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Exploration of the impact of demographic changes on life insurance consumption: empirical analysis based on Shanghai Cooperation Organization

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ABSTRACT

Based on the panel data of eight member states of Shanghai Cooperation Organization (SCO) from 1996 to 2019, this study explores the impact of demographic changes on life insurance consumption in SCO member countries under the framework of static panel model and dynamic panel model. And the study analyzes the heterogeneity of religious division and different aging degrees. The empirical results show that both old-age dependency ratio and teenager dependency ratio have positive impacts on life insurance consumption in the SCO countries. Besides, the current consumption of ordinary life insurance significantly stimulates the future consumption of ordinary life insurance. Furthermore, demographic changes have heterogeneous impacts on life insurance consumption in terms of different religions and different degrees of aging. Our findings provide managerial implications for insurance companies that carry out life insurance business in SCO member states. Insurance companies should consider the policyholders' life insurance consumption in accordance with demographic changes of both old-age dependency ratio and teenager dependency ratio, and also take differentiated life insurance sales strategies according to different degrees of aging and whether the residents believe in Islam.

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1. Introduction

Shanghai Cooperation Organization (SCO) is currently under the guidance of the 'Shanghai Spirit' and guided by the new type of state-to-state relations, which is an effective exploration to establish up-to-date international political and economic environment. Since it was formally established in 2001 in Shanghai, SCO has achieved

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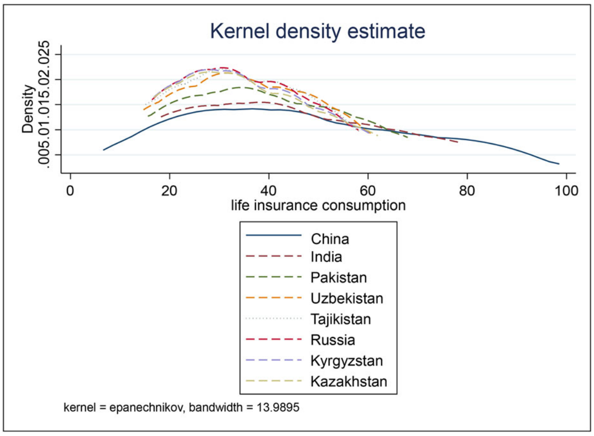

Figure 1. The interaction of life insurance consumption of each SCO member states.
Source: Authors calculation based on the data obtained from the Sigma Explorer database released by Swiss Re.

fruitful results in various fields including politics, economics, humanities, environment, democracy, foreign communication, and organizational mechanism construction. Upholding mutual trust, mutual benefit, equality, consultation, respect, joint development for diverse civilizations, the 'Shanghai Spirit' has become a model for promoting economic stability and sustainable development in contemporary international relations (Ambrosio, 2008).

With the deepening of economic cooperation between member states, the interaction of economic activities among these SCO member countries has been thriving over the years. By 2019, SCO member countries have achieved $4.90 trillion in trade, 7.29 times more than in 2001, and $178.77 billion in capital investment, 2.8 times more than in 2001(Zhou, 2019). Meanwhile, the consumption of life insurance market among SCO member states has surged, and there is still a lot of space for insurance companies to boost life insurance business in the SCO member states. Figure 1 shows the kernel density curves of the life insurance consumption among eight SCO member states, which are based on the data of sales of life insurance by insurers in one SCO member country to other member countries. Rosenblatt (1956) first proposed a non-parametric estimation method of the probability density function, called the kernel density estimation. The sample period in this paper is 1996–2019, and sampling uses the same time interval. We plot the kernel density curve of life insurance consumption of each SCO member countries, including China, India, Pakistan, Uzbekistan, Tajikistan, Russia, Kyrgyzstan and Kazakhstan. By comparing the sales of life insurance by insurers in one SCO member country to other member countries, Figure 1 reflects the interaction of life-insurance sales activities among the insurance companies in these countries.

