite variables to be strongly correlated. Thus, this will make our results biased and inconsistent. To resolve the problem, we adopt Maddala's (1988) recommendations and use instrumental variable (IV) technique to account for endogeneity problem.[13] Previous strand of literature adopted lagged or historical variables of firm features, sectoral and country level economic indicator as instruments (Campa and Kedia, 2002).

We adopt investor risk aversion status (IAS) as instrumental variable for risk aversion. We argue that people with positive favorable projection will be more confident and willing to take calculated risk. Similarly, they will not seek non-life insurance. We calculated our IAS measure using two groups of valid instruments: 1) economic and time related variables, 2) investor features.

[10] Our bootstrapping procedure is based on the premise of central limit theorem and law of large numbers. This implies that statistical estimates will converge to population statistics with rise in sample sized. To control for sample bias we draw random bootstrap sample with bias correction. See Adèr, 2008 for details.

[11] Appendix A outlines the details

[12] We also regressed sovereign ratings variable on non-life insurance demand and investor sentiment to gauge the possible effect of economic impairment on non-life insurance demand and risk aversion. The results were non-significant and are available on request.

[13] Maddala (1988) suggested that "if two variables are determined by the same underlying factors then it is reasonable to predict that exogenous variables in one equation will be independent of the error term in other equation. For example, exogenous variables in insurance demand equation will be independent of error term in the investor sentiment equation that's why they are unlikely to drive investor confidence" (Maddala, 1988, p 245).

We used GMM technique to regress risk appetite on IAS and other exogenous explanatory variables. In addition, we used dummy variable, which assumed the value of "1" when there is decline in our risk appetite measure and "0" otherwise. We applied probit regression and regressed IAS on variables measuring economic, time and investor features.[14] Afterwards, we adopted the probit regression estimates as an instrument for our risk aversion measure. Wooldrige (2002) suggests that effective instruments need to satisfy two pre-requisites: 1) instrument should be directly linked (correlated) with endogenous variables, 2) the instrument should not be linked (correlated) with error term. To ascertain whether these conditions are met, we will run multiple tests. First, we will run partial R^2 and F-test to check whether excluded instruments are appropriate. The partial R^2 will estimate the correlation between excluded instruments and endogenous variable while it will limit out the effect of exogenous predictors.[15] In addition, F-statistic measure the joint significance of the excluded instruments. We are going to dismiss the null hypothesis that instrument as weak.[16] Furthermore, we also run Durbin-Wu-Hausman (DWH) approach to check the if our independent variable is exogenous (Hausman, 1978).

Econometric literature has also presented other roots of endogeneity. We will also consider them individually: 1) we are using panel data for our analysis. Furthermore, unobserved heterogeneity due to time invariant and panel related characteristics may also bias our results (Nerlove, 2005). This condition will also make our error term to be directly linked with explanatory variables. 2) this correlation may also cause omitted variable bias. To minimize this problem, we employed least square dummy variable (LSDV) estimation, 3) we also use alternate measure of our dependent variable to make our result more robust.

[INSERT TABLE 2 HERE]

5 EMPIRICAL RESULTS AND DISCUSSION

The results for nexus between risk aversion and non-life insurance are presented in table 3. We used insurance density to measure non-life insurance demand. Moreover, we have used two proxies to measure levels of risk aversion: 1) ICIR and 2) CSGRAI. We have checked the

[14] The details of the variables used are given in table 1 and 2.
[15] Like Laeven and Levine (2009), we run partial R^2 and F-test to check the effectiveness of the instruments adopted.
[16] "GMM estimates biased results if the IV is weak and their interpretation will be false" (Stock et al., 2002)

relationship in presence of control variables, as well as, how the relationship is moderated by negative market condition. For brevity, the results for control variables are omitted.

