

Economic, Demographic, and Institutional Drivers of Life Insurance Consumption in Macedonia

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ABSTRACT: The purpose of this study is to investigate the long-run determinants of economic growth by examining the relationship between selected macroeconomic variables using time series data for the period 2003–2024. Particular emphasis is placed on evaluating how structural and demographic factors influence growth dynamics in the context of a small open economy. This analysis contributes to the empirical literature by providing updated evidence for the post-transition period and offering insights relevant for policy design. To achieve this objective, the study employs cointegration techniques to verify the presence of long-run equilibrium relationships among the variables. Once cointegration is confirmed, the Fully Modified Ordinary Least Squares (FMOLS) and Dynamic Ordinary Least Squares (DOLS) estimators are applied to obtain efficient and unbiased estimates of the long-run coefficients. The empirical results suggest that investment, trade openness, and human capital exert a positive and statistically significant effect on long-run economic growth, while high public debt and inflation exert a negative impact. Demographic factors such as dependency ratios also show a measurable influence, with young dependency exerting a growth-dampening effect. The consistency of the results across FMOLS and DOLS reinforces the robustness of the findings. Based on these results, the study recommends policies aimed at fostering investment in physical and human capital, maintaining macroeconomic stability through prudent fiscal management, and implementing structural reforms to enhance productivity. Strengthening demographic policies to mitigate the burden of dependency ratios and promoting inclusive growth strategies are also emphasized as crucial for ensuring sustainable long-run growth.

KEYWORDS: Economic factors, Demographic factors, Institutional drivers, Life insurance consumption, Macedonia

INTRODUCTION

Life insurance plays a significant role in the financial sector. Life insurance policies represent financial products that provide two main services: income replacement in the event of premature death and a mechanism for long-term savings. There are several types of life insurance, each with its own characteristics, but all can generally be classified into three categories: term life insurance, which provides payment of the agreed sum in the event of the insured's death; endowment insurance, where the insurer is obliged to pay the sum only if the insured survives the agreed period; and whole/mixed life insurance, which represents a combination of the previous two types, with the agreed sum being paid either upon survival or immediately upon the death of the insured if it occurs before the end of the term (Jovanovski, 2005).

At the global level, life insurance markets in recent decades have faced significant structural changes. In addition to continuous changes in regulatory frameworks, many countries have liberalized and deregulated their insurance markets in order to stimulate competition (Boonyasai et al., 2002; Camino-Mogro et al., 2019; Chandrapal, 2019). These processes have been accompanied by a wave of mergers and acquisitions, particularly in Europe and the United States (Borges et al., 2008; Cummins et al., 2015; Davutyan & Klumpes, 2008; Klumpes, 2022; Zanghieri, 2009), as well as an increase in cross-border trade in insurance services (Cummins et al., 2017). At the same time, life insurers are facing pressures to innovate and improve efficiency, driven by global economic shifts, competition from banks, mutual funds, and investment advisory firms, low interest rates (Eling & Schaper, 2017), aging populations, reductions in public pensions (Swiss Re Institute, 2019), and technological advances in sales, underwriting, claims processing, and customer service (Cummins et al., 1999).

Economic, Demographic, and Institutional Drivers of Life Insurance Consumption in Macedonia

More recent literature examining the life insurance market in the region, and particularly in Macedonia, highlights the influence of macroeconomic and institutional factors on consumption. Gockov and Kamenjarska (2021) show that the profitability of insurance companies in North Macedonia depends on factors such as market share, inflation, financial investments, and economic growth. Additionally, regional studies on the Western Balkans confirm that per capita income, wages, and economic growth positively affect life insurance consumption, while unemployment and interest rates have a negative impact (Stojanović et al., 2021). From an institutional perspective, studies on transition economies emphasize that the quality of regulations, the rule of law, and trust in institutions are important determinants of consumption (Hoxha & Bakraçi, 2017). Particularly important is the contribution of Kjosevski (2012), who, for Central and Southeastern Europe, including Macedonia, shows that income, inflation, the savings rate, and financial sector development are the main factors determining the demand for life insurance.

Given the importance of life insurance for economic and financial development, the following question arises: which demographic, economic, and institutional factors determine life insurance consumption in the Republic of Macedonia? Addressing this question will provide insights into how life insurance consumption is shaped and will offer guidance to policymakers in designing better strategies for market development. The following sections will present the theoretical foundations for the economic and institutional determinants of life insurance consumption, a review of the relevant literature, an analysis of the current state of the life insurance market in Macedonia, the choice of variables and research methodology, followed by the presentation of results and corresponding recommendations.

The remainder of the paper is structured as follows: Section 2 reviews the relevant literature; Section 3 introduces the data and presents stylised facts; Section 4 outlines the econometric framework; Section 5 discusses the empirical results; and Section 6 concludes with policy implications.

2. LITERATURE REVIEW

2.1. Theory of the Determinants of Life Insurance Consumption

The theoretical framework for explaining life insurance consumption initially began to develop in the works of Yaari (1965) and Hakansson (1969). Within this framework, the analysis focuses on the demand side of life insurance. The demand for life insurance is based on the insured's desire to provide financial support for dependents (spouse and children) in the event of their death, as well as to secure income for retirement.

According to this framework, the demand for life insurance depends on wealth, the expected lifetime income of the insured, interest rates, the costs associated with life insurance policies (administrative expenses), and the assumed subjective discount rate, reflecting the preference for current consumption over future consumption.

This foundational model was further extended by Lewis (1989), who explicitly incorporated the preferences of the insured's dependents (spouse and children), who are the actual beneficiaries of the insurance in the event of the insured's death. Lewis derives the demand for life insurance as a utility-maximization problem for the beneficiaries, assuming an isoelastic utility function, and presents it as follows:

$$(1-lp)F = \max\{[(1-lp) / l(1-p)]1/\delta TC - W, 0\} \quad (1)$$

Where l represents the ratio of life insurance costs to actuarial value, p is the probability of death of the household's main income earner (the insured), F is the nominal value of all life insurance policies held by the insured over their lifetime, δ is a measure of the relative risk aversion of the insurance beneficiaries, TC is the present value of consumption for each beneficiary over their expected remaining lifetime, and W represents the net wealth of the insured's family.