As shown in Figure 1, life insurance consumption in China is the most dispersed, while the other seven countries have the similar range of life insurance consumption to a large extent. The kernel density curve of life insurance consumption has obvious right drag and keeps moving to the right over time. It is also seen that its dispersion level is increasing over time and life insurance density is changing from low level aggregation to high level of being discrete. These traits of kernel density curve

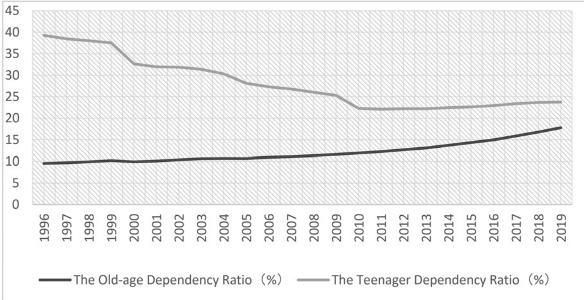

Figure 2. The trend of dependency ratio of SCO member states from 1996 to 2019.
Source: Authors calculation based on the data obtained from CSMAR database.

demonstrate that life insurance density rises over time, and prosperity of the life insurance market has become a major economic interaction trend in SCO member states. Meanwhile, the differentiation of per capita life insurance premium of SCO member states is increasing over time, that is, the differentiation of prosperity in the life insurance market is rising from 1996 to 2019.

Meanwhile, significant changes have taken place in demographic indicators such as old-age dependency ratio, teenager dependency ratio, etc., which have impacts on life insurance consumption in the member countries of SCO (Qi et al., 2018). It can be seen from Figure 2 that old-age dependency ratio has been rising, while teenager dependency ratio has shown a clear downward trend in SCO member states from 1996 to 2019, which indicates that SCO member states have witnessed the trend of population aging over the past twenty-four years.

In this context, it is necessary to provide insurance companies that conduct life insurance sales in SCO member states with the implications and strategies regarding how to promote their life insurance sales, that is, figure out the consumption of life insurance from SCO countries' policyholders and provide suitable life insurance products for them. Therefore, deepening exploration of the impact of the demographic changes on life insurance consumption needed to analyzed.

This study contributes to the extant studies regarding the impact of demographic changes on life insurance consumption in several ways. First, we focus on the particular perspective of Shanghai Cooperation Organization. There is a lack of studies on the life insurance of SCO member states. This paper extends the research perspective from a country or region community to regional organizations like SCO. The demographic variables within SCO are more complex, and regional differences are more obvious. Factors such as aging degree and religion that were ignored in the previous research samples can be taken into consideration. Thus, we introduce not only different religious sub-samples, but also sub-samples of different degrees of aging in the heterogeneity analysis. Second, the line of life insurance encompasses a wide variety of products, which have quite different characteristics, thus it is difficult to construct theories to life insurance consumption as a whole. Therefore, in this study, we focus on ordinary life insurance, a type of specific life insurance product. Ordinary life insurance includes term life insurance, whole life insurance, endowment insurance and annuity insurance. We exclude health insurance, accident insurance and universal life insurance in this study. Third, we not only analyze the impact of demographic changes on life insurance consumption, but also consider the cross-period effect of the future consumption of ordinary life insurance on the current consumption of ordinary life insurance. Hence, this study establishes the static panel model and first-order lagged dynamic panel model in the empirical analysis.

2. Literature review

Liao and You (2012) pointed out that the population structure is the proportional relationship among various internal structures of the population in a certain area at certain time, including natural population structure, social population structure and geographic population structure. Demographic changes lead to specific population risks, increasing the uncertainty of household consumption in the future, and then affect life insurance consumption, so insurance companies have to adjust product types and sales strategies, and a new life insurance market equilibrium is ultimately formed (Wang & Fan, 2018). Yuan and Cui (2020) adopted system generalized moment estimation (System GMM) and difference generalized moment estimation (Difference GMM) to test the impact of demographic changes on life insurance consumption based on the panel data of 73 countries and regions around the world, and divided the population structure into population natural structure, population social structure and population geographical structure for empirical regression. Alhassan and Biekpe (2016) concluded the influence mechanism of population structure on life insurance consumption as follows: population structure affects life insurance consumption through natural population structure, social population structure and geographical population structure.

