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The Non-Monotonic Relationship Between Income and Life Insurance Demand: A Case Study of Forty-One Countries

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Abstract: Income is often viewed as the main determinant of life insurance demand. However, in the last two decades, the world's life insurance penetration has continued to decrease even as income grows. This study investigates the relationship between income and life insurance demand using panel data from forty-one countries from 2013 to 2022, along with education and life expectancy as control variables. The study finds a non-monotonic relationship between income and life insurance penetration and between education and life insurance penetration, while life expectancy shows a monotonic relationship with life insurance penetration. This study provides significant policy implications for insurers to predict life insurance demand and suggests that non-high-income countries emphasize the improvement of their life insurance sector development.

Keywords: life insurance demand; non-monotonic relationship; income

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1. Introduction

Life insurance, among other financial products, represents a pivotal innovation for risk management. It serves as a useful tool to reduce risk and provides a source of business financing. It operates by the insurer pooling the risks of individuals in exchange for a premium, then the insurer mobilizes funds into productive investments and pays a stated sum if the insured passes away. People gain financial protection against the risk of premature death, insurers earn profit, and the financial market can finance its long-term business. The development of the life insurance industry is also linked to economic growth (Webb, 2000).

In the last four decades, the world's life insurance premiums increased by more than 1200%, from USD 222.51 billion in 1983 to USD 2813.03 billion in 2022 (Sigma Re Institute, 2024). This rate exceeds the growth rate of the world's gross domestic product (GDP), which increased by 870% during the same period, from USD 2464 in 1983 to USD 12,591.7 in 2022. However, the world's life insurance penetration, the ratio of premium to GDP, has shown a decreasing trend since the world's GDP per capita reached USD 6129 in 2003 (Figure 1). Furthermore, from 2003 to 2022, global life insurance penetration fell by 35% to 2.81%, while GDP per capita increased by 105% to USD 12,591. In contrast, from 1983 to 2002, global life insurance penetration rose by 127%, while GDP per capita increased by 125%. Thus, life insurance demand appears to grow as the economy develops but reduce as the economy matures.

Life insurance demand also exhibits large variation at the country level. For example, based on OECD Statistics data (OECD, 2024), in 2021, Indonesia had a GDP per capita of USD 4334 and a life insurance penetration of 1.21%. However, Morocco, with a GDP

per capita of USD 3768, had a life insurance penetration of 1.79%, while Iceland, with a GDP per capita of USD 68,710, had a life insurance penetration of 0.22%. Many countries globally also have lower life insurance penetration than Indonesia, despite having higher incomes (Figure 2).

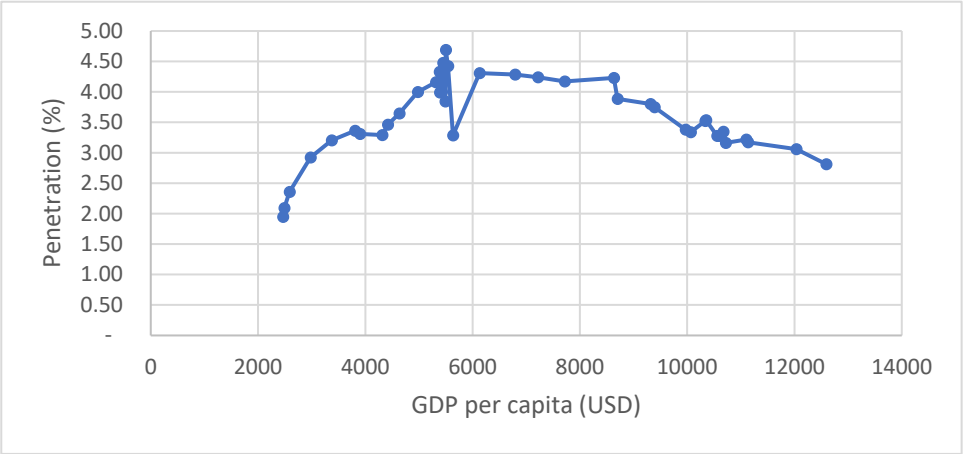


Figure 1. Life insurance penetration decreases after an initial increase as the GDP per capita of the world grows.

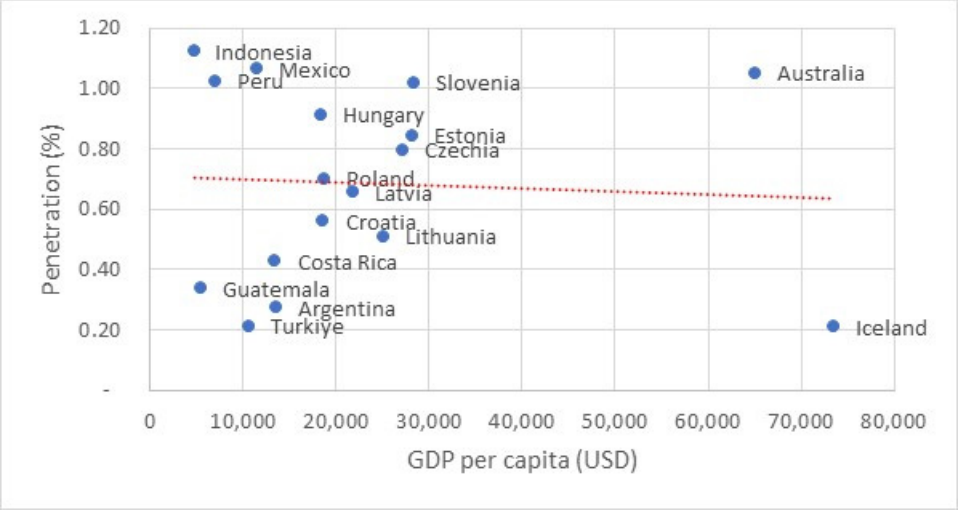


Figure 2. Life insurance penetration and GDP per capita around the world in 2021.

Figures 1 and 2 contrast with the long-held view that life insurance demand grows as income increases or income has a positive relationship with life insurance demand. Feyen et al. (2011) argue that higher income should increase life insurance demand due to improved affordability and a stronger need to protect against the risk of premature death. This view has been tested by numerous empirical research studies for over fifty years (Fortune, 1973; Outreville, 1996; Srinivasan & Mitra, 2024).

These figures also differ from the "S curve" model (Enz, 2000), which other researchers refer to as a "non-linear" relationship between income and life insurance demand (Chang & Lee, 2012). S-curves explain that life insurance demand is expected to accelerate with economic growth, but then it slows as the economy reaches a developed stage, with income elasticity staying positive across all economic levels. However, Figures 1 and 2 demonstrate that life insurance penetration decreased when the economy was in the developed stage.

Given their significant importance and contradictory results in research, it is vital to reinvestigate the relationship between income and life insurance demand. This study

argues that the term "non-monotonic" can better explain the relationship, life insurance demand initially increases but later decreases as income rises..

This paradoxical relationship raises the following questions: "Is there a non-monotonic relationship between income and life insurance demand?" and "What causes the non-monotonic relationship between these factors?" The purposes of this study are (1) to investigate the non-monotonic relationship between income and demand for life insurance and (2) to analyze the cause of this dynamic relationship between income and life insurance demand.

This study employs selected countries from the Organisation for Economic Cooperation and Development (OECD) Statistics. The first question is answered by analyzing panel data from all selected countries and groups based on income level, comprising high-income and non-high-income groups. Then, this study incorporates additional factors such as education and life expectancy as control variables to improve the explanation and comprehensiveness of the phenomena. Data estimation for panel data is performed using the generalized method of moments (GMM) (Arellano & Bond, 1991).