Our results show that significant and negative relationship exist between risk appetite and non-life insurance demand. Our results for instrumental variable regression estimation are qualitatively the same as least square dummy variable (LSDV) regression. Our results show that when risk appetite is low, people will be more risk averse hence, they will demand more insurance to protect against transaction and bankruptcy costs.[17] Our results are in-agreement with past studies, they contended that risk averse individuals and corporations will demand more insurance products to protect against transaction and bankruptcy costs in case of adverse financial event (e.g. Mayers and Smith, 1982; Smith and Stulz, 1985; and Froot, Scharfstein, and Stein, 1993). Furthermore, we also investigated how the nexus between risk appetite and non-life insurance buying behavior is moderated by negative market condition. Our results show that negative market condition has lower impact on the relationship between risk aversion and non-life insurance demand.

[INSERT TABLE 3 HERE]

Table 4 presents the regression results and the endogeneity check in the presence of control variables, country, and year fixed effects[18]. We used insurance penetration to measure non-life insurance demand. Moreover, we have used two proxies to measure levels of risk aversion: 1) ICIR and 2) CSGRAI. Our results show that significant and negative relationship exists between risk aversion and non-life insurance demand during normal economic activity (i-e when SPR=0). Previous research used different proxies (e.g. education and UAI) for risk aversion. Discernibly, their findings on the influence of risk aversion on insurance demand are inconclusive. Some studies found risk aversion positively influenced insurance demand (e.g. Curak *et al.*, 2009 & 2013; Zerria and Noubbigh, 2016), while others observed negative relationships (e.g. Feyen *et al.*, 2013; Outreville, 2015). Conversely, some studies found no statistical relationship (Esho *et al.*, 2004). Our findings imply that during normal economic activity people will be rational. Thus, when

[17] We use risk appetite and investor confidence as a proxy measure of risk aversion. Therefore, interpretation of our results is somehow tricky. If people risk appetite or confidence increases, they will be less risk averse or in simple words, they are willing to take risk and vice versa. So, rise in risk appetite or confidence is equivalent to decline in risk aversion and vice versa.

[18] We have excluded results for control variables to save space.

people' and corporation's risk appetite is low, they will be more risk averse and demand more non-life insurance products to protect against transaction and bankruptcy costs.

We found a significant and positive impact of both risk aversion proxies (*ICIR* and *CSGRAI*) on non-life insurance demand during economic impairment period (i.e. when Moody's ratings =1). Our results show that during economic impairment period, people's confidence in financial institutions will be reduced, discouraging them from buying insurance. Hence, they will seek private arrangements. Previous academic literature also found similar results that uncertainty and negative information in the market may cause people to form mistaken beliefs about the market (Daniel et al., 1998, 2001; Hirshleifer, 2001).

[INSERT TABLE 4 HERE]

Model (3) and (4) of Table 4 also present the regression results using *GMM* estimation techniques. We found quite similar findings for risk aversion-non-life insurance purchases link during both economic situations.

Regression results presented in table 4 for control variables also generated mixed results. In both situations, the effect of inflation on non-life insurance demand is negative and significant predicting that individuals will buy more non-life insurance demand with fall in inflation. Our findings are supported by previous studies (e.g. by Babbel, 1981; Beck and Webb, 2003). To our surprise the relationship between real interest rates and non-life insurance demand is significant and negative. Our result contradicts Beenstock et al. (1988) finding that the relationship between non-life insurance demand and real interest rates is positive.

In both situations, the relationship between financial development and non-life insurance demand is negative and significant. Our findings are inconsistent with the work by Outreville (1996), and Li et al. (2007), they found that financial development will improve the individuals' confidence in financial intermediaries. The possible reason behind could be when the financial system is developed then people would move to other attractive investment prospects. The regression coefficient for education is positive and significant indicating that higher education generates more awareness about insurance products hence, the demand for insurance will be increased. Our finding is in-agreement with Focarelli et al. (2004), who also found a positive relationship between health insurance and education. Surprisingly, in both situations, urbanization negatively influenced non-life insurance demand. This finding might be because OECD countries already have a higher proportion of people living in cities and there has not been significant

variation in it (Dragos, 2014). Our finding contradicts the work by Park and Lemaire (2011b), who found that urbanization positively influenced non-life insurance demand. Lastly, in both situations, income positively influenced non-life insurance demand indicating that people with a higher income are more likely to buy non-life insurance to streamline their consumption and standard of living. Our finding is consistent with Beenstock et al. (1988); Outreville (1990); Grace and Skipper (1991); Guiso and Jappelli (1998) and Focarelli et al. (2004), they also discovered the same relationship.