In terms of the measurement of population structure, the extant studies comprise several indicators such as dependency ratio, life expectancy at birth, female ratio, education level, urbanization level and so on. The dependency ratio refers to the ratio of the non-working-age population to the working-age population, which measures the per capita dependency burden of the labor force. The dependency ratio mainly includes old-age dependency ratio and teenager dependency ratio, which both measure population age structure (Qi et al., 2018). Wang and Fan (2018) and Li et al. (2007) all tested that old-age dependency ratio and teenager dependency ratio have significantly positive impact on life insurance consumption. But the empirical analysis of Beck and Webb (2003) in terms of the sixty-eight countries from 1961 to 2000 confirmed that old-age dependency ratio does have a positive effect on life insurance density, but the teenager dependency ratio has no significant impact on life insurance density. The impact of life expectancy at birth on life insurance consumption is different in many existing studies. Some empirical results show that life expectancy has a positive impact on life insurance consumption (Beenstock et al., 1986; Outreville, 1996; Truett & Truett, 1990), and others show a negative impact (Lewis, 1989; Li et al., 2007), there are also some results which are not significant (Beck & Webb, 2003; Browne & Kim, 1993).Wang and Fan (2018) concluded that the increase in life expectancy leads to prolonged pension time and increased pension cost, thereby stimulating people's demand for pension insurance. The female ratio generally refers to the proportion of women in the total population. In terms of various attitudes towards risks, there is a huge difference between men and women. He et al. (2002) found that men prefer risks more than women in the case of profit, and women prefer risks than men in the case of loss. The basic function of life insurance is to disperse risks and pay economic compensation. Due to the compensation principle of insurance, it is impossible for public to get profit from life insurance compensation, but its protective features lead to women policyholders' preference for life insurance. Lee (2018) concluded that women have more demands for life insurance products of protection, savings and pension types, while men are more inclined to buy life insurance products of investment type. Education level, also known as the degree of education, is one of the main indicators of the social population structure, which affects individuals' perceptions of risks and further affects their attitudes towards risks. Qi et al. (2018) pointed out that the improvement of education level enables residents to fully understand and accept insurance, recognize the function of life insurance to disperse risks and obtain economic compensation, and be able to rationally use life insurance products for decreased risks and financial investment. Therefore, the enhancement of education level increases life insurance consumption. This positive correlation between life insurance consumption and education level is shown in a large number of articles (Kjosevski, 2012; Li et al., 2007; Yuan & Jiang, 2015). Urbanization level is one of the main indicators of the geographical population structure. Zhang (2013) included urbanization level in the research through an empirical study of panel data from 30 provinces in China from 2000 to 2012, showing that the higher the degree of urbanization in a region, the more concentrated the population and the stronger the motivation to prevent risks, which will greatly promote life insurance consumption. Some studies such as Hwang and Gao (2003) and Guo and Zhang (2014) have obtained similar results through empirical analysis.

In accordance with the above literature, we find that population structure is comprised of natural population structure, social population structure and geographic population structure, and measured by a wide variety of variables including old-age dependency ratio, teenager dependency ratio life expectancy at birth, female ratio, education level, urbanization level. Too many explanatory variables are included in the study would make it difficult to construct the theories and explain the empirical results. Therefore, we focus on the changes of population age structure to reflect demographic changes in the study, which is mainly measured by dependency ratio including old-age dependency ratio and teenager dependency ratio.

In terms of the impact of population age structure on life insurance consumption, Beenstock et al. (1986) were the first to include the population age structure in the study of the insurance consumption. The study found that age distribution, dependency rates, interest rates and income were positively correlated with the demand for life insurance and negatively correlated with the level of social security coverage. Truett and Truett (1990) used median age and the rate of 25–64 years old population to represent the population age structure and compared the factors affecting the demand for insurance in the United States and Mexico through a linear regression model. The elasticity of insurance demand is greater in low-income than in high-income areas. Subsequently, Outreville (1996) and Browne and Kim (1993) conducted similar studies for developing countries, using a classical linear regression framework. They found that economic indicators such as output per capita and inflation were consistently associated with life insurance, while education, life expectancy, child support and the level of social security were unstable in terms of their impact on life insurance demand. In contrast to the OLS approach estimated in previous studies, Li et al. (2007) used a mixed estimation of the GMM approach to obtain robust estimates of the parameters using panel data from 1993 to 2000 for 30 countries in the OECD. In recent years, some scholars have also started to look at the Asian region. Hwang and Greenford (2005) compared the differences in the factors affecting the demand for life insurance in Mainland China, Taiwan and Hong Kong and the results showed that the ability to consume life insurance varies across different levels of economic development, with the more developed the region, the stronger the ability to consume insurance and the weaker is the opposite. Sen and Madheswaran (2013) adopted the panel data model for 12 Asian countries and regions and the time series model for India to analyze economic, demographic and urbanization factors affecting life insurance density and depth of life insurance. The regressions of the economic factors on life insurance confirmed by the panel model also hold for India. However, the demographic factors are not significant, whereas the uncertainty in the panel model for urbanization is significant for India.