2. Literature Review and Hypothesis Development

Life insurance plays an important role as a precaution against the premature death of a breadwinner and as a long-term savings instrument (Beck & Webb, 2003). The breadwinner's premature death causes serious financial problems for the surviving family members because their future earnings are lost forever and there are funeral costs and unpaid medical bills, which must be paid by others in the household (Rejda & McNamara, 2017).

Life insurance also encourages long-term savings and mobilizes these savings into productive investments (Arena, 2008). In addition, social security funding is closely related to the purchase of life insurance (Black & Skipper, 1994). UNCTAD (1982) argues that the contribution of life insurance is greater in developing countries because it helps minimize financial stress and worry. These examples illustrate the importance of life insurance for individuals, insurance companies, and regulators.

Despite the significant importance of life insurance, consumption remains low in many developing and even in developed countries, as shown in Figure 2. What causes this variation, or what determines life insurance demand, are critical questions that each stakeholder should understand.

Determinant studies have examined factors that might significantly influence life insurance purchases (Bhatia et al., 2021). This topic has been studied for over fifty years and can be traced back to when Yaari developed the life insurance demand theory. Yaari (1965) explains that a risk-averse individual, faced with an uncertain lifetime, purchases life insurance in preparation for a bequest and retirement. As a result, life insurance demand should increase as the breadwinner's income and interest rates rise.

Beck and Webb (2003) tested Yaari's theory using data from 68 countries between 1961 and 2000. This research has become the most cited empirical study on life insurance determinant research. This study demonstrates that income, inflation, and the development of the banking sector are the main determinants of life insurance demand. Beck and Webb (2003) argue that life insurance demand should increase with income because a person's consumption typically rises along with income, creating a greater desire to protect the income potential of the insured and the expected consumption of dependents.

Low interest rates pose a challenge for consumers seeking retirement savings. Higher interest rates predict a positive effect on life insurance demand because they offer higher returns, and consumer profitability, in turn, enhances life insurance's attractiveness. Studies have measured interest rates using deposit rates and real interest rates, demonstrating a positive effect on life insurance demand (Sliwinski et al., 2013).

Consumers in certain countries, such as Indonesia, can use interest rates as indicators of inflation expectations (Laksmono et al., 2003). Life insurance provides monetary benefits over the long term, creating a greater need for price stability, which depends on inflation. Higher inflation also erodes the value of life insurance and reduces its demand. Research indicates the negative effect of inflation (Babbel, 1981; Emamgholipour et al., 2017).

After Yaari (1965), research on the demand for life insurance has increased, with the theory developed by adding other determinants to the theoretical framework and testing it empirically. Lewis (1989) expands Yaari's framework by including beneficiaries in the analysis. Thus, dependents' expected utility and risk aversion become new determinants. Li et al. (2007), using data from 30 OECD countries between 1993 and 2000, show that income, life expectancy, and education positively affect life insurance demand but decrease with inflation, real interest rates, and social security.

Some studies analyze different income levels. Hammond et al. (1967) examine the economic and demographic effects on life insurance demand. This study shows that income, net worth, occupation, and education significantly affect life insurance demand. When data were divided into low-, middle-, and high-income groups, low- and high-income groups exhibited lower income elasticity than the middle-income group but values were still positive.

Ward and Zurbruegg (2002) also demonstrate different effects of law and politics on life insurance demand. This study, using data from 37 countries between 1987 and 1998, shows that an increase in civil rights and political stability leads to an increase in life insurance demand, with the effect in Asia being greater than in developed countries. Ward and Zurbruegg (2002) results also support the "S-curve" proposed by Enz (2000) by showing that the effect of income on life insurance demand is higher in Asia than in developed countries, and the influence of law and politics varies at different income levels.

Beenstock et al. (1986) argue that as income grows, people can afford more goods and are less likely to experience premature death. Enz (2000) also contends that as income increases, consumers will seek substitute products and insurers will limit the benefits of life insurance to avoid moral hazard. Thus, the relationship between income and life insurance demand is not linear. Enz argues that the "S-curve" model can explain this phenomenon, where life insurance demand accelerates in the development stage of the economy and then slows as the economy moves into the developed stage. Figure 3 shows the illustration of the "S-curve".

The S-curve model has become very popular among academics and practitioners, helping to forecast market conditions and economic development (Millo, 2015). Chang and Lee (2012), testing the "S-curve" by comparing two different income stages, showed that income has a positive effect, but the effect is greater in high-income countries than in low-income countries. Dragos et al. (2017) also analyze from the perspectives of developing and developed markets, showing the positive effect of income on life insurance demand and how legal and political conditions have different impacts on life insurance demand.

Some studies focus on analyzing life insurance demand in emerging countries. Hwang and Gao (2003) studied China's life insurance market from 1986 to 1996. This study shows that increases in income, education, and urbanization have significantly boosted life insurance demand, allowing life insurance to reasonably develop in emerging countries.

Kakar and Shukla (2010) also analyze life insurance demand in India as a representation of an emerging economy. A sample of 63,016 households from surveys conducted in 2004 to 2005 shows that education and occupation are motivating factors for purchasing life insurance. Zerriaa et al. (2017) also analyze emerging markets such as Tunisia using data from 1990 to 2014, showing that income and financial sector development have a significant

positive effect on life insurance demand, while education and pension expenditure have a negative effect.

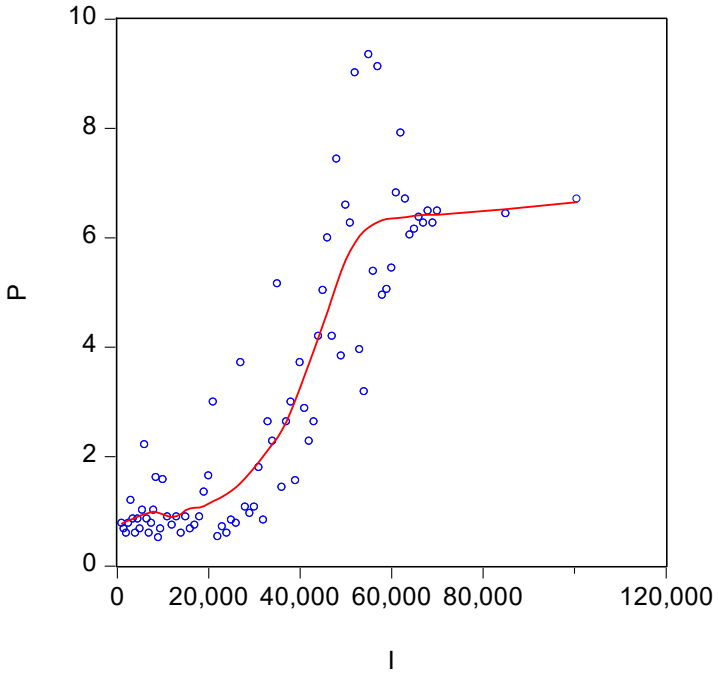


Figure 3. Illustration of the "S-curve" relationship between GDP per capita (I) and life insurance penetration (P).

The behavioral approach is also used in analyzing life insurance demand. Coe et al. (2016) show that mental accounting and money illusion become barriers to the demand for life insurance but interventions such as creating default rules and checklists have been proven to increase life insurance demand. Nagy et al. (2019) demonstrate that loss aversion has a negative influence on life insurance demand but individuals who are more open to technology will have a higher rate of adopting insurance.