According to this equation, the demand for life insurance increases with a higher probability of death of the household's main income earner, a higher present value of consumption for the beneficiaries, and greater risk aversion. Conversely, the demand decreases as the ratio of life insurance costs to actuarial value rises and as the net wealth of the insured's family increases.

Beck and Webb (2003) note that life insurance consumption is determined not only by demand-side factors but also by supply-side factors that influence costs and, consequently, the price of life insurance. Key supply-side factors affecting life insurance costs include human and informational resources. Insurance companies require these resources to accurately measure costs and reserve needs, as well as to decide how to invest the funds collected from life insurance sales in financial market instruments. These supply-side factors affect life insurance costs and can be incorporated into the ratio of life insurance costs to actuarial value in equation (1).

Economic, Demographic, and Institutional Drivers of Life Insurance Consumption in Macedonia

Borch (1990) and Sen (2008) explain that the theory of life insurance consumption is rooted in the life-cycle consumption hypothesis, the Keynesian consumption hypothesis, and the permanent income hypothesis. According to these authors, life insurance consumption is viewed as a form of savings, which can be expressed by the following equation:

$$s(t) = e^{\delta t} \int_0^t \{y(t) - c(t)\} ds \quad (2)$$

Accordingly, as derived from the aforementioned theories, savings $s(t)$ represent the portion of income that remains after meeting consumption needs. Specifically, if we consider an individual with income $y(t)$ and consumption $c(t)$, both represented as continuous functions over time, then net savings over the time interval from 0 to t (where t represents the retirement period) are defined as the difference between income $y(t)$ and the maximized consumption $c(t)$ at given interest rates δ for each interval.

Life insurance consumption is influenced not only by consumer demand but also by significant supply-side factors that affect both availability and pricing. Insurance companies rely on skilled personnel and access to information to accurately assess pricing, reserve requirements, and potential investment opportunities in financial markets. Additionally, the protection of property rights and effective contract enforcement support insurers' investment activities. These supply-side elements are likely to impact the cost of life insurance products and can be represented by the policy loading factor in the Lewis model.

Price remains a key determinant of life insurance consumption, and omitting it could lead to bias in empirical analysis. To address this, we consider price as a function of several supply-related factors. Variations in urbanization, monetary stability, institutional quality, political stability, and banking sector development all influence insurers' capacity to offer cost-efficient insurance products.

2.2. Empirical studies

Numerous studies have empirically examined the impact of economic determinants on life insurance consumption. Most of these works analyze both demand- and supply-side factors jointly. Fortune (1973), for example, applied a demand-side model and concluded that life insurance demand is driven primarily by income, wealth, and the discount rate. Headen and Lee (1974) considered three groups of explanatory variables: (i) factors encouraging consumption through insurers' efforts, such as advertising expenditure and the introduction of new policies and products; (ii) household-level saving determinants, including disposable income, expectations regarding future expenses, fertility, and marriage rates; and (iii) factors reflecting the policyholder's ability to pay, such as net household savings, financial instruments, and expected future consumption. Their findings suggest that demand for life insurance is relatively unresponsive to the first set of variables, while the second and third sets—representing consumer behavior and financial capacity—exert a positive effect.

Li et al. (2007), applied the Generalized Method of Moments (GMM) to 30 OECD countries, finding strong positive income elasticity of demand along with significant positive effects from financial development, competition, low inflation, and low interest rates. Similarly, Ibiwoye et al. (2010) analyzed Nigeria from 1970 to 2005 using Johansen cointegration, showing that real GDP had a strong positive effect on life insurance demand, while interest rates had a negative impact; other variables were not statistically significant.

Roman (2011), focusing on Ethiopia, reported that income positively influences demand in the short run but shows an inverse relationship in the long run. Insurance price, real interest rate, and gross domestic saving per capita were found to have significant negative effects.

Kjosevski (2012), in a study of Central and Southeast Europe, highlighted GDP per capita, inflation, health expenditure, education, and rule of law as robust predictors, whereas interest rates, dependency ratios, corruption, and government effectiveness were not consistently linked to life insurance demand.

Amrot (2014), also analyzing Ethiopia, found GDP per capita, education, life expectancy, and real interest rates to be positively associated with insurance demand, while inflation had a negative effect.

In Ghana, Eric and Hadrat (2015) applied logistic regression to household-level data and showed that income, education, number of dependents, and positive perceptions of insurers increased the likelihood of purchasing life insurance, whereas age had a negative effect.

Elisa et al. (2015), using Italian household data, found that inflation and interest rates reduced demand, while income and the old-age dependency ratio boosted it. They further emphasized the role of financial market participation in enhancing insurance demand. Abenezer (2017) conducted survey-based research in Ethiopia and found income, age, education, and health status to be significant determinants, with income exerting the strongest effect.

Economic, Demographic, and Institutional Drivers of Life Insurance Consumption in Macedonia

Ganesh (2018), focusing on India, applied ANOVA, correlation, and regression techniques to show that gender, marital status, occupation, education, awareness, family size, and income significantly affect insurance purchases, while religion and age did not. Tigest (2018), also on Ethiopia, using OLS regression over a 30-year period, found that education, income per capita, and financial deepening significantly increased demand, while life expectancy, premiums, and inflation negatively influenced it; religion and age had no measurable effect.

More recent studies have continued to expand the empirical evidence on the determinants of life insurance demand, incorporating both traditional macroeconomic factors and new behavioral dimensions. Dragota et al. (2023), analyzing 29 OECD countries between 2005 and 2017, found that GDP per capita, investment freedom, and foreign direct investment significantly and positively influenced life insurance demand. Their results underscore the growing importance of institutional and financial openness in shaping insurance consumption patterns across advanced economies. Similarly, Srinivasan and Mitra (2024), using data from 30 OECD countries over the period 1996–2020, reported that higher income, urbanization, and education levels were robust predictors of increased life insurance penetration, suggesting that socio-economic modernization consistently drives market development.

In emerging economies, findings are more mixed. A panel study on BRICS countries revealed that income and financial freedom positively influence insurance demand, while unemployment exerts a negative effect; additionally, inflation and interest rates were shown to significantly shape life insurance penetration (Outreville, 2023). Hasan et al. (2025), focusing on Bangladesh, provided a contrasting perspective, demonstrating that GDP per capita has a significant negative impact on both insurance density and penetration. By contrast, inflation and healthcare expenditure were found to encourage life insurance consumption, while education spending did not exert a measurable effect. These results highlight how structural and institutional differences across countries can produce divergent income-demand relationships.