To sum up, extant studies mainly focus on the influence of one or several demographic indicators on life insurance consumption, or population structure on life insurance consumption as a whole, which fail to focus on certain life insurance products. Besides, some studies divide population structure into natural population structure, social population structure and geographical population structure, and select all these metrics as explanatory variables in the empirical regression. This leads to decentralization of the theories and empirical results. Additionally, the research perspective is restricted to one country or region, and has not specifically explored the relationship between the population structure and the life insurance consumption in some regional organizations like SCO. There is a lack of studies that focus on life insurance consumption of SCO member states. In this paper, we attempt to make up for these shortcomings.

3. Methodology

3.1. Variables

This study analyzes the impact of demographic changes on life insurance consumption among SCO member states. The line of life insurance encompasses a wide variety of products, which have quite different characteristics, thus it is difficult to construct theories to life insurance consumption as a whole. Therefore, in this study, we focus on ordinary life insurance, a type of specific life insurance product. The explained variable is ordinary life insurance consumption. Life insurance density (LID) is an excellent indicator to measure life insurance consumption on the basis of the recent literature (Browne & Kim, 1993; Outreville, 1996; Truett & Truett, 1990). It is life insurance premium income per capita, which indicates the degree of popularity of life insurance among the total population, reflecting the development of life insurance business in certain countries and regions (Li et al., 2007). Furthermore, population structure is comprised of natural population structure, social population structure and geographic population structure, and measured by a wide variety of variables including old-age dependency ratio, teenager dependency ratio life expectancy at birth, female ratio, education level, urbanization level. Too many explanatory variables are included in the study would make it difficult to construct the theories and explain the empirical results. Therefore, we focus on the changes of population age structure including old-age dependency ratio and teenager dependency ratio to reflect demographic changes in the study. Based on the literature review and theory sorting above, this study selects old-age dependency ratio (ODR) and teenager dependency ratio (TDR) to represent the age structure. Hence, the explanatory variable is old-age dependency ratio (ODR) and teenager dependency ratio (TDR). Besides, life expectancy at birth (LIFE) and female ratio (FEMALE) represents natural population structure, education level (EDU) indicates social population structure, and urbanization level (URBAN) measures geographical population structure (Hsu & Yamada, 2019; Yuan & Cui, 2020) respectively. We select these demographic variables as control variables, which influence the consumption of ordinary life insurance. In addition to the demographic variables mentioned above, some other factors that affect ordinary life insurance consumption are also taken as control variables, including personal income (INCOME), inflation rate (INF), savings (SAVING), and interest rate (RATE) (Beenstock et al., 1986; Kjosevski, 2012). In the robustness test, we use life insurance penetration (LIP), old-age population ratio (OPR), teenager population ratio (TPR) as the surrogate variables. Table 1 shows the definitions of all variables in the study.

3.2. Data

This study uses panel data from eight member countries of SCO from 1996 to 2019 for the empirical analysis. The data on life insurance density (LID) and life insurance penetration (LIP) are selected from the Sigma Explorer database released by Swiss Re, while other demographic and economic data in the study are selected from China Economic Network database, World Bank database and CSMAR database. The research uses Stata15 to perform regression analysis on the entire sample, religious sub-samples, and sub-samples of different aging degrees. We use interpolation to supplement the missing data in the empirical study. Table 2 shows the descriptive statistics of the main variables in the study.