5.1 Robustness Tests

For robustness, we use an alternative measure of non-life insurance demand that is, non-life insurance density (Beck and Webb 2003). We estimated our regression again using the alternate variable for non-life insurance demand. Moreover, we used Moody's sovereign ratings as indicator variable, which equal '1' for downgrades and '0' otherwise. The results are presented in Table 5. Our regression results in the sensitivity analyses are consistent with our previous results. Finally, our results for *GMM* approach also yield similar findings. In all the analyses, we included all the control variables and controlled for country and year fixed effects.

[INSERT TABLE 5 HERE]

6 Conclusion

Our paper provides an understanding of insurance buying behavior by studying how risk aversion influences the non-life insurance demand. We studied the relationship in the event of two different economic scenarios (i-e normal and economic impairment period). We found that risk appetite is inversely related with insurance purchases generally. Furthermore, when economy is functioning normally, risk averse individuals/corporations will buy non-life insurance to cushion themselves from transactions and bankruptcy costs. Conversely, during economic impairment period, individual's confidence in the financial system will decline. Hence, they will seek private arrangements.

Psychology plays a key role in financial decision making. The economic impairment period may have been characterized by negative public information which may be causing prospective policyholders form wrong perceptions about the insurance companies, thereby discouraging them from buying insurance. Insurers should take corrective measures that disseminate fundamental

information about the strength of their product offerings. However, conventional sources such as annual reports, credit ratings and industry reports already disseminate information related to insurers' financial strength. Insurers may also resort to unconventional sources such as policy holder awareness programs. Governments should also take measures to avoid formation of disbeliefs by the public such as introducing risk-based capital requirements and conducting periodic stress tests. This information should be made public to raise public confidence in the insurance sector.

Our research contributes to growing debate on the effect of investor sentiment on demand for insurance. Literature has shown that measuring sentiment is a very difficult task. To resolve the matter scholars used miscellaneous approaches (Outreville, 2015), some developed survey-based measures (Szpiro and Outreville, 1988) and some opted for risk aversion proxies (Beck and Webb, 2003, Browne and Kim, 1993; Ward and Zurbruegg, 2002; Zerria and Noubbigh, 2016). However, these approaches generated contradictory results. Researchers attempted to provide different explanations to justify their findings. Many scholars used education as a proxy measure to risk aversion. They contended that education increases risk aversion and awareness to insurance benefits. We argue that it is not conventional education that matters but financial knowledge. On the other hand, investor risk appetite is an objective measure for risk aversion, which measures people's actual risk behavior by capturing their securities buying behavior[19].

APPENDIX A

Ahmed, et. al (2021) presented Steck and Jaakkola (2003) boostrapping procedure as "a procedure for bootstrap bias estimation and correction. They proposed that in a domain of ***n*** discrete random variables, $\mathbf{X\ (X_1, \ldots, X_n)}$, let **p(X)** represent (unidentified) correct population distribution of the sample D. The experimental distribution assumed by **D** is given as **ṕ(X)**, where $\mathbf{\acute{p}(X)= \mathit{N\ (x)\ /\ N}}$, where ***N(x)*** is the frequency distribution of $\mathbf{X = x}$ and $\mathbf{N = \sum_x N(x)}$ is the sample size of **D**. A statistic **T** is any number that can be computed from the given data **D**. Its bias is defined as $\mathbf{Bias_T = \{T(D)_{D\sim p}\} - T(p)}$, where $\mathbf{\{T(D)_{D\sim p}\}}$ denotes the expectation over the data sets **D** of size **N** sampled from the (unknown) true distribution **p**. While **T(D)** is an arbitrary statistic, **T(p)** is the associated, but possibly slightly different statistic that can be computed from a (normalized) distribution. Since the true distribution **p** is typically unknown, $\mathbf{Bias_T}$ cannot be computed. However, it can be approximated by the bootstrap bias-estimate, where **p** is replaced by the empirical distribution **ṕ**, and the average over the data sets **D** is replaced by the one over the bootstrap samples $\mathbf{D^{(b)}}$ generated from **ṕ**, where **b = 1, ..., B** with sufficiently large **B:**