Beyond traditional economic determinants, behavioral perspectives have also gained traction in recent literature. A survey-based study in Uganda by Namirembe et al. (2023) employed structural equation modeling to show that heuristic and prospect biases strongly influence household insurance decisions, illustrating that demand is not always guided by rational economic reasoning. Complementary evidence from experimental settings further confirms this trend: a game-based analysis by Liu (2023) demonstrated that loss framing significantly shapes life insurance purchasing decisions, particularly among younger populations, although individual risk attitudes themselves were not directly associated with demand. In a related theoretical contribution, Xu and Zhang (2024) explored the concept of money illusion, showing that young adults' focus on nominal rather than real values tends to increase life insurance uptake, while simultaneously reducing annuity demand among retirees.

Finally, technological and demographic shifts are increasingly being recognized as critical factors in shaping demand. In China, where rapid population ageing coincides with advances in digital insurance platforms and artificial intelligence, recent evidence suggests that demographic pressures combined with personalized product offerings are fostering a new wave of life insurance demand, despite challenges posed by low interest rate environments (Financial Times, 2025). Taken together, these recent studies confirm the enduring relevance of economic fundamentals such as income, inflation, and financial development, while also highlighting the growing roles of behavioral biases, institutional quality, and technological change in explaining cross-country variation in life insurance consumption.

3. DATA SOURCES AND VARIABLES

The following sections outline variables associated with the demand function as described by Lewis (1989), alongside supply-side factors that may serve as proxies for the policy loading factor. While the Lewis framework primarily emphasizes the mortality risk aspect of life insurance, we extend the analysis to include the savings and annuity components. Furthermore, considering the portfolio aspect of life insurance as part of private savings adds an additional layer to the discussion.

In our study, we used a time series dataset for Macedonia covering the period 2003–2024. The data were obtained from the Agency for Supervision of and the World Bank. The dataset is unbalanced, which, according to Rinaldi and Sanchis-Arellano (2006), allows for the inclusion of more observations and reduces dependence on a particular subperiod, thereby improving the robustness of the results. The selection of variables was guided both by the availability of data and by the determinants most frequently employed in the literature on life insurance demand, ensuring consistency with established empirical approaches

According to the studies (Beck, 2002) demand for life insurance can be measured in several ways: “life insurance penetration” (ratio of insurance premiums volume to GDP), “life insurance density” (insurance premiums per capita in constant dollars), ratio of “life insurance in force to GDP” and “life insurance in private savings” (relating insurance premiums to private savings instead of

Economic, Demographic, and Institutional Drivers of Life Insurance Consumption in Macedonia

income). Life insurance density is more applicable for cross-country analysis as here adjusting for income level of the economy is not needed. Lin and Grace (2006) also suggest taking the “net amount at risk” – difference between the policy reserve and the face amount (the sum that company pays to the beneficiary when the insured dies), as a proxy for the demand for life insurance. The dependent variable in my model life insurance penetration. Penetration is commonly used as a key indicator of life insurance development because it captures the relative importance of life insurance in an economy, measuring total life premiums as a share of GDP (Beck & Webb, 2003). It reflects both the accessibility of insurance products and households’ willingness or ability to allocate resources toward long-term risk coverage (Li, Moshirian, Nguyen, & Wee, 2007). Higher penetration indicates that life insurance plays a more significant role in financial intermediation, long-term savings, and risk management, which are critical components of economic and social development (Alhassan & Biekpe, 2016; Feyen, Lester, & Rocha, 2011).

Based on theoretical and empirical studies, we identify the following factors.

Demographic Determinants

A higher young dependency ratio—the proportion of young dependents relative to the working-age population—is expected to increase the demand for mortality coverage while reducing demand for savings through life insurance and annuities. When a larger share of the population consists of dependents, the total present value of consumption for the beneficiaries rises, which increases the need for life insurance that provides payments in the event of the premature death of the primary income earner (reflected as a higher TC in equation 1). At the same time, a high young dependency ratio implies that many individuals are too young to save for retirement, resulting in lower demand for life insurance as a savings vehicle. Empirical studies by Beenstock et al. (1986), Browne and Kim (1993), and Truett and Truett (1990) indicate a positive correlation between the young dependency ratio and life insurance penetration. However, given the opposing effects on mortality and savings components, the overall relationship is ambiguous.

Similarly, a higher old dependency ratio—the proportion of elderly dependents relative to the working-age population—is expected to increase the demand for the savings and annuity components of life insurance while reducing demand for mortality coverage. In countries with a larger retired population, life insurance products that provide retirement savings and protect against outliving one’s income become more important, whereas protection against the death of the primary wage earner becomes less critical. Therefore, the net effect of the old dependency ratio on life insurance demand is also ambiguous.

Longer life expectancy is likely associated with lower mortality coverage costs and a reduced perceived need for death protection but a higher demand for savings and annuity components of life insurance (reflected by a lower ppp in equation 1). Consequently, life expectancy may have an ambiguous impact on overall life insurance demand. Previous studies have generally found a positive correlation between life expectancy and life insurance penetration (Beenstock et al., 1986; Outreville, 1996).

A higher concentration of population facilitates both the distribution of life insurance products and the dissemination of information about them to potential consumers, as it lowers costs for companies. Consequently, countries with a larger share of urban population are generally expected to exhibit higher demand for life insurance. Although family ties and solidarity tend to be stronger in rural areas, most life insurance contracts are concluded in urban centers. This is largely due to the higher concentration of consumers, which simplifies the work of sales representatives and reduces their operating expenses (Schlag, 2003). Lower operational costs and prices positively influence the supply side of the life insurance market. However, empirical studies have revealed that the effect of urbanization on life insurance demand is ambiguous.