3.3. Empirical models

In order to explore the impact of demographic changes on life insurance consumption in SCO member countries during the sample period, this study establishes the static panel model and dynamic panel model shown as below. To alleviate the effect of inconsistencies in the quantiles, the variable 'INCOME' is taken logarithm in the following empirical models and empirical analysis.

Table 1. Variables definitions.

Variable type		Variable	Variable symbol	Variable definition
Explained variable		Life insurance density	LID	Per capita life insurance premium
Explanatory variables	Population age structure	Old-age dependency ratio	ODR	The proportion of the population over age of 65 to the working-age population
		Teenager dependency ratio	TDR	The proportion of the population under age of 14 to the working-age population
Control variables		Life expectancy at birth	LIFE	Life expectancy at birth
		Female ratio	FEMALE	The proportion of women in total population
		Education level	EDU	Gross enrollment rate of higher education institutions
		Urbanization level	URBAN	The proportion of people living in the cities in total population
		Personal income	INCOME	Average annual salary among total population
		Inflation rate	INF	CPI-based inflation rate
		Savings	SAVING	Per adult annual deposits
		Interest rate	RATE	Yield to maturity of 10-year government bonds
Surrogate variables		Life insurance penetration	LIP	The proportion of annual life insurance premium of a country or region in GDP
		Old-age population ratio	OPR	The proportion of the population over the age of 65 in the total population
		Teenager population ratio	TPR	The proportion of the population under the age of 14 in the total population

Source: Authors calculation based on the empirical analysis of the paper.

Table 2. Descriptive statistics of main variables in the study.

Variable	Observations	Means	Standard Deviation	Minimum	Maximum
LID	192	19.02812	37.07726	0.5	230
ODR	192	9.797604	4.161946	4.81	22.61
TDR	192	47.64031	16.7617	20.49	84.43
LIFE	192	68.15984	3.730462	59	79.12
FEMALE	192	50.10151	1.72365	47.97	53.67
EDU	192	29.59182	21.42258	1.2	85.98
URBAN	192	44.06486	15.08572	26.50101	74.59
INCOME	192	2888.602	3698.067	258.05	15974.64
INF	192	15.71266	33.51559	−1.4	430.42
SAVING	192	13.86599	12.65972	1.23	46.79
RATE	192	4.909484	2.03635	0.49	8.51

Notes: For variables definitions see Table 1.
Source: Authors calculation based on the empirical analysis of the paper.

3.3.1. Static panel model

The static panel model generally uses the F test to judge whether the pooled regression or the fixed effect is adopted in the study, and then the LM test is used to judge whether the pooled regression or the random effect is taken. Finally, Hausman test is used to determine whether the fixed effect or the random effect is adopted in the static panel model. The two-way fixed effect not only considers the country-fixed effect, but also considers the year-fixed effect. Hence, the estimation of two-way fixed effect is more accurate than other estimation methods among static panel model. The static panel model is shown below.

$$LID_{it} = \alpha + \beta_1 ODR_{it} + \beta_2 TDR_{it} + \beta_3 LIFE_{it} + \beta_4 FEMALE_{it} + \beta_5 EDU_{it} + \beta_6 URBAN_{it} + \beta_7 lnINCOME_{it} + \beta_8 INF_{it} + \beta_9 SAVING_{it} + \beta_{10} RATE_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

In the above static panel model, LID_{it} is the dependent variable, ODR_{it} and TDR_{it} are the independent variables, and all others are control variables (see Table 1 for variable definitions). α represents the constant, μ_i is the country-fixed effect, λ_t is the year-fixed effect and ε_{it} is the random error.

3.3.2. Dynamic panel model

In order to avoid regression errors caused by endogenous factors, and considering the cross-period effect of the future consumption of ordinary life insurance on the current consumption of ordinary life insurance, this study further establishes the first-order lagged dynamic panel model. The dynamic panel model generally uses the Difference GMM and System GMM to conduct empirical regression. Arellano and Bond (1991) used all possible lagged variables as instrumental variables to perform generalized moment estimation (GMM estimation) called Difference GMM, which is to perform GMM estimation on the difference equation. They proposed to use Difference GMM to solve endogenous problems. However, there is a weak instrumental variable problem in the lagged term of the level variables, which leads to statistical bias in regression results. Blundell and Bond (1998) combined the difference equation and the level equation as the whole system of equations for GMM estimation, which is called System GMM. They concluded that using System GMM can solve the problem of weak instrumental variables, which is more accurate than Difference GMM and improves the estimation efficiency. The first-order lagged dynamic panel model is shown below.