[19] Outreville (2015) presented a detailed survey of studies on risk aversion and insurance demand. Please refer to Outreville (2015) for further details.

$$\mathbf{Bias_T = \{T(D^{(b)})\}_b - T(\acute{p})} \qquad \mathbf{(1)}$$

Obviously, a plug-in statistic yields an unbiased estimate concerning the distribution that is plugged in. Consequently, when the empirical distribution is plugged in, a plug-in statistic typically does not give an unbiased estimate concerning the (unknown) true distribution. The general procedure of bias-correction can be used to reduce the bias of a biased statistic considerably. The bootstrap bias-corrected estimator $\mathbf{T^{BC}}$ is given by:

$$\mathbf{T^{BC}(D) = T(D) - Bias_T = 2\ T(D) - \{T(D^{(b)})\}_b} \qquad \mathbf{(2)}$$

where $\mathbf{Bias_T}$ is the bootstrap bias estimate according to Eq. 1. Typically, $\mathbf{T^{BC}(D)}$ agrees with the corresponding unbiased estimator in leading order in **N**. We followed Steck and Jaakkola (2003) and took the following steps:

1. We computed regression estimates **[T(D)]** of original sample (n=330) using the estimation techniques outlined in the methodology section
2. We bootstrapped our sample (n=10,220). Our original sample consisted of 33 OECD countries, where each country represents unique economic characteristics. Therefore, for every country, we identified minimum and maximum values (taken from the original sample) for each variable of interest to serve as limits for bootstrapping procedure. By doing this, the original sample characteristics will be preserved in our bootstrapped sample.
3. We calculated regression estimates $\mathbf{T(D^{(b)})\}_b}$, for bootstrapped sample.
4. We arrived at bias-corrected regression estimates [$\mathbf{T^{BC}(D)]}$ using equation 2" (Ahmed et. al, 2021, p. 28).

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Tables

Table 1: Variables' description

Variables	Symbol	Details	Source
Dependent variable			
Insurance Penetration	PEN	'Insurance Penetration (PEN_{it})' indicates the insurance activity in an economy. We followed previous studies (Beenstock et al. 1988; Browne et al. 2000) and measured insurance penetration as ratio of total direct premiums	OECD Library

		written to the real GDP of each country (e.g. Browne et al. 2000).	
Independent variables			
Risk aversion	ICIR and CSGRAI	We measure 'risk aversion' through changes in the 'State Street Investor Index Global (ICIR) and 'Credit Suisse global risk appetite index (CSGRAI)' as a proxy to measure the levels of investor sentiment.	State Street corporation Credit Suisse group AG
Economic Impairment	MR SPR	To measure economic impairment, we take average Moody's and Fitch's foreign sovereign ratings. We use an indicator variable which equals to '1' for downgrades and '0' otherwise.	Moody's corporation Standard and Poor's corporation
Negative market condition	ICIR x FR, CSGRAI x FR	We measure negative market condition through the multiplication of sovereign economic ratings and risk aversion (Ahmed et al., 2021)	
Income	Income	We use 'Income' measured by GDP per capita in an economy (Beenstock et al. 1988; Browne et al. 2000; Dragos 2014).	OECD Library
Inflation	Inflation	We also use GDP deflator calculated annually (in percentage) as an alternate measure for 'inflation' (Dragos 2014).	OECD Library
Real Interest Rate	Real Interest Rate	'Real Interest rate' is calculated as the difference of lending rate and inflation measured by GDP deflator (Browne et al. 2000).	
Financial development	Financial development	Furthermore, 'Financial development' is calculated as the ratio of broad money M2 to GDP. This ratio also represents the "real money circulation" in the economic system (Beenstock et al. 1988).	OECD Library
Education	Education	We estimate the 'education' in a by the level of tertiary education gross enrolment rate in an economy(Beenstock et al. 1988).	