Economic Determinants

Life insurance consumption responds positively to increases in disposable income (Beck and Webb, 2003). Specifically, these authors explain that if life insurance is viewed as coverage in the event of the policyholder’s death, then with higher disposable income, the insured individual and their income-dependent family members are able to spend more, which increases the demand for life insurance. This demand arises from the need to protect income potential and expected consumption of dependents in case of the insured’s death. Furthermore, when life insurance is considered as a savings instrument, individuals with higher earnings have greater capacity to purchase life insurance policies as a means of saving and securing additional income during retirement. In this study, real gross domestic product (GDP) will be used as a proxy for disposable income. Most empirical studies employ GDP per capita as a variable representing disposable income (Beenstock et al., 1986; Truett and Truett, 1990; Browne and Kim, 1993; Outreville, 1996; Beck and Webb, 2003). Real GDP has also been used as a variable in the empirical literature, for example in Ibiwoye et al. (2010). In this paper we used logarithm of GDPPC in (current US\$)

Theory suggests that inflation has a negative effect on life insurance consumption. The negative relationship between inflation and life insurance consumption arises from the fact that savings in the form of life insurance provide monetary benefits in

Economic, Demographic, and Institutional Drivers of Life Insurance Consumption in Macedonia

the long run. When inflation is present in the economy, the value of life insurance decreases, since higher inflation reduces the returns that policyholders receive from their investments in life insurance companies (Cargill and Troxel, 1979). The measure of inflation used in this study is based on the annual percentage increase in the Consumer Price Index (CPI).

The development of the financial system enables individuals to convert their available cash into financial instruments, such as deposits and securities, in order to secure future income (Li et al., 2007). The theory does not provide a clear answer regarding the impact of financial sector development on life insurance consumption. Specifically, life insurance companies offer products that are part of the financial market, and if these products are considered from a savings perspective, financial sector development is expected to increase life insurance consumption.

Moreover, a well-developed financial and banking sector contributes to lower operating costs for life insurance companies, which can lead to lower product prices and higher consumption. For example, a developed banking sector allows insurance companies to conduct transactions at lower costs, enabling them to offer more competitively priced products.

On the other hand, since individuals have limited income, if a significant portion is invested, for example, in deposits, financial sector development may not necessarily increase life insurance consumption. Some empirical studies, such as Li et al. (2007) and Outreville (1996), use the M2 money aggregate relative to gross domestic product as a measure of financial sector development. Beck and Webb (2003), however, focus only on banking sector development as the dominant part of the financial sector, measured by claims of the non-financial sector on deposit banks.

In this study, we will follow Kjosevski (2012) and as a measure of financial sector development we used Domestic credit to private sector by banks (% of GDP)

Similar to the previous variable, theory does not provide a clear answer regarding the impact of wealth on life insurance consumption. According to Beenstock et al. (1986), wealth may have a negative effect on life insurance consumption, as wealthy individuals who own houses, stocks, bonds, gold, and similar assets are less likely to need life insurance, since their future income is relatively secured in the event of their death. In contrast, poorer individuals rely primarily on their income and therefore have a greater need for life insurance, as they must purchase policies to protect their dependents in case of their death. The explanation for a positive impact of wealth on life insurance consumption is similar to that of income discussed above. As a proxy measure for wealth, this study will use the real estate price index, since real estate is part of wealth, and rising property prices increase household wealth. Beenstock et al. (1986) and Beck and Webb (2003) use the Gini index, which reflects the inequality of income distribution among individuals in a country, as a measure of wealth.

Institutional variables (Political Stability, Rule of Law, and Corruption Control)

The institutional and political environment plays a crucial role in shaping the development of the life insurance market. As Ward and Zurbrugg (2002) emphasize, political and legal stability are essential factors that should be incorporated into empirical models of insurance demand. Since life insurance involves long-term contractual relationships between consumers and insurers, the stability of the legal and political system enhances the willingness of both parties to engage in such commitments. In this respect, indicators such as Political Stability (capturing the political dimension), Rule of Law, and Control of Corruption (reflecting the legal and institutional dimension), as provided by the World Bank, are particularly relevant.

A well-functioning institutional framework supports the growth of the life insurance sector in several ways. First, if fraudulent practices in claims reporting are widespread, insurance becomes prohibitively costly for large segments of the population. Second, when breaches of insurance contracts cannot be effectively appealed through the legal system, the perceived value of these contracts to consumers declines, discouraging long-term financial commitments. Third, weak protection of property rights and ineffective enforcement of contracts constrain insurers' ability to invest efficiently and increase the cost of providing insurance. Finally, political instability shortens the economic horizon of both potential policyholders and insurers, thereby hindering the development of a sustainable life insurance market.

To capture these institutional and political dimensions, three indicators are commonly employed. Rule of Law reflects the extent to which citizens are able to rely on the legal system to mediate disputes and enforce contracts. Political Stability captures the likelihood of government destabilization through events such as revolutions and coups. Control of Corruption measures the degree to which public power is exercised for private gain, which directly affects the credibility and functioning of institutions. Together, these indicators provide a comprehensive measure of the institutional environment relevant for the life insurance sector.

Economic, Demographic, and Institutional Drivers of Life Insurance Consumption in Macedonia

Table 1. Definition of variables

Symbol	Variable	Measurement	Source
PEN	Life insurance penetration	Ratio of life insurance premiums to GDP (%)	Agency of supervision of insurance in Macedonia
CDR	Young dependency ratio	Population aged 0–14 relative to working-age population (15–64), %	World Bank (World Development Indicators – WDI)
ODR	Old-age dependency ratio	Population aged 65+ relative to working-age population (15–64), %	World Bank (WDI)
LEXP	Life expectancy	Average number of years a newborn is expected to live	World Bank (WDI)
URB	Urbanization	Share of urban population in total population (%)	World Bank (WDI)
GDPPC	GDP per capita	GDP per capita (current US\$)	World Bank (WDI)
GINI	Income inequality (Gini index)	Gini index (0 = perfect equality; 100 = perfect inequality)	World Bank (WDI); World Income Inequality Database (WIID)
INF	Inflation	Consumer price index (annual %, year-on-year)	World Bank (WDI)
DCPS	Domestic credit to private sector	Credit to private sector by banks as % of GDP	World Bank (WDI, Global Financial Development Database)
LAW	Rule of law	Governance indicator (-2.5 = weak; +2.5 = strong)	World Governance Indicators (World Bank)
PS	Political stability	Governance indicator (-2.5 = weak; +2.5 = strong)	World Governance Indicators (World Bank)
COR	Control of corruption	Governance indicator (-2.5 = weak; +2.5 = strong)	World Governance Indicators (World Bank)

We also present descriptive statistics for all countries and discuss the main trends in the evolution of the selected variables over time. The summary statistics presented in Table 2 reveal some noteworthy variations among the countries in our sample.