The recent literature also shows a positive effect of income. Srinivasan and Mitra (2024), using data from 30 OECD countries from 1996 to 2020, show the positive effects of income, urbanization, and education on life insurance demand. Dragota et al. (2023), analyzing 29 OECD countries from 2005 to 2017, find that GDP per capita, investment freedom, and foreign direct investment have a positive and significant impact on income. Qian (2021), using data from China, reveals that income continues to positively affect life insurance demand even in the COVID-19 pandemic situation.

However, Kabrt (2022), using data from Visegrad countries from 1993 to 2017, finds a negative effect of income and education on life insurance demand but a positive effect for pension funds. Segodi and Sibindi (2022), analyzing data from BRICS countries from 1999 to 2020, also show a negative effect of income, unemployment, interest rates, and inflation on life insurance demand, while economic growth and financial freedom have a positive effect.

Furthermore, some studies argue that income has a positive effect on risky assets, suggesting that insurance coverage should decrease with income (Campbell, 2006; Calvet & Sodini, 2014). Outreville (2015) contends that high-income individuals with a high level of education tend to take more risks, leading to reduced insurance demand among skilled and well-educated consumers. Armantier et al. (2023) suggest that these phenomena can be explained by behavioral factors such as regret avoidance and nonperformance risk, as well as specific behavioral patterns where low-income consumers invest too conservatively, while high-income consumers are overinsured.

Therefore, after more than fifty years, research on life insurance demand shows a transition from analyzing the effect of income on life insurance demand in different groups of countries to some contradictory results regarding how income affects life insurance demand and how to explain the mechanism behind the phenomenon.

This study fills the literature gap by analyzing the effect of income on life insurance demand with education and life expectancy as control variables. This study also analyzes the phenomenon in a "non-monotonic" framework, where income has a positive effect on life insurance demand in the developing stage, but at a certain level, its effect becomes negative. Thus, their relationship will have an inverted U-shape, not an "S" shape.

Yaari (1965) argues that income growth should increase the demand for life insurance because preparation for bequests and retirement will grow as income increases. Li et al. (2007) also argue that larger income results in a greater loss when the breadwinner dies, and life insurance becomes more affordable; thus, life insurance coverage will increase. Theoretical (Hakansson, 1969) and empirical (Srinivasan & Mitra, 2024) studies highlight that the demand for life insurance has been positively related to income growth for over fifty years. Considering this, it seems appropriate to formulate the following hypothesis, that income has a positive effect on life insurance demand:

H_1: *Income has a positive effect on the demand of life insurance.*

Enz (2000) argues that the income elasticity of demand for insurance declines as GDP grows, and their relationship follows an "S" pattern, with income elasticity still exceeding one. However, Figure 1 in this study demonstrates a negative trend between income and life insurance penetration after the GDP per capita reached USD 6129.

This study contends that the "non-monotonic" relationship better explains the phenomenon. A "monotonic" relationship indicates that along the regression curve, there is no region where the sign of the coefficient changes. Meanwhile, a "non-monotonic" relationship reflects the existence of a monotonic relationship that alters the sign of the regression coefficient (Yitzhaki & Schechtman, 2012).

Non-monotonic relationships have been discussed in insurance research. Some studies also use the term "inverted-U curve" to explain this relationship. Nguyen (2024) finds an inverted U-shaped relationship between life insurance market development and bank stability, then argues for the importance of monitoring the growth trajectory of insurance. Rochet and Villeneuve (2011) also find non-monotonic effects of profitability, which explain the mixed findings of studies on corporate demand for hedging and insurance.

This shape is also shown in other fields. Enam et al. (2023) find the non-monotonic relationship in the banking sector between corporate governance and banks' performance. The non-monotonic relationship was also used to explain life distribution in actuarial studies, where residual lifetime at a certain period starts to decrease as age increases (Belzunce et al., 2007).

Beenstock et al. (1986) argue that income does not always increase life insurance demand because income growth will enhance consumer purchasing power and reduce the likelihood of consumers experiencing premature death. Friedman and Savage (1948) argue that consumer behavior toward risk will shift from risk-averse individuals, who buy insurance to avoid future financial loss, to risk-tolerant individuals, who take gambles when faced with risk and thus do not buy insurance as consumer income reaches higher levels. Chen et al. (2006) show that individuals with substantial financial wealth on hand have less demand for life insurance. Therefore, it is expected that low-income consumers will purchase life insurance, while high-income consumers may refuse it.

Considering this, it seems appropriate to formulate the following hypothesis, that income has a non-monotonic relationship with life insurance demand:

H_2: *Income has a non-monotonic relationship with life insurance demand in high- and non-high-income countries*.

Alhassan and Biekpe (2016) find that income has a negative effect on life insurance demand and argue that demographic factors better explain life insurance demand. Zuckerman (1994) argues that demographics can provide alternative hypotheses for explaining social phenomena.

Razin (1976) shows that the more educated consumers are, the greater their demand for life insurance is. Hwang and Gao (2003) find a positive effect of education and income on life insurance demand and argue that the increase in educational levels leads to greater awareness and understanding of the role of life insurance.

Lewis (1989) argues that life insurance increases as the breadwinner's probability of death grows. Thus, life expectancy, which is inversely related to the probability of death, will decrease life insurance demand. Li et al. (2007) support Lewis's theory and find a negative effect of life expectancy on life insurance demand. Considering this, it seems appropriate to formulate the following hypothesis, that education has a positive effect on life insurance demand, while life expectancy has a negative effect:

H_3: *Education has a positive effect on life insurance demand*.

H_4: *Life expectancy has a negative effect on life insurance demand*.

Mathew and Sivaraman (2017) argue that a higher educational level means consumers are better able to manage their risk by investing in low-cost, high-yield financial products. Kabrt (2022) also argues that people with higher incomes and greater educational levels will allocate funds to other assets with lower risk and higher yields, thereby reducing the demand for life insurance.

Meanwhile, higher income leads to higher life expectancy, which also results in a lower probability of death and diminishes the demand for life insurance (Beenstock et al., 1986). However, Kabrt (2022) found a different situation in the Visegrad countries, where an increase in life expectancy drives people to purchase more life insurance while reducing pension demand. Therefore, it is expected that education and life expectancy also have a non-monotonic relationship with life insurance demand.

H_5: *Education has a non-monotonic relationship with life insurance demand in high- and non-high-income countries*.

H_6: *Life expectancy has a non-monotonic relationship with life insurance demand in high- and non-high-income countries*.

3. Methodology

This study uses secondary data from OECD Statistics and World Bank (WB) data. Panel data are estimated using the generalized method of moments (GMM). The data are transformed into natural logarithm and Eviews 10 is used to portray and estimate data.

The dependent variable of life insurance demand is measured by penetration and density. Penetration is the ratio of premium to GDP, while density is the ratio of premium to population. The independent variables are measured by GDP per capita or the average income of the population.

This study also uses control variables such as education or tertiary school enrollment, as well as life expectancy. Education is the ratio of total enrollment to the population of the age group that officially corresponds to the level of tertiary education, which normally requires the successful completion of education at the secondary level. Life expectancy is the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to remain the same throughout its life.

The unit of observation is a country from OECD Statistics that has complete data from 2013 to 2022. The period chosen was based on data availability for all variables that also accommodate non-high-income countries in OECD Statistics. Luxembourg is excluded because it is an outlier, it has life insurance penetration of 27.01%, which is ten times the average of the other countries. Thus, there are forty-one countries (see Appendices A–D). Each selected country is divided, based on World Bank classifications (World Bank, 2023), into non-high-income countries (GDP per capita in 2022 below USD 13,845) and high-income countries (GDP per capita in 2022 above USD 13,845). There are 11 non-high-income countries and 30 high-income countries.