Urbanization	Urbanization	*'Urbanization'* is estimated as share of the urban population divided by the total population of a country (Beenstock et al. 1988).	United Nations, Department of Economic and Social Affairs, Population Division (2017)[20]

Table 2 Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Insurance Penetration	11,712	2.455	1.267	0	6.8
Insurance Density	11,712	1110.151	2.508	0	13.020
ICIR	11,731	-0.762	10.036	-18.573	20.067
CSGRAI	11,731	-0.950	3.005	-5	4
Moody's Rating	11,731	0.103	0.304	0	1
Inflation	11,731	2.482	3.913	-9.680	33.541
Interest Rate	11,731	2.335	4.540	-26.21	18.89
Financial Development	11,721	0.970	1.012	0	7.44
Education	11,690	56.020	29.084	0	117.426
Urban Ratio	11,731	77.093	11.614	49.6	97.9
Income	11,731	36918.7	13703.02	14573.82	91367.46

[20] United Nations (Department of Economics and Social Affairs, Population Division; Accessed August, 2017) https://population.un.org/wup/DataQuery/

Table 3 Direct and moderating relationship

Dependent Variable = Insurance Density								
	1		**2**		**3**		**4**	
	LSDV	**GMM**	**LSDV**	**GMM**	**LSDV**	**GMM**	**LSDV**	**GMM**
ICIR	-0.0169***	-	-0.0149***	-	-	-	-	-
	(0.0010)	0.0536***	(0.0010)	0.0029***				
		(0.0107)		(0.0014)				
CSGRAI	-	-	-	-	-0.3041***	-	-0.3040***	-
					(0.0217)	0.0910***	(0.0217)	0.1394***
						(0.0127)		(0.0172)
FR	0.1991***	0.2227***	0.2276***	0.0671***	0.2022***	0.0753***	0.2028***	0.1898**
	(0.0095)	(0.0447)	(0.0087)	(0.0229)	(0.0095)	(0.0227)	(0.0091)	(0.0245)
ICIR x FR	-	-	0.0130***	0.0011	-	-	-	-
			(0.0008)	(0.0140)				
CSGRAI x FR	-	-	-	-	-	-	0.0007	0.1510***
							(0.0027)	(0.0177)
Constant	-	6.9666***	-	6.8950***	-	6.7143***	-	6.6776***
	22.0081***	(0.0432)	22.1151***	(0.0503)	21.6335***	(0.0351)	21.6323***	(0.0384)
	(0.1109)		(0.1107)		(0.1142)		(0.1136)	
R^2	0.8952	-	0.8972	-	0.8961	-	0.8961	-
Partial R^2		0.0528	-	0.1521	-	0.0914	-	0.1970
F Statistic	-	0.0000	-	0.0000	-	0.0000	-	0.0000
(p-value)								
Endogeneity test	-	-	-	-	-	-	-	-
Durbin-Wu-Hausman test (p-value)	-	0.0000	-	0.0000	-	0.0000	-	0.0000
Controls								
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 4 Regression results for ICIR and CSGRAI