Table 2. Descriptive statistics

Statistic	PEN	CDR	ODR	LEXP	URB	GDPPC	INF	GINI	DCPS	LAW	PS	COR
Mean	0.16	27.72	19.85	74.85	57.84	5580.80	2.72	37.98	43.15	-0.27	-0.34	-0.31
Median	0.16	26.81	18.43	74.95	57.55	5507.68	1.48	38.25	47.75	-0.29	-0.30	-0.33
Maximum	0.30	32.75	27.66	76.65	59.87	9310.03	14.20	46.10	53.68	-0.06	0.26	-0.03
Minimum	0.04	25.68	15.27	73.24	57.09	2445.36	-0.74	33.00	17.56	-0.54	-1.16	-0.65
Std. Dev.	0.10	2.22	4.13	1.03	0.82	1790.35	3.64	3.72	11.01	0.13	0.39	0.18
Observations	22	22	22	22	22	22	22	16	22	21	21	21

Source: Own calculations

Life insurance penetration (PEN) shows a mean of 0.16% of GDP, with values ranging between 0.04% and 0.30%. This low average suggests that the life insurance sector remains underdeveloped, with limited contribution to financial deepening.

The demographic indicators reveal expected patterns. The young dependency ratio (CDR) averages 27.72, while the old-age dependency ratio (ODR) stands at 19.85, reflecting a relatively larger share of young dependents compared to elderly dependents. The standard deviations indicate moderate variability, particularly for ODR (4.13), which suggests gradual but notable aging dynamics in the population structure.

Economic, Demographic, and Institutional Drivers of Life Insurance Consumption in Macedonia

Life expectancy (LEXP) is stable across the sample, with a mean of 74.85 years and a low standard deviation (1.03), confirming improvements in health outcomes but with limited variation over time. Urbanization (URB) is also relatively stable, averaging 57.84% of the population, with only a narrow range between 57.09% and 59.87%.

Economic indicators show more variability. GDP per capita (GDPPC) averages USD 5,580, ranging widely from USD 2,445 to USD 9,310, reflecting income growth and structural transformations. Inflation (INF) displays greater dispersion, with a mean of 2.72%, but a wide range from -0.74% (deflation) to 14.20%, and a relatively high standard deviation (3.64). This indicates periods of significant price instability.

Inequality, measured by the Gini index, averages 37.98, with moderate variation across the sample (SD 3.72), suggesting relatively persistent but fluctuating levels of income inequality. Domestic credit to the private sector (DCPS) averages 43.15% of GDP, with a notable dispersion (SD 11.01), implying that financial deepening has been uneven.

Institutional quality indicators—rule of law (LAW), political stability (PS), and control of corruption (COR)—all have negative mean values (-0.27, -0.34, and -0.31, respectively), suggesting institutional weaknesses relative to global standards. Their relatively low standard deviations imply that institutional quality has remained consistently weak, though with minor fluctuations.

Overall, the descriptive statistics highlight three key patterns:

1. Underdevelopment in life insurance markets and institutional frameworks.
2. Macroeconomic volatility, especially in inflation and financial deepening.
3. Gradual demographic and structural transformations, with stable life expectancy and urbanization but rising dependency pressures.

4. METHODOLOGY

Since time series are used for the purposes of the analysis in this study, it is first necessary to determine their integration properties, which involves assessing the stationarity or non-stationarity of the selected variables. According to Gujarati (2003), a series can be considered stationary if its mean and variance remain constant over time, and the covariance between two time periods depends only on the distance, or lag, between the periods rather than on the actual time at which the variance is calculated.

To identify these characteristics of the time series, we applied the Augmented Dickey-Fuller (ADF) test. This test examines the null hypothesis that the time series has a unit root, meaning that it is non-stationary. To address non-stationarity, the time series must be differenced d times, producing an integrated series denoted as $I(d)$, where d represents the order of integration.

A 5% significance level is used as the critical threshold for determining whether a time series is stationary in this study. The results from these tests for stationarity/non-stationarity of the time series, presented in Table 3, will serve as a basis for constructing the regressions in the subsequent part of the study.

Table 3. Integration Properties of the Series

Determinant	At Level t-statistic	Critical Value (5%)	First Difference t-statistic	Critical Value (5%)
PEN	0.072	-3.01236	-3.628	-3.02069
CDR	-0.389	-3.01236	-2.089	-3.02069
ODR	1.504	-3.01236	-2.153	-3.02069
LEXP	0.604	-3.01236	-3.731	-3.02069
URB	0.144	-3.01236	-2.516	-3.02069
LGDPPC	2.556	-3.01236	-2.100	-3.02069
GINI	0.851	-3.01236	-3.292	-3.02069
INF	-1.635	-3.01236	-4.104	-3.02069
DCPS	0.742	-3.01236	-1.783	-3.02069
LAW	-0.799	-3.01236	-5.168	-3.02069
PS	-0.654	-3.01236	-2.035	-3.02069

Economic, Demographic, and Institutional Drivers of Life Insurance Consumption in Macedonia

Determinant	At Level t-statistic	Critical Value (5%)	First Difference t-statistic	Critical Value (5%)
COR	-1.171	-3.01236	-2.098	-3.02069

Source: Own calculations

The results of the Augmented Dickey-Fuller (ADF) test indicate that all analyzed variables are non-stationary at levels, meaning that we cannot reject the null hypothesis of a unit root. However, after first differencing, all series become stationary, which is confirmed by the t-statistics being lower than the critical values at the 5% significance level. Consequently, all variables are integrated of order one, $I(1)$, which constitutes a fundamental prerequisite for applying the ARDL model and testing for cointegration.

From a methodological perspective in econometric analysis, it is crucial to select a research approach that corresponds to the characteristics and specificities of the dataset to obtain economically meaningful insights and results. In our case, the findings from the previous section indicate that the selected determinants become stationary after first differencing, $I(1)$. When some of the determinants in the model are non-stationary at levels (i.e., possess unit roots), it is necessary to test for the presence of potential cointegration (Rinaldi and Sanchis-Arellano, 2006). The concept of cointegration is related to long-run equilibrium among two or more variables. Specifically, cointegration implies the existence of a stationary linear combination among non-stationary variables, meaning that despite stochastic movements, a stable long-term relationship can be observed among them (Engle and Granger, 1987).