GMM is used to estimate panel data. Firdaus (2020) argues that the GMM produces unbiased, consistent, and valid estimators to handle the endogeneity problem. The criteria for choosing the best GMM model are (1) unbiased, indicated by the GMM's estimated coefficient being between the estimated coefficients using the fixed effects model (FEM) and pooled least squares (PLS); (2) valid, if the Sargan test cannot reject the null hypothesis; and (3) consistent, which is tested using the Arellano–Bond (AR) correlation test, wherein the consistent estimator is if the AR(2) test does not reject the null hypothesis. Significant results are if the probability < α = 0.1, 0.05, or 0.01, with signs *, **, and ***, respectively.

Models 1 and 2 are estimated to test the first hypothesis.

$$(1) \quad P_{i,t} = \alpha_0 P_{i,t-1} + \alpha_1 I_{i,t} + \mu_i + \tau_t + \varepsilon_{i,t}$$
$$(2) \quad D_{i,t} = \beta_0 D_{i,t-1} + \beta_1 I_{i,t} + \mu_i + \tau_t + \varepsilon_{i,t}$$

Where i denotes the country based on Appendix A; t denotes the year from 2013 to 2022; $P_{i,t}$ is the life insurance penetration of country i in year t; $D_{i,t}$ is the life insurance density of country i in year t; $P_{i,t-1}$ and $D_{i,t-1}$ are the lagged dependent variables; $I_{i,t}$ is the GDP per capita of country i in year t; μ_i is the country i specific effect; τ_t is the time t specific effect; and $\varepsilon_{i,t}$ is an error term.

Models 3 to 6 are estimated to test the second hypothesis.

$$(3) \quad P_{j,t} = \gamma_0 P_{j,t-1} + \gamma_1 I_{j,t} + \mu_j + \tau_t + \varepsilon_{j,t}$$
$$(4) \quad D_{j,t} = \delta_0 D_{j,t-1} + \delta_1 I_{j,t} + \mu_j + \tau_t + \varepsilon_{j,t}$$
$$(5) \quad P_{k,t} = \theta_0 P_{k,t-1} + \theta_1 I_{k,t} + \mu_k + \tau_t + \varepsilon_{k,t}$$
$$(6) \quad D_{k,t} = \lambda_0 D_{k,t-1} + \lambda_1 I_{k,t} + \mu_k + \tau_t + \varepsilon_{k,t}$$

Where j and k denote non-high and high-income countries, respectively, based on Appendix A; t denotes the year from 2013 to 2022; $P_{j,t}$ and $P_{k,t}$ are the life insurance penetrations of country j and k in year t; $D_{j,t}$ and $D_{k,t}$ are the life insurance densities of country j and k in year t; $P_{j,t-1}$, $P_{k,t-1}$, $D_{j,t-1}$, and $D_{k,t-1}$ are the lagged dependent variables; $I_{j,t}$ and $I_{k,t}$ are the GDP per capita of country j and k in year t; μ_j and μ_k are country j and k specific effects; τ_t is the time t specific effect; and $\varepsilon_{j,t}$ and $\varepsilon_{k,t}$ are error terms.

Models 7 and 8 are estimated to test the third and fourth hypothesis for all countries.

$$(7) \quad P_{i,t} = \sigma_0 P_{i,t-1} + \sigma_1 I_{i,t} + \sigma_1 E_{i,t} + \sigma_1 L_{i,t} + \mu_i + \tau_t + \varepsilon_{i,t}$$
$$(8) \quad D_{i,t} = \varphi_0 D_{i,t-1} + \varphi_1 I_{i,t} + \varphi_1 E_{i,t} + \varphi_1 L_{i,t} + \mu_i + \tau_t + \varepsilon_{i,t}$$

Where i denotes the country based on Appendix A; t denote the year from 2013 to 2022; $P_{i,t}$ is the life insurance penetration of country i in year t; $D_{i,t}$ is the life insurance density of country i in year t; $I_{i,t}$ is the GDP per capita of country i in year t; $E_{i,t}$ is the tertiary education for country i in year t; $L_{i,t}$ is the life expectancy for country i in year t; μ_i is the country i specific effect; τ_t is the time t specific effect and $\varepsilon_{i,t}$ is an error term.

Then, Models 9 to 12 are estimated to test the fifth and sixth hypothesis. Education and life expectancy has added to Models 3 to 6 as control variables.

$$(9) \quad P_{j,t} = \vartheta_0 P_{j,t-1} + \vartheta_1 I_{j,t} + \vartheta_1 E_{j,t} + \vartheta_1 L_{j,t} + \mu_j + \tau_t + \varepsilon_{j,t}$$
$$(10) \quad D_{j,t} = \omega_0 D_{j,t-1} + \omega_1 I_{j,t} + \omega_1 E_{j,t} + \omega_1 L_{j,t} + \mu_j + \tau_t + \varepsilon_{j,t}$$
$$(11) \quad P_{k,t} = \pi_0 P_{k,t-1} + \pi_1 I_{k,t} + \pi_1 E_{k,t} + \pi_1 L_{k,t} + \mu_k + \tau_t + \varepsilon_{k,t}$$
$$(12) \quad D_{k,t} = \rho_0 D_{k,t-1} + \rho_1 I_{k,t} + \rho_1 E_{k,t} + \rho_1 L_{k,t} + \mu_k + \tau_t + \varepsilon_{k,t}$$

Where j and k denote non-high and high-income countries, respectively, based on Appendix A; t denotes the year from 2013 to 2022; $P_{j,t}$ and $P_{k,t}$ are life insurance penetrations of country j and k in year t; $D_{j,t}$ and $D_{k,t}$ are life insurance densities of country j and k in year t; $P_{j,t-1}$, $P_{k,t-1}$, $D_{j,t-1}$, and $D_{k,t-1}$ are lagged dependent variables; $I_{j,t}$ and $I_{k,t}$ are the GDP per capita of country j and k in year t; $E_{j,t}$ and $E_{k,t}$ are the tertiary education of country j and k in year t; $L_{j,t}$ and $L_{k,t}$ are the tertiary education of country j and k in year t; μ_j and μ_k are country j and k specific effects; τ_t is the time t specific effect; and $\varepsilon_{j,t}$ and $\varepsilon_{k,t}$ are error terms.

Table 1 presents the operational variables.

Table 1. Operational variables.

Variable	Code	Measurement	Data Source
Dependent Variable			
Penetration	P	$P = \frac{Premium}{GDP}$	Secondary data
Density	D	$D = \frac{Premium}{Populaion}$	• P : OECD • D :OECD
Independent Variable			
GDP per capita	I	$I = \frac{GDP}{Population}$	Secondary data
Education	E	School enrollment, tertiary (% gross)	• *I: WB* • *E: WB*
Life expectancy	L	Life expectancy at birth, total (years)	• *L: WB*

4. Results

A summary of descriptive statistics for all variable data can be seen in Table 2. The means of penetration and density are 2.79% and USD 1220, while the means of GDP per capita, education, and life expectancy are USD 32,432, 72.02, and 79.1. Thus, the mean of the country's income is 234% higher than the income limit in high-income countries, at USD 13,845.

Table 2. Descriptive statistics of full samples.