$$LID_{it} = \alpha + \beta_0 LID_{i,t-1} + \beta_1 ODR_{it} + \beta_2 TDR_{it} + \beta_3 LIFE_{it} + \beta_4 FEMALE_{it} + \beta_5 EDU_{it} + \beta_6 URBAN_{it} + \beta_7 lnINCOME_{it} + \beta_8 INF_{it} + \beta_9 SAVING_{it} + \beta_{10} RATE_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (2)$$

In the above dynamic panel model, $LID_{i,t-1}$ is the first-order lagged explained variable, which represents the ordinary life insurance density of the i^{th} country or region in the $(t\text{-}1)^{th}$ year. The other variable symbols are consistent with those in the static panel model.

4. Empirical results

4.1. Panel unit root tests

This paper selects panel data from eight member states of SCO from 1996 to 2019. Since the time series are quite long, we should first conduct the unit root test of the

Table 3. Results of panel unit root tests.

Variable	IM-Pesaran-Shin W-stat	Prob	Levin-Lin-Chu T-stat	Prob
LID	5.9186***	0.0000	4.7237***	0.0000
ODR	5.9539***	0.0021	4.8659***	0.0001
TDR	−0.0628**	0.0475	0.6129*	0.0852
LIFE	0.4697**	0.0461	1.2851*	0.0994
FEMALE	−1.9419**	0.0261	1.7513**	0.0399
EDU	−3.1432***	0.0008	−3.4940***	0.0002
URBAN	−0.7545**	0.0253	−5.2143***	0.0000
INCOME	2.2580*	0.0998	0.2638*	0.0604
INF	−11.4534*	0.0000	−4.8365***	0.0000
SAVING	−8.5554**	0.0196	−2.1721**	0.0149
RATE	−3.4246***	0.0003	−3.0124***	0.0079
LIP	−0.8878*	0.0873	−1.6779**	0.0467
OPR	4.2825***	0.0011	3.8739*	0.0575
TPR	−6.0514***	0.0000	−6.2185***	0.0000

Notes: *, **, *** indicate significant at the level of 10%, 5%, and 1% respectively.
Source: Authors calculation based on the empirical analysis of the paper.

panel data, in order to ensure the stability of the panel data and avoid pseudo-regression problems due to non-stability. In the study, two test methods called IPS (IM-Pesaran-Shin) and LLC (Levin-Lin-Chu) are used to testify the stability of the panel data. The statistics and corresponding P values are reported in Table 3. It can be seen that the P values of all variables are significant, which means that there is no unit root in the panel data, so the test results indicate that the variables selected in the research are stable, and the regression of the panel model is effective.

4.2. Benchmark regression analysis

Table 4 presents the results of the impact of demographic changes on life insurance consumption. In the benchmark regression, this paper reports the results of entire sample regression by using stepwise regression method. Columns (1) and (3) do not include control variables, while control variables are added in columns (2) and (4) respectively. Hausman test is used to choose whether random effect or fixed effect, shown as P values. Sargan test is over-identification test to determine the validity of instrumental variables, of which null hypothesis is that all instrumental variables are valid, shown as P values. Arellano-Bond test is used to determine whether there is auto-correlation in disturbance terms, and AR (1) and AR (2) are the first-order sequential correlation test and the second-order sequential correlation test respectively for the residuals after the first-order difference, shown as P values. Wald statistics are also shown as P values.

It can be seen that the P value of Hausman test is less than 0.001 in the static panel model. Hence, the study adopts two-way fixed effect estimation. In dynamic panel model, the P value of Sargan test is nearly equal to 1. It indicates that the dynamic panel model does not have over-recognition and tool variables are valid. AR (1) in Arellano-Bond test is significant but AR (2) is not significant, which shows that there is no second-order auto-correlation of disturbance term. Therefore, not only the regression model setting, but also Difference GMM and System GMM estimation are effective. System GMM is more accurate than Difference GMM, and

Table 4. Benchmark regression.