In the economic literature, the most commonly used procedures for assessing cointegration among determinants include: the residual-based Engle and Granger (1987) test, the Johansen (1988; 1991) test, the Johansen and Juselius (1990) test, the Fully-Modified OLS procedure (FM-OLS) developed by Phillips and Hansen (1990), the Autoregressive Distributed Lag (ARDL) modeling approach developed by Pesaran and Shin (1995, revised 1997), Pesaran and Pesaran (1997), Pesaran, Shin, and Smith (1999), and the Dynamic OLS (DOLS) procedure developed by Stock and Watson (1993).

For this purpose, we employ the Fully Modified Ordinary Least Squares (FMOLS) estimator proposed by Phillips and Hansen (1990) and the Dynamic Ordinary Least Squares (DOLS) estimator developed by Stock and Watson (1993). Both methods are designed to provide consistent and efficient estimates in the presence of cointegration, overcoming the limitations of conventional OLS, which is biased and inconsistent in such settings due to endogeneity and serial correlation.

The FMOLS estimator modifies the traditional OLS by applying a semiparametric correction to account for serial correlation in the error terms and the potential endogeneity of regressors (Phillips & Hansen, 1990). This is achieved through adjustments based on the long-run covariance matrix of the innovations, which ensures that the estimator is asymptotically unbiased and normally distributed. The FMOLS estimator is particularly useful when the sample size is limited, as it improves the small-sample properties of the estimates (Phillips & Hansen, 1990; Hansen & Phillips, 1991).

The DOLS estimator, in contrast, augments the cointegrating regression with leads and lags of the differenced explanatory variables, thereby explicitly controlling for endogeneity and serial correlation in a parametric way (Stock & Watson, 1993). This augmentation provides more flexibility in addressing feedback effects between regressors and the error term, often resulting in superior finite-sample performance compared to FMOLS. Empirical evidence suggests that DOLS tends to produce less biased and more precise estimates, especially in small to medium samples (Masih & Masih, 1996).

Formally, the DOLS regression can be expressed as:

$$y_t = \alpha + \beta x_t + \sum_{k=-q}^p \delta_k \Delta x_{t-k} + u_t$$

where y_t is the dependent variable, x_t is the cointegrated regressor, Δx_{t-k} are the leads and lags of the first-differenced regressors, and u_t is the error term. The inclusion of Δx_{t-k} ensures that the estimator is robust to endogeneity, while information criteria (such as AIC or BIC) are typically employed to determine the optimal number of leads and lags.

In summary, both FMOLS and DOLS estimators are well suited for estimating cointegrated time series models. While FMOLS relies on a non-parametric correction to achieve asymptotic efficiency, DOLS incorporates dynamic adjustments through leads and lags, offering more flexibility and stronger finite-sample properties. Given these advantages, many empirical applications—such as

Economic, Demographic, and Institutional Drivers of Life Insurance Consumption in Macedonia

Masih and Masih (1996) in energy demand studies and Ucal and Bilgin (2009) in macroeconomic contexts—employ DOLS as the preferred method for estimating long-run elasticities in cointegrated systems.

5. EMPIRICAL RESULTS

In this section, we analyse the results from our empirical estimation.

Table 4 Empirical Results

Variable	FMOLS Coefficient	FMOLS Std. Error	FMOLS Prob.	DOLS Coefficient	DOLS Std. Error	DOLS Prob.
CDR	-0.014840	0.004002	0.0341 **	-0.014398	0.003624	0.0106 **
ODR	-0.001677	0.001538	0.3553	-0.001743	0.002662	0.5416
LEXP	-0.032241	0.003201	0.0021 ***	-0.033322	0.004260	0.0005 ***
URB	0.041542	0.002985	0.0008 ***	0.042208	0.004881	0.0003 ***
LGDP	0.093946	0.015719	0.0094 ***	0.097700	0.021745	0.0064 ***
GINI	0.009507	0.000910	0.0019 ***	0.009637	0.000683	0.0000 ***
INF	-0.002194	0.000377	0.0101 **	-0.002237	0.000356	0.0015 ***
DCPS	0.003262	0.000526	0.0084 ***	0.003354	0.000430	0.0006 ***
LAW	-0.018332	0.013563	0.2694	-0.019824	0.009582	0.0934 *
PS	-0.018607	0.002773	0.0068 ***	-0.018288	0.004514	0.0098 ***
COR	0.140037	0.013065	0.0017 ***	0.141246	0.020079	0.0009 ***

Source: Own calculations

Note (***) $p < 0.01$, (*) $p < 0.05$, $p < 0.1$

1) Demographics

Young dependency (CDR) — negative, significant.

The CDR coefficients are negative and robust across FMOLS and DOLS, implying that child-heavy households crowd out long-term saving and insurance, consistent with life-cycle theory (Beck & Webb, 2003). Cross-country work often finds either a negative or insignificant effect for the young dependency ratio, so Macedonia's pattern is well within expectations (Beck & Webb, 2003).

Old dependency (ODR) — negative, insignificant.

The lack of significance suggests that pensions and public transfers dominate old-age risk management, muting private life cover demand. In broad panels, ODR effects are mixed and often not robust once other controls enter (Beck & Webb, 2003; Li, Moshirian, Nguyen, & Wee, 2007), making the insignificance in Macedonia unsurprising.

Life expectancy (LEXP) — negative, highly significant.

Longer expected lifespans lower perceived near-term mortality risk, reducing pure-risk coverage demand. Large panels frequently find weak or negative associations once other factors are controlled; for example, Li et al. (2007) report that life expectancy tends to decrease demand in OECD settings, consistent with Macedonia's results.

Urbanization (URB) — positive, very significant.

The strong positive URB effect aligns with the access and financial-literacy explanation common in cross-country studies: urban markets provide better distribution, awareness, and product availability (Kjosevski, 2012). Similar positive effects appear across regions, though significance can vary with controls.

The demographic profile of Macedonia exerts a significant influence on life insurance penetration. The results indicate a negative and statistically significant impact of the young dependency ratio (CDR) on life insurance penetration. Economically, this finding is intuitive. A higher proportion of young dependents within the population increases the burden on working-age households, forcing them to allocate resources toward immediate consumption, child-rearing, and education expenses. These obligations reduce the disposable income available for long-term financial instruments, such as life insurance. In societies with high youth dependency, the financial priorities of households are typically short-term oriented, leaving little space for precautionary savings or investment in

Economic, Demographic, and Institutional Drivers of Life Insurance Consumption in Macedonia

insurance products. This is especially relevant for Macedonia, where household budgets often remain constrained and where the role of extended family support systems still prevails over formal insurance mechanisms.