Variable	P	D	I	E	L
Mean	2.79	1220	32,432	72.02	79.10
Median	1.93	438	26,331	72.18	80.72
Maximum	16.46	9305	108,729	166.67	84.56
Minimum	0.16	4.39	1795	16.12	67.57
Std. Dev.	2.63	1640	23,458	23.42	3.77
Skewness	1.59	2.15	0.79	0.15	(0.76)
Kurtosis	6.15	8.45	2.98	4.29	2.66
Jarque–Bera	342.24	822.30	42.32	29.94	41.59
Probability	0.00	0.00	0.00	0.00	0.00
Observations	410	410	410	410	410

Life insurance density exhibits a variation exceeding two thousand-fold between its maximum and minimum values, while the maximum life insurance penetration is a

hundred times greater than the minimum. The difference between maximum income is sixty times greater than the minimum, maximum education enrollment is ten times higher than the minimum, and maximum life expectancy is seventeen times higher than the minimum. All variables, except life insurance density, have relatively lower data variation.

Appendix B presents the results of the correlation matrix for each model. The correlation matrix shows that all correlation coefficients are less than 0.95 with the highest value at 0.71. This suggests multicollinearity is not a problem and all variables can be utilized.

Table 3 presents the descriptive statistics based on income country classification. There are 11 non-high-income countries with a mean GDP per capita of USD 8044 and 31 high-income countries with a mean GDP per capita of USD 41,374, which is five times larger than low-income countries. The average income in non-high-income countries falls within the middle–high-income classification, while the average income in high-income countries is three times greater than the income limit for high-income countries. The mean life insurance penetration in high-income countries is 3.44%, which is three times higher than non-high-income countries, at 1.02%. The average life insurance density in high-income countries is USD 1635, or eighteen times greater than non-high-income countries, at USD 88.27. The average education level in high-income countries is 47% higher than in non-high-income countries, and life expectancy in high-income countries is six years longer.

Table 3. Descriptive statistics based on income country classification.

Status	Variable	P	D	I	E	L
Non-high-income countries (income ≤ USD 13,845)	Mean	1.02	88.27	8044	53.48	74.58
	Median	0.88	54.08	8732	49.23	74.93
	Maximum	3.49	393.76	14,613	127.58	79.48
	Minimum	0.16	4.39	1795	16.12	67.57
	Std. Dev.	0.88	94.62	3502	27.60	2.70
	Skewness	1.19	1.73	−0.22	0.78	−0.49
	Kurtosis	3.55	5.23	1.86	3.07	2.92
	Jarque–Bera	27.28	77.86	6.83	11.16	4.44
	Probability	0.00	0.00	0.03	0.00	0.11
	Observations	110	110	110	110	110
High-income countries (income > USD 13,845)	Mean	3.44	1635	41,374	78.81	80.75
	Median	2.67	1084	40,729	75.84	81.43
	Maximum	16.46	9305	108,729	166.67	84.56
	Minimum	0.20	58.54	12,379	49.48	72.98
	Std. Dev.	2.76	1741	21,195	17.31	2.55
	Skewness	1.32	1.83	0.71	1.55	(1.15)
	Kurtosis	5.24	6.94	3.08	7.12	3.46
	Jarque–Bera	150.31	361.55	25.50	333.00	69.05
	Probability	0.00	0.00	0.00	0.00	0.00
	Observations	300	300	300	300	300

Appendix C shows the average values for each variable from 2013 to 2022. For all data, GDP per capita has increased by 14.44% over the last ten years, while penetration has decreased by 14.81% and density has reduced by 4.05%. Education has increased by 15.65% and life expectancy has grown by 0.38%.

In non-high-income countries, income has increased by 2%, while penetration and density have risen by 11.84% and 9.5%, respectively. In high-income countries, life insurance penetration and density have decreased by 17.35% and 4.32%, as income has grown by 15.41%. Education has experienced higher growth in non-high-income countries than in high-income countries, at 27.48% compared to 12.97%. Life expectancy in non-high-income countries has decreased by 0.66%, while in high-income countries, it increased by 0.29%.

The data in this study are dominated by high-income countries, which have higher values than non-high-income countries in all aspects, notably in life insurance density and income. However, Appendix C shows that life insurance demand in forty-one countries over the last ten years has decreased as income and education have increased. This result was also found in high-income countries but not in non-high-income countries, where life insurance demand has grown over the last ten years.

Table 4 presents the regression results using pooled data. Models 1, 3, and 5 are the best GMM models, while Models 2, 4, and 6 are not, as they do not meet the unbiased criteria. As a result, the income elasticity in the entire data sample is −0.03, indicating that income has a negative but not significant effect on life insurance penetration. In contrast, the income elasticities in non-high-income and high-income countries are 0.125 and −0.1. Therefore, income in non-high-income countries has a positive but not significant effect on life insurance penetration, whereas in high-income countries, income has a negative and significant effect on life insurance penetration.

Table 4. GMM results of Models 1 to 6.

VARIABLE	ALL		≤USD 13,845		>USD 13,845	
	1	**2**	**3**	**4**	**5**	**6**
P(−1)	0.87 ***		0.75 ***		0.83 ***	
D(−1)		0.33 ***		0.24 ***		0.39 ***
I	−0.03	0.47 ***	0.125	0.64 ***	−0.10 ***	0.28 ***
J-stat	37.47	39.69	5.49	9.96	29.71	28.79
Prob(J-stat)	0.31	0.23	0.48	0.35	0.38	0.42
AR(2)	0.31	0.58	0.23	0.58	0.92	0.96
P(−1) (FEM)	0.72		0.70		0.72	
D(−1) (PLS)	0.99		0.99		0.99	
P(−1) (FEM)		0.59		0.50		0.61
D(−1) (PLS)		0.97		0.97		0.97

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Figure 4 portrays the relationship between income (I) and life insurance penetration (P) using data from forty-one countries in 2022 and the "Nearest Neighbor Fit" in Eviews. The red line in Figure 4 shows that the relationship between income and life insurance penetration is like an "inverted-U" curve. Life insurance penetration accelerates when income is in the developing stage and then declines as income reaches around USD 40,000.

Models 7 and 11 are the best GMM models, while models 8, 9, 10, and 12 show biased results (Table 5). For the last ten years, income, education, and life expectancy have had a significant effect on life insurance penetration, with coefficients of 0.32, −1.04, and 5.32. Income shows a positive effect and higher elasticity when education and life expectancy are added as control variables, differing from Model 1. Model 11 shows a significant effect for all variables, with coefficients of 0.22, −0.7, and 2.3. Moreover, income in high-income countries has a positive effect on life insurance penetration, while education has a negative effect and life expectancy has a positive effect.

Models 9 and 11 show that there are non-standard relationships between income and life insurance penetration and between education and life insurance penetration. Income shows a negative effect in non-high-income countries with education and life expectancy as control variables, but their effects become positive in high-income countries.

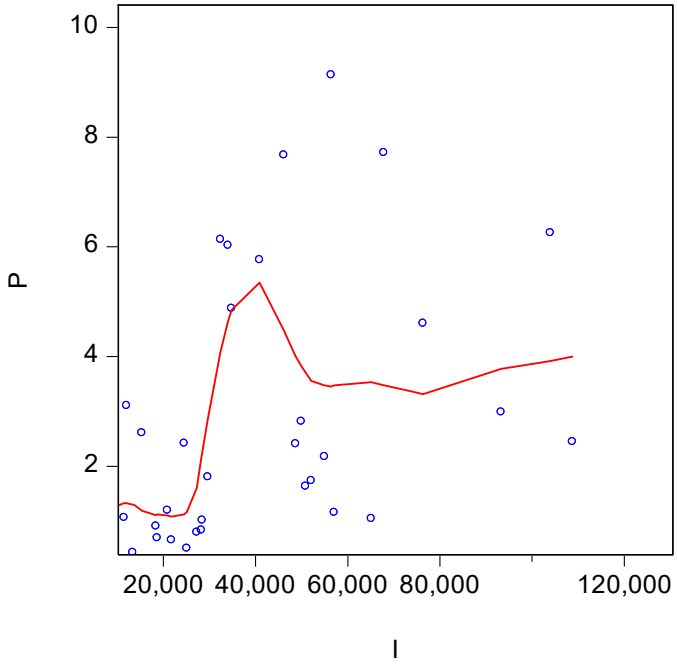


Figure 4. Life insurance penetration and GDP per capita of forty-one countries in 2022.