Dependent variable=Insurance Penetration								
	LSDV				GMM			
	(1)		(2)		(3)		(4)	
	SPR=0	SPR=1	SPR=0	SPR=1	SPR=0	SPR=1	SPR=0	SPR=1
ICIR	-0.0210***	0.0020*	-	-	-0.1038***	0.0087**	-	-
	(0.003)	(0.001)			(0.013)	(0.003)		
CSGRAI	-	-	1.3181***	0.0101***	-	-	-0.0696***	0.0309*
			(0.1195)	(0.0022)			(0.013)	(0.016)
Inflation	-0.0274***	-0.0896***	-0.0364***	-0.0896**	-0.0374***	-0.1023***	-0.0089**	-0.0966***
	(0.055)	(0.006)	(0.004)	(0.006)	(0.006)	(0.006)	(0.004)	(0.005)
Interest Rate	-0.0204***	-0.0513***	-0.0312***	-	-0.0045	-0.066***	-0.0075**	-0.0570***
	(0.002)	(0.005)	(0.002)	0.0513***	(0.004)	(0.005)	(0.002)	(0.003)
				(0.005)				
Financial Development	-0.2686***	-0.5250***	-0.2659***	-0.774***	0.2586***	-0.5070***	-0.2618***	-0.4370
	(0.012)	(0.0891)	(0.011)	(0.243)	(0.017)	(0.068)	(0.012)	(0.067)
Education	0.003***	0.0030**	0.0037***	-0.0030**	0.0111***	-0.0040***	0.0033***	-0.002*
	(0.000)	(0.011)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)
Urbanization	0.011***	-0.0247**	-0.0111***	-0.0247**	-0.0189***	-0.0222***	-0.0110***	-0.0226***
	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Income	2.2329***	3.0600***	2.2022***	3.060***	2.1884***	3.0164***	2.2624***	2.9443***
	(0. 047)	(0.1301)	(0.046)	(0.130)	(0.060)	(0.096)	(0.048)	(0.0955)
Constant	-	-	-	-	-	-	-	-
	19.8024***	26.0201***	18.1905***	26.003***	19.3060***	25.8632***	20.2192***	25.3474***
	(0.476)	(1.307)	(0.4830)	(1.2838)	(0.621)	(1.009)	(0.486)	(1.001)
R^2	0.3044	-	0.3143	-	-	-	-	-
DWH test (p-value)	-	-	-	-	0.086	-	0.620	-
F-test (p-value)	-	-	-	-	0.000	-	0.000	-
Partial R^2	-	-	-	-	0.504	-	0.199	-
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: The regression coefficients with standard errors adjusted for country-level clustering are given in the parenthesis.

***, ** and * represents significance at 1, 5 and 10 percent respectively. Standard and Poor's rating (SPR) =1 for downgrade and 0 otherwise.

Table 5 Robustness checks

Dependent variable=Non-Life Density								
	LSDV				GMM			
	(1)		(2)		(3)		(4)	
	MR=0	**MR=1**	**MR=0**	**MR=1**	**MR=0**	**MR=1**	**MR=0**	**MR=1**
ICIR	-0.0120**	0.4172***	-	-	-0.0164***	0.0024*	-	-
	(0.001)	(0.015)			(0.005)	(0.001)		
CSGRAI	-	-	-0.2558***	0.6745**	-	-	-0.0089***	0.0060**
			(0.025)	(0.024)			(0.004)	* (0.003)
Constant	-22.1239***	-	-	-	-22.1084	-	-22.2041***	-
	(0.1181)	31.5978**	21.7784**	24.1399**	(0.1404)	24.8096**	(0.113)	24.7280*
		* (0.2744)	* (0.1257)	* (0.2935)		* (0.4054)		**
								(0.3843)
R^2	0.8929		0.8935	-	-	-	-	-
DWH test (p-value)	-	-	-	-	0.0950	-	0.4357	-
F-test (p-value)	-	-	-	-	0.000	-	0.001	-
Partial R^2	-	-	-	-	0.5510	-	0.0383	-
Controls	Included	Included	Included	Included	Included	Included	Included	Included
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: The regression coefficients with standard errors adjusted for country-level clustering are given in the parenthesis.
***, ** and * represents significance at 1, 5 and 10 percent respectively. Moody rating (MR) =1 for downgrade and 0 otherwise.

[i] We collected data for (a) urbanization from United Nations (b) sovereign ratings from Moody's foreign sovereign rating data, and (c) investor sentiment from Credit Suisse, Switzerland & State Street, USA. We collected data for the rest of the variables from the OECD official website.