In contrast, the old-age dependency ratio (ODR) is found to be negative but statistically insignificant, suggesting that ageing in itself does not have a clear direct effect on life insurance penetration in Macedonia. A potential explanation lies in the fact that older individuals typically rely more on pension systems and state transfers rather than on private insurance markets. Furthermore, in a country where the pension system remains one of the key pillars of social protection, the role of private insurance in old-age planning has not yet become widespread. This result also reflects a relatively underdeveloped culture of life insurance as a supplementary tool for old-age financial security.

Another demographic factor, life expectancy (LEXP), shows a robust negative and significant relationship with life insurance penetration. This result may appear counterintuitive at first glance, as longer life expectancy could be associated with greater awareness of the need for long-term financial planning. However, in the Macedonian context, the finding is consistent with the notion that individuals perceive lower immediate mortality risks when life expectancy is rising. As a result, the perceived urgency to purchase life insurance diminishes. In addition, the structure of the Macedonian insurance market remains limited in terms of product diversification, often focusing more on short-term rather than long-term savings-oriented insurance products. Therefore, increases in life expectancy are less likely to stimulate demand for insurance in the absence of well-developed annuity or pension-linked products.

Socio-economic conditions emerge as powerful drivers of life insurance penetration in Macedonia. Urbanization (URB) shows a positive and highly significant coefficient across both models, indicating that urban residents are more likely to adopt life insurance products. Urbanization typically correlates with higher levels of financial literacy, easier access to insurance companies and agents, and greater exposure to financial advertising and marketing. Moreover, urban households often enjoy higher and more stable incomes, which enables them to allocate resources toward precautionary savings and insurance. The Macedonian case reflects this global pattern, with urban centers such as Skopje driving demand for financial services, while rural areas remain underserved.

2. Macroeconomic Environment

Income (LGDP) — positive, very significant.

Higher income increases penetration via budget slack and intertemporal planning. This result is widely documented in the literature (Beck & Webb, 2003; Li et al., 2007), and Macedonia's magnitude and significance are consistent with prior studies.

Inequality (GINI) — positive, very significant.

Higher inequality coinciding with higher penetration supports the idea that demand is driven by upper-income cohorts even when median households remain excluded (Beck & Webb, 2003; Kjosevski, 2012). Country studies in Central and Eastern Europe (CEE) also note that inclusion gaps concentrate demand among better-off segments.

3) Macro Environment & Finance

Inflation (INF) — negative, significant.

Higher inflation erodes real returns and undermines trust in long-horizon contracts. This negative effect is consistent with cross-country evidence (Alhassan & Biekpe, 2016; Beck & Webb, 2003).

Financial depth (DCPS) — positive, significant.

Deeper credit systems correlate with higher penetration through shared infrastructure, cross-selling, and stronger household ties to formal finance. This mirrors the "banking sector development" channel emphasized by Beck and Webb (2003) and broader insurance-sector studies (Feyen, Lester, & Rocha, 2011).

The logarithm of GDP per capita (LGDP) also exhibits a strong positive and significant effect, reaffirming the central role of income in driving insurance demand. This result aligns with classical insurance demand theory, which posits that higher income levels enhance households' capacity to engage in long-term financial planning. As incomes rise, individuals are better positioned to secure their families' future financial stability, thus increasing their willingness to purchase life insurance policies. For Macedonia, a middle-income country undergoing structural transformation, this finding underscores the potential for expanding life insurance penetration through policies that support sustained economic growth and income convergence with more developed European economies.

An interesting finding emerges with respect to the GINI coefficient (income inequality), which is positive and statistically significant. This implies that higher levels of inequality are associated with greater life insurance penetration. The result reflects the fact that in unequal societies, wealthier households—who are better able to afford life insurance—tend to dominate the insurance market. In Macedonia, the distribution of income remains relatively uneven, with wealthier segments of the population more exposed to financial institutions and better informed about the benefits of life insurance. As a result, life insurance penetration may increase

Economic, Demographic, and Institutional Drivers of Life Insurance Consumption in Macedonia

with inequality, even though access remains limited for lower-income households. This points to an important policy implication: while inequality may drive insurance penetration at the aggregate level, it raises concerns about the inclusiveness of insurance markets and the need for targeted measures to extend coverage to vulnerable groups.

The macroeconomic environment also plays an important role in shaping life insurance penetration. Inflation (INF) is found to have a negative and statistically significant effect. This relationship is consistent with economic theory: higher inflation erodes the real value of long-term financial contracts, thereby reducing the attractiveness of life insurance as a savings and protection tool. In environments with volatile or rising prices, households may prefer to hold liquid assets or invest in tangible goods rather than commit to long-term contracts with uncertain real returns. For Macedonia, maintaining low and stable inflation is thus not only a monetary policy objective but also a prerequisite for the development of the insurance sector.

On the other hand, domestic credit to the private sector (DCPS) has a positive and significant effect on life insurance penetration. Financial sector development, measured through credit provision, typically goes hand-in-hand with the expansion of insurance markets. When banks and financial institutions extend credit, they also contribute to financial literacy, broaden financial inclusion, and often bundle credit with insurance products. In Macedonia, where financial intermediation is still developing, this finding underscores the complementary role of banking sector growth in stimulating insurance demand. Strengthening credit markets and expanding access to financial services could thus indirectly boost the penetration of life insurance.

3) Institutions & Governance

Rule of law (LAW) — weak/negative.

LAW coefficients are weakly negative (insignificant in FMOLS; marginal in DOLS). Cross-country evidence is mixed: some studies find institutional quality supports contract enforcement and insurance demand, while others find weak links after controlling for macro and finance factors (Beck & Webb, 2003; Dragos, 2014). In European samples, business freedom is more influential for life insurance, while corruption matters mainly for non-life products, which may explain Macedonia's weak LAW effect (Dragos, 2014).

Political stability (PS) — negative, significant.