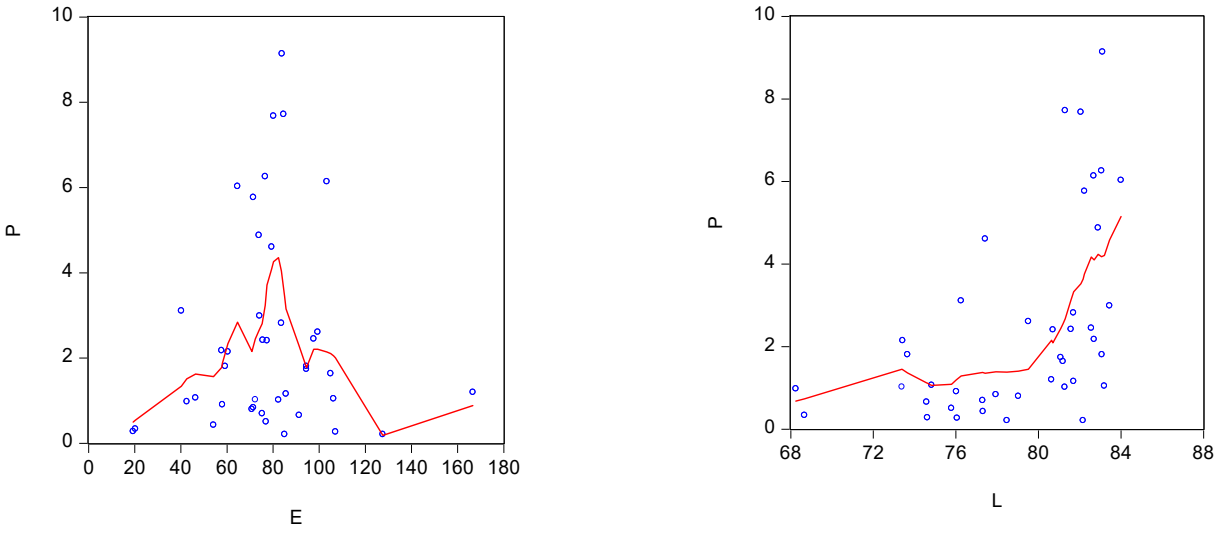
Table 5. GMM results of Models 7 to 12.

VARIABLE	ALL		≤USD 13,845		>USD 13,845	
	7	**8**	**9**	**10**	**11**	**12**
P(−1)	0.98 ***		0.5 **		0.86 ***	
D(−1)		0.32 ***		0.17		0.45 ***
I	0.32 ***	1 ***	−0.18 **	0.71 ***	0.22 ***	0.70 ***
E	−1.04 ***	−1.2 ***	0.35	0.08	−0.7 ***	−0.9 ***
L	5.32 ***	−2.2 ***	0.74	8.77	2.30 ***	−0.4 ***
J-stat	35.40	37.87	8.54	6.48	28.13	28.82
Prob(J-stat)	0.31	0.22	0.29	0.48	0.35	0.32
AR(2)	0.47	0.18	0.29	0.92	0.98	0.92
P(−1) (FEM)	0.72		0.68		0.72	
P(−1) (PLS)	0.99		0.99		0.99	
D(−1) (FEM)		0.59		0.49		0.60
D(−1) (PLS)		0.97		0.97		0.97

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

On the contrary, education in high-income countries shows a negative effect on life insurance penetration but a positive effect in non-high-income countries. Life expectancy shows a consistent positive effect on life insurance penetration for all models. The effect of life expectancy on penetration in high-income countries is around two and a half times more important than in non-high-income countries. Life expectancy also shows a higher effect on life insurance penetration than income and education in all models.

Moreover, this study finds that education has a non-monotonic relationship with life insurance penetration. Figure 5 shows that as people attain a higher level of education, they reduce life insurance demand. The decline in life insurance demand (P) begins as the level of education (E) exceeds around 80. While life expectancy has a monotonic relationship, the increase in penetration accelerates as life expectancy (L) exceeds around 80.



(**a**) (**b**)

Figure 5. (**a**) Education and life insurance penetration of forty-one countries in 2022; (**b**) life expectancy and life insurance penetration of forty-one countries in 2022.

5. Discussion

This study finds that income has a negative and significant effect on life insurance penetration in high-income countries. This result is also found in all data, but income does not significantly affect life insurance penetration. Conversely, income has a positive but not significant effect on penetration in non-high-income countries. Therefore, there is a non-monotonic relationship between income and life insurance demand.

The negative effect of income on life insurance demand contrasts with numerous researchers over more than 50 years. Hammond et al. (1967) show, using data from America, that income has a positive elasticity, with elasticity being higher in middle-income households. Current research, such as Dragota et al.'s work (2023), also finds that GDP per capita has a positive and significant impact on life insurance demand.

This non-monotonic result differs from the non-linear relationship argued by Enz (2000), as life insurance demand not only slows as income enters the developed economic stage, but the sign of income's effect changes to negative. Figure 4 also shows that the relationship between income and penetration has an inverted U-shape, not an S-shape.

Thus, the inverted U-shaped curve in Figure 1 is not an anomaly but rather reflects the negative effect of income on life insurance demand as a country's economy matures. Figure 2 is also not an anomaly, as life insurance penetration will decrease at certain points in the developed economic stage with increasing income.

What makes this non-monotonic relationship? This study argues that education has contributed to this phenomenon. Education shows consistent negative effects on life insurance demand, with a higher coefficient than income. This finding corresponds with Outreville (2015), who states that education has a negative effect, and Mathew and Sivaraman, who argue that people seek insurance substitution as their income and education has grown.

As we conduct further analysis, the data also show that income has a positive effect on life insurance penetration when education is used as a control variable, while education shows a negative effect, with a coefficient higher than income (Appendix D). Therefore, as the level of education of people increases and the growth of education is higher than income, the demand of life insurance may decrease.

This study also finds a dynamic relationship between education and life insurance penetration. This finding corresponds with Kabrt's (2022) argument that consumers are better able to manage risk by investing in low-cost and high-yield financial products as they have a higher educational level. Thus, they will reduce their life insurance demand.

However, income shows a positive and significant effect when education and life expectancy are added as control variables. This finding aligns with Srinivasan and Mitra (2024), who find a positive yet significant effect of income. Srinivasan and Mitra argue that higher income makes life insurance more affordable and that more educated individuals are less hesitant to purchase life insurance.

Thus, despite income showing an inverted U-shapedrelationship with life insurance demand, which means high-income consumers may not buy life insurance, the addition of education and life expectancy in the analysis will help insurers improve the life insurance market.

Life expectancy shows a positive effect on life insurance demand. This finding differs from previous empirical studies by Li et al. (2007) and Lewis' (1989) theory, which states that life insurance demand increases as the probability of the breadwinner's death grows. Figure 5 also shows that life expectancy has a monotonic relationship with life insurance penetration, with the increase in penetration accelerating at a certain point as life expectancy increases.