	Static panel model		Dynamic panel model	
Variables	TW-FE (1)	TW-FE (2)	SYS-GMM (3)	SYS-GMM (4)
L.LID			0.706*	0.561**
			(0.631)	(0.306)
ODR	3.703***	4.752*	0.855**	0.044***
	(1.086)	(3.480)	(1.381)	(0.747)
TDR	0.492*	0.308*	0.319**	0.119*
	(0.283)	(0.352)	(0.212)	(0.130)
LIFE		1.743		0.310*
		(1.134)		(0.327)
FEMALE		−12.074		−0.738*
		(21.357)		(4.589)
EDU		0.199*		0.051*
		(0.236)		(0.101)
URBAN		6.415***		1.210***
		(0.790)		(0.339)
lnINCOME		0.577*		0.482**
		(0.305)		(0.218)
INF		0.035		0.011
		(0.019)		(0.038)
SAVING		−1.171*		−0.258**
		(0.580)		(0.117)
RATE		−2.636***		−0.484
		(0.485)		(0.424)
Constant	949.583***	1037.552	779.881	546.415
	(161.041)	(1105.763)	(384.883)	(141.667)
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	192	192	192	192
R-squared	0.749	0.895		
Hausman	445.24	906.80		
	(0.000)	(0.000)		
Sargan			0.9832	0.9998
AR (1)			0.0738	0.0153
AR (2)			0.6655	0.0269
Wald			0.0006	0.0001

Notes: *, **, *** indicate significant at the level of 10%, 5%, and 1% respectively, and the parentheses are the robust standard errors.
Source: Authors calculation based on the empirical analysis of the paper.

efficiency of estimates can be improved by System GMM, so System GMM is adopted in the dynamic panel model. Overall, in columns (1) and (2), two-way fixed effect (TW-FE) is adopted in static panel model and System GMM (SYS-GMM) is used in dynamic panel model for benchmark regression in columns (3) and (4).

Furthermore, the results show that coefficients of old-age dependency ratio are significantly positive, indicating that the increase in old-age dependency ratio has a positive impact on life insurance consumption in the SCO countries. The increase in old-age dependency ratio indeed stimulates life insurance consumption, which is also consistent with the conclusions of the above theory sorting. Teenager dependency ratio also has a significant positive impact on life insurance consumption. It is closely related to the current trend of high-input parenting. With the current economic and social development, parents often buy various insurance products for their children after their birth (McGarry & Grabowski, 2019). Therefore, teenager dependency ratio is significantly positive with life insurance consumption, which confirms the social phenomenon mentioned above. Besides, 70.6% of the life insurance consumption can be explained by the first-order lagged term of life insurance consumption (L.LID) without control variables. After adding control variables, 56.1% of life insurance consumption can be explained by the first-order lagged term. It indicates that residents' life insurance consumption does have the inertia of continuous payment and renewal. That is, if the last period of life insurance has been insured due to the inertia of residents' life insurance consumption, the current period will not terminate the life insurance contract but continue to pay premium to continue the life insurance contract, so that the beneficiary can obtain economic compensation in the future in case of unpredictable death or disability of the policyholder (Qiu et al., 2020).

As for control variables, all have significant effects on life insurance consumption. Among them, the higher life expectancy at birth, the higher life insurance consumption will be. It confirms the previous view that the increase in life expectancy will prolong the pension time and pension costs, thereby stimulating people's demand for pension insurance. The increase in female ratio has a significant negative impact on life insurance consumption. The reason is that women have more demand for universal life insurance, whereas males are more inclined to buy ordinary life insurance (Yuan & Cui, 2020). Universal life insurance is a life insurance product that has a certain asset value in at least one investment account. In addition to providing life protection like ordinary life insurance, universal life insurance also allows customers to directly participate in the investment activities of funds in the investment account established by the insurance company for the policyholder. The level of urbanization has a significant positive impact on life insurance consumption, because population clustering is more conducive to life insurance product sales (Barrese et al., 2016). The inflation rate is significant for life insurance consumption. It indicates that inflation rate is an important factor affecting life insurance consumption in the SCO member states. Inflation makes the currency depreciate and the purchasing power decrease, so the guarantee of life insurance bought now will be greatly reduced in the future. Life insurance policyholders will face the risk of a serious decline in purchasing power and a serious decline in long-term life insurance protection, which greatly inhibits life insurance consumption. The hyperinflation in from 1996 to 2001 in Russia, Uzbekistan and Tajikistan is a case in point, which led to the great depression in the life insurance market at that time. The higher education level, the more insurance conscious a person has and the more motivated to buy life insurance. Besides, the increase in interest rate indicates the investment return is higher than before. Investors would put more funds into capital market products rather than ordinary life insurance because of lucrative financial tools.