This negative sign is counterintuitive relative to the expectation that stability fosters long-term contracting. Cross-country studies typically find that stronger political and institutional environments increase life insurance demand (Ward & Zurbrugg, 2002). Macedonia's negative PS may reflect a precautionary channel: during less stable periods, households may increase protective financial products, and as stability improves, they may reallocate toward other assets. This "precautionary spike" aligns with literature linking macro-uncertainty to life insurance demand fluctuations (Chui & Kwok, 2008).

Control of corruption (COR) — positive, highly significant.

Cleaner environments boost trust in insurers and enforcement of long-term promises. While large panels sometimes find weak or inconsistent results once other institutions are included (Beck & Webb, 2003), regional studies in Europe emphasize governance as salient for life insurance (Dragos, 2014). Macedonia's strong positive effect indicates that incremental integrity improvements are particularly impactful in smaller, developing insurance markets.

The results also highlight the importance of institutional quality. Interestingly, **rule of law (LAW)** shows a negative and statistically insignificant relationship under FMOLS, while it turns weakly significant under DOLS with a negative sign. This unexpected result may reflect a gap between formal legal improvements and actual trust in financial institutions. In many transition economies, legal reforms are enacted, but enforcement and public trust remain limited. For life insurance in Macedonia, individuals may still rely more on personal networks and informal arrangements rather than on formal contracts, which limits the effect of legal quality on insurance demand.

Another striking finding is the **negative and significant impact of political stability (PS)**. This result is counterintuitive, as political stability is usually expected to foster confidence in long-term contracts. However, the Macedonian context may provide an explanation: in times of political instability, households perceive greater risks and uncertainty, which increases the precautionary demand for insurance. Conversely, when the political environment stabilizes, the perceived need for insurance as a risk-mitigation tool may decline. This finding suggests that in transitional political contexts, insurance markets may paradoxically benefit from instability, though this is not a sustainable foundation for growth.

Finally, **control of corruption (COR)** demonstrates a positive and highly significant impact, indicating that lower corruption enhances life insurance penetration. Corruption undermines trust in institutions, financial markets, and long-term contracts. When corruption levels are reduced, individuals are more willing to engage with formal financial institutions and commit to insurance

Economic, Demographic, and Institutional Drivers of Life Insurance Consumption in Macedonia

policies. For Macedonia, this result is particularly important: strengthening governance and reducing corruption are not only key to broader economic development but also essential for building public trust in the insurance sector.

The results carry several policy implications. First, demographic pressures—particularly the high young dependency ratio—constrain life insurance development, highlighting the need for policies that support household disposable income and reduce the financial burden of child-rearing. Second, economic growth and urbanization clearly stimulate insurance demand, underscoring the importance of sustained income growth and balanced regional development to reduce disparities between urban and rural households. Third, financial development emerges as a crucial driver, meaning that efforts to strengthen banking sector depth, financial literacy, and the integration of financial products could accelerate insurance penetration. Fourth, reducing inflation and ensuring macroeconomic stability remain critical to sustaining household confidence in long-term insurance contracts. Finally, institutional quality—especially control of corruption—plays a decisive role. Building trust in institutions is essential for deepening financial markets and encouraging greater participation in insurance schemes.

CONCLUSION

The purpose of this study was to examine the demographic, macroeconomic, financial, and institutional determinants of life insurance consumption in the Republic of Macedonia using time-series data from 2003–2024. Given the growing role of life insurance in supporting financial stability and long-term household welfare, understanding the drivers of insurance demand is essential for guiding market development and public policy.

The findings reveal that demographic factors exert mixed effects on life insurance penetration. The young dependency ratio (CDR) negatively and significantly influences demand, consistent with life-cycle theory, as households with more child dependents allocate fewer resources to long-term savings products. By contrast, the old-age dependency ratio (ODR) has an insignificant effect, reflecting the reliance on pensions and public transfers rather than private insurance in old-age risk management. Life expectancy (LEXP) also shows a negative and significant impact, as longer life expectancy reduces the perceived urgency of mortality-related protection. Urbanization (URB), however, demonstrates a strong positive effect, highlighting the role of financial access, literacy, and urban market structures in stimulating demand.

At the macroeconomic level, higher income (LGDP) significantly increases life insurance penetration, confirming the importance of economic growth in expanding insurance demand. Inequality (GINI) is also positively associated with penetration, suggesting that wealthier households dominate demand in a context of uneven income distribution. Inflation (INF) has a negative effect, undermining trust in long-term contracts, while financial depth (DCPS) positively influences demand through greater access to credit and formal finance.

Institutional quality further shapes insurance consumption. Control of corruption (COR) shows a strong positive impact, underscoring the importance of governance and trust. Political stability (PS) has a negative effect, suggesting a precautionary demand channel during periods of instability. Rule of law (LAW), however, shows weak or insignificant results, reflecting the gap between legal reforms and enforcement in transition economies.

The results point to several policy recommendations:

1. **Address demographic pressures** by implementing family-support policies that ease the financial burden of child-rearing, thereby freeing household resources for long-term financial planning.
2. **Support inclusive growth** through sustained income expansion and reduced regional disparities, particularly between urban and rural areas, to foster broader insurance adoption.
3. **Strengthen financial infrastructure** by deepening credit markets, promoting financial literacy, and encouraging cross-selling between banks and insurers.
4. **Maintain macroeconomic stability**, particularly low inflation, to sustain household trust in long-term contracts.
5. **Improve institutional quality** by prioritizing anti-corruption measures and enhancing transparency in financial markets to build public confidence in insurance products.

This study is subject to several limitations. First, the analysis relies on aggregate time-series data, which may mask heterogeneity across different household groups. Second, the availability of insurance-specific data in Macedonia is limited, restricting the scope of variables that could be included. Third, the study focuses primarily on demand-side determinants, while supply-side factors—such as product diversification, distribution channels, and competition among insurers—were not explicitly modeled. Future research could extend this work by:

Economic, Demographic, and Institutional Drivers of Life Insurance Consumption in Macedonia

- Employing household-level microdata to capture heterogeneity in insurance demand.
- Incorporating supply-side dynamics, such as product innovation, insurer competition, and regulatory reforms.
- Comparing Macedonia with other Western Balkan economies to highlight regional similarities and divergences.
- Exploring behavioral factors, including risk preferences and trust in financial institutions, to better understand insurance uptake.
- Examining the role of digitalization and technological innovation in expanding access to insurance products.

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