Therefore, this study suggests insurers to focus not only on non-high-income consumers but also on high-income consumers with high education and life expectancy levels. Recognizing this non-standard relationship also helps insurers to better forecast market conditions and formulate strategies, such as improved monitoring of demand growth and adapting strategic responses when the life insurance market is in a declining stage.

At the country level, non-high-income countries have a massive opportunity in the life insurance market. Maybe in some countries, the life insurance penetration and density seem low, but this study argues that as income, education, and life expectancy increase, the demand of life insurance will continue to grow. Thus, policymakers and regulators should support the development of life insurance demand, such as by offering protection for consumers (Ward & Zurbruegg, 2002) and reducing detrimental market conduct practices (Srbinoski et al., 2022).

One limitation of this study is that it uses only 41 countries from 2013 to 2022 to support the non-monotonic argument. This number is relatively small compared to other research that supports the "S-curve", such as the study by Chang and Lee (2012), which used 92 countries from 1996 to 2008, and Enz (2000) itself, who used 88 countries from 1970 to 1988. Chang and Lee (2012) also portray the curve using 92 countries and reveal an S-curve shape that corresponds to Enz's argument.

Moreover, this study also includes countries with an average income of USD 32,432, almost three times the average GDP per capita in the world. The average income of high-income countries in this study is USD 41,374. For comparison, the average income in Srinivasan and Mitra (2024) is USD 28,677, while Kabrt (2022) reports USD 18,820 (Czech), USD 15,588 (Hungary), USD 15,752 (Poland), and USD 16,656 (Slovakia). With the sample of countries dominated by high-income countries, the results may differ.

However, this study improves Enz's (2000) research by adding education and life expectancy as control variables and using the GMM method to test the effect of income on life insurance demand. This study also shows that education has a non-monotonic relationship with life insurance demand, while life expectancy has a monotonic relationship with life insurance demand. Some differing results from previous studies and limitations of data in this study require further research to enhance comprehensiveness and accuracy.

Another limitation is that this study only analyzes income, education, and life expectancy in its analysis. Interest rates, loading, and risk aversion, as in Lewis' (1989) theory, inflation and banking sector development, as in Beck and Webb's (2003) research's result, law and politics (Ward & Zurbruegg, 2002), and many other determinants are potentially helpful in deepening the analysis of life insurance demand.

This limitation of factor also affect the explanation of non-monotonic phenomena. One potential explanation for the decline in life insurance demand as income increases is the risk aversion hypothesis (Pratt, 1964; Arrow, 1965). Friedman and Savage (1948) explain that consumers' attitudes toward risk change as income rises. A consumer is a risk lover at high income levels but risk averse at lower income levels. A risk-averse consumer will buy life insurance, while a risk lover will take a gamble when facing uncertainty and will not purchase life insurance.

Therefore, the relationship between income, risk aversion, and life insurance demand may explain the non-monotonic phenomenon shown in Figure 1. Life insurance demand will increase as consumers' income grows, because they are risk averse, but decrease as consumers' income stabilizes, as they shift their behavior to become risk lovers. This argument needs to be tested in further research.

Zietz (2003) and Bhatia et al. (2021) review previous research on life insurance determinants but find some contradictory and inconsistent results. Moreover, Zietz (2003) argues that technology, demographic shifts, and environmental changes may likely render previous findings obsolete. Heo (2020) also argues that the determinants of life insurance do not exhibit a simple direct and linear relationship but rather a complicated one, as macroenvironmental and microenvironmental factors interact interdependently and affect purchasing decisions.

Bhatia et al. (2021) assert that it is critical for consumers, insurers, and regulators, as key stakeholders, to understand life insurance purchasing behavior. Kunreuther et al. (2013) argue that each side has an interest in the development of life insurance. Consumer aims to maximize their expected utility, insurers aim to maximize expected profit, while the government also has an interest in social security purposes (Black & Skipper, 1994). Therefore, it would be appropriate to re-examine this research, despite the fact that this topic has been studied for more than fifty years.

6. Conclusions

This study shows that income has a negative effect on life insurance demand across all sample data. Moreover, income positively influences life insurance penetration in non-high-income countries but negatively affects it in high-income countries. Therefore, income and life insurance penetration exhibit a non-monotonic relationship.

This study also finds an inverted U-shaped relationship between education and life insurance demand. Thus, the dynamic relationship between income and life insurance demand arguably arises because as consumers become wealthier and have higher educational levels, they seek insurance substitutes and reduce life insurance demand. This study also identifies a monotonic relationship between life expectancy and life insurance demand.

Understanding this non-monotonic relationship can improve market predictions and forecasting. Companies can develop target markets based on factors that positively influence life insurance demand, such as non-high-income consumers or consumers with high income, education, and life expectancy levels. This study also reveals opportunities for non-high-income countries to enhance the development of their life insurance sectors.

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T.B.; project administration, D.S.P.; funding acquisition, K.R. All authors have read and agreed to the published version of the manuscript.

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Data Availability Statement: Data of world life insurance penetration were manually extracted and can be found in Sigma Explorer (https://www.sigma-explorer.com/, data extracted on 19 May 2024). Data of life insurance penetration and life insurance density on various countries were manually extracted and can be found in OECD.Stat (https://www.oecd-ilibrary.org/finance-and-investment/oecd-insurance-statistics_2307843x, data extracted on 19 May 2024). Data of GDP per capita (current USD) were manually extracted and can be found in World Bank Open Data (https://data.worldbank.org/indicator/NY.GDP.PCAP.CD, data extracted on 19 May 2024).

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A. Indicators of the Studied Countries

Country	I (USD)	P (%)	D (USD)	E (%)	L (years)	i	j	k
Nicaragua	2255	0.28	6.66	19.33	74.62	1	1	
Indonesia	4788	0.98	48.52	42.63	68.25	2	2	
Guatemala	5473	0.34	16.88	20.32	68.67	3	3	
Colombia	6624	1.81	120.29	59.29	73.66	4	4	
Peru	7126	1.03	74.34	72.29	73.39	5	5	
Brazil	8918	2.15	193.28	60.39	73.43	6	6	
Turkiye	10,675	0.21	22.44	127.58	78.48	7	7	
Mexico	11,497	1.07	115.75	46.41	74.83	8	8	
Malaysia	11,993	3.11	383.05	40.27	76.26	9	9	
Costa Rica	13,365	0.43	55.78	54.20	77.32	10	10	
Argentina	13,651	0.27	47.91	107.05	76.06	11	11	
Chile	15,355	2.61	393.81	99.34	79.52	12		1
Hungary	18,390	0.91	167.97	58.07	76.02	13		2
Poland	18,688	0.70	128.33	75.29	77.30	14		3
Greece	20,867	1.20	246.59	166.67	80.64	15		4
Latvia	21,780	0.66	142.83	91.33	74.58	16		5
Portugal	24,515	2.42	592.03	75.56	81.58	17		6
Lithuania	25,065	0.51	127.04	76.92	75.79	18		7
Czechia	27,227	0.80	220.55	70.81	79.03	19		8
Estonia	28,247	0.84	241.13	71.43	77.94	20		9
Slovenia	28,439	1.02	290.62	82.39	81.28	21		10
Spain	29,675	1.81	531.71	94.51	83.08	22		11
Korea, Rep.	32,423	6.14	1989.74	103.28	82.68	23		12
Japan	34,017	6.03	1903.95	64.63	84.00	24		13
Italy	34,776	4.88	1661.72	73.90	82.90	25		14
France	40,886	5.77	2445.32	71.42	82.23	26		15
United Kingdom	46,125	7.68	3477.38	80.15	82.06	27		16
Germany	48,718	2.41	1172.84	77.37	80.71	28		17
Belgium	49,927	2.82	1404.45	83.57	81.70	29		18
Finland	50,872	1.64	834.45	104.94	81.19	30		19
Austria	52,085	1.74	906.82	94.51	81.09	31		20
Israel	54,931	2.18	1199.05	57.64	82.70	32		21
Sweden	56,424	9.14	5137.78	83.90	83.11	33		22

Country	I (USD)	P (%)	D (USD)	E (%)	L (years)	i	j	k
Netherlands	57,025	1.16	663.36	85.65	81.71	34		23
Australia	65,100	1.05	695.95	106.24	83.20	35		24
Denmark	67,790	7.72	5262.16	84.59	81.30	36		25
Iceland	73,467	0.21	154.43	84.99	82.17	37		26
United States	76,330	4.61	3515.38	79.36	77.43	38		27
Switzerland	93,260	2.99	2759.97	74.15	83.45	39		28
Ireland	103,983	6.26	6497.15	76.60	83.06	40		29
Norway	108,729	2.45	2610.11	97.64	82.56	41		30

Appendix B. Correlation Matrix

Correlation matrix for all data with life insurance penetration as the dependent variable.

Variable	P	I	E	L
P	1.00			

I	0.51	1.00		
	0.00	-----		
E	0.08	0.33	1.00	
	0.10	0.00	-----	
L	0.50	0.72	0.51	1.00
	0.00	0.00	0.00	-----

Correlation matrix for all data with life insurance density as the dependent variable.

Variable	D	I	E	L
D	1.00			

I	0.71	1.00		
	0.00	-----		
E	0.13	0.33	1.00	
	0.01	0.00	-----	
L	0.51	0.72	0.51	1.00
	0.00	0.00	0.00	-----

Correlation matrix for non-high-income countries with life insurance penetration as the dependent variable.

Variable	P	I	E	L
P	1.00			

I	0.15	1.00		
	0.12	-----		
E	−0.17	0.55	1.00	
	0.07	0.00	-----	
L	−0.09	0.66	0.54	1.00
	0.34	0.00	0.00	-----

Correlation matrix for non-high-income countries with life insurance density as the dependent variable.

Variable	D	I	E	L
D	1.00			

I	0.38	1.00		
	0.00	---		
E	−0.08	0.55	1.00	
	0.39	0.00	---	
L	0.10	0.66	0.54	1.00
	0.30	0.00	0.00	---

Correlation matrix for high-income countries with life insurance penetration as the dependent variable.

Variable	P	I	E	L
P	1.00			

I	0.36	1.00		
	0.00	---		
E	−0.17	0.01	1.00	
	0.00	0.82	---	
L	0.41	0.53	0.12	1.00
	0.00	0.00	0.04	---

Correlation matrix for high-income countries with life insurance density as the dependent variable.

Variable	D	I	E	L
D	1.00			

I	0.64	1.00		
	0.00	---		
E	−0.12	0.01	1.00	
	0.04	0.82	---	
L	0.38	0.53	0.12	1.00
	0.00	0.00	0.04	---

Appendix C. Average Value of Each Variable in Every Year

Average value for all data.

Year	I (USD)	P(%)	D (USD)	E (%)	L (years)
2013	32,000	2.92	1232	67.42	78.75
2014	32,359	3.12	1369	68.29	79.05
2015	29,047	2.98	1193	69.23	79.01
2016	29,352	2.81	1130	70.48	79.22
2017	31,218	2.80	1186	71.27	79.36
2018	33,232	2.74	1225	71.95	79.49
2019	32,584	2.73	1197	72.90	79.75
2020	31,663	2.63	1140	73.73	78.85
2021	36,244	2.70	1347	76.94	78.46
2022	36,621	2.49	1182	77.97	79.05
Growth	14.44%	−14.81%	−4.05%	15.65%	0.38%
Average	32,432	2.79	1220	72.02	79.10

Average value for non-high-income countries.

Year	I (USD)	P(%)	D (USD)	E (%)	L (years)
2013	8589	0.95	90.07	46.34	74.58
2014	8527	0.93	89.38	48.05	74.73
2015	7882	0.97	78.52	50.62	74.84
2016	7724	1.02	81.78	52.33	74.93
2017	8231	1.03	86.17	53.55	75.12
2018	8012	1.02	88.79	54.64	75.32
2019	7851	1.07	91.98	55.73	75.50
2020	7005	1.11	84.45	56.20	73.81
2021	7858	1.10	92.89	58.31	72.92
2022	8760	1.06	98.63	59.07	74.09
Growth	2.00%	11.84%	9.50%	27.48%	−0.66%
Average	8044	1.02	88.27	53.48	74.58

Average value for high-income countries.

Year	I (USD)	P(%)	D (USD)	E (%)	L (years)
2013	40,584	3.64	1650.39	75.15	80.28
2014	41,097	3.92	1837.56	75.71	80.64
2015	36,808	3.72	1602.14	76.05	80.54
2016	37,283	3.46	1514.60	77.14	80.79
2017	39,646	3.45	1589.49	77.76	80.91
2018	42,479	3.38	1641.06	78.30	81.02
2019	41,653	3.33	1601.62	79.19	81.30
2020	40,704	3.19	1526.71	80.16	80.70
2021	46,652	3.29	1806.47	83.78	80.49
2022	46,837	3.01	1579.15	84.89	80.87
Growth	15.41%	−17.35%	−4.32%	12.97%	0.74%
Average	41,374	3.44	1635	78.81	80.75

Appendix D. Further Analysis

GMM results with income and education as independent variables.

Variable	ALL		≤USD 13,845		>USD 13,845	
P(−1)	0.89 ***		0.95 ***		0.84 ***	
D(−1)		0.31 ***		0.23 ***		0.45 ***
I	0.24 ***	0.98 ***	0.17	0.77 ***	0.16 ***	0.7 ***
E	−1.01 ***	−1.19 ***	−0.39	0.77 ***	−0.6 ***	−1.0 ***
J-stat	33.62	37.81	3.26	7.13	29.21	29.75
Prob (J-stat)	0.44	0.26	0.66	0.52	0.35	0.33
AR (2)	0.74	0.21	0.36	0.63	0.94	0.91
P(−1) FEM	0.72		0.70		0.73	
P(−1) PLS	0.99		0.99		0.99	
D(−1) FEM		0.59		0.50		0.61
D(−1) PLS		0.97		0.97		0.97

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

GMM results with income and life expectancy as independent variables.

Variable	ALL		≤USD 13,845		>USD 13,845	
P(−1)	0.94 ***		0.73 ***		0.85 ***	
D(−1)		0.33 ***		0.18		0.39 ***
I	0.02	0.48 ***	0.02	0.78 ***	−0.11 ***	0.29 ***
L	3.35 ***	−0.97 ***	1.50	2.35	1.11 ***	
J-stat	36.71	38.33	9.54	7.74	28.25	28.47
Prob (J-stat)	0.30	0.24	0.30	0.46	0.40	0.39
AR (2)	0.60	0.54	0.27	0.69	0.93	0.99
P(−1) FEM	0.71		0.68		0.72	
P(−1) PLS	0.99		0.99		0.99	
D(−1) FEM		0.59		0.49		0.60
D(−1) PLS		0.97		0.97		0.97

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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