4.3. Heterogeneity analysis

Owing to large differences of the religions and the aging degrees among different member states of SCO, it is necessary to analyze the heterogeneity of countries with different religions and with different aging degrees. This section adopts two-way fixed effect to estimate static panel model and System GMM to estimate dynamic panel model, in order to explore whether the demographic changes of SCO member

Table 5. The classification of religion.

Classification	Countries	Religious dummy variable (REL)
Non-Islamic countries	China, Russia, India	REL = 0
Islamic countries	Pakistan, Uzbekistan, Tajikistan, Kyrgyzstan, Kazakhstan	REL = 1

Source: Authors calculation based on the empirical analysis of the paper.

countries have the above two heterogeneous impacts on ordinary life insurance consumption.

4.3.1. Heterogeneity analysis of religious sub-samples

Whether or not to believe in the Islam affects individual behaviors and choices of life insurance consumption. Browne and Kim (1993) included religious factors for the first time based on the sample data of 45 countries from 1980 to 1987, and studied the influence of Islam on life insurance density. Beck & Webb (2003) also included religious variables into the model regression. The empirical findings show that, compared with other countries, Islam-dominated countries have lower life insurance consumption because the concept of traditional insurance conflicts with the Islamic law. Ward and Zurbruegg (2002) pointed out that it is believed according to Sharia law that uncertainty must be eliminated when signing an exchange contract, and the rights and obligations of the parties to the contract must be clearly stipulated. If the rights and obligations are signed on the basis of possibilities, then the contract is invalid. In reality, however, the final settlement of insurance claims depends on whether a risk event will occur. Obviously, there is a conceptual conflict between traditional insurance and Islamic Sharia law, and this disagreement has led to a relatively low consumption of life insurance in Islamic countries, which is clearly seen in the low life insurance density in countries such as Pakistan, Uzbekistan, Tajikistan, Kyrgyzstan, Kazakhstan that believe in Islam (Tattar, 2015). There are significant differences in the religion of SCO member states, which are mainly divided into Islamic countries and non-Islamic countries. Therefore, it is necessary to take religion into consideration when studying the SCO member states. We further introduce religious dummy variable (REL) to divide the samples into Islamic countries and non-Islamic countries. The classification of religion is shown in Table 5. If it is a country that believes in Islam, REL is set to 1; if it is not a country that believes in Islam, REL is set to 0.

Two-way fixed effect estimation is used to estimate model (1) and System GMM estimation is used to estimate model (2), in order to examine whether there are differences in the impact of demographic changes on life insurance consumption with religious sub-samples. The results of heterogeneity analysis in terms of religion are shown in Table 6. It can be found that in non-Islamic countries, the old-age dependency ratio is significantly positive for life insurance consumption, but it is significantly negative in Islamic countries. This is completely opposite to the results in the entire sample, mainly because Islamic law is contrary to our traditional views (Ward & Zurbruegg, 2002). Furthermore, the impact of teenager dependency ratio on life insurance consumption is significantly positive both in Islamic countries and non-Islamic countries. Distinct from other control variables, the impact of life expectancy

Table 6. Heterogeneity analysis in terms of religion.

	Non-Islamic countries		Islamic countries	
Variables	TW-FE (1)	SYS-GMM (2)	TW-FE (3)	SYS-GMM (4)
L.LID		0.845***		0.749***
		(0.025)		(0.178)
ODR	13.938***	2.110*	−0.900***	−1.200*
	(4.616)	(2.102)	(0.332)	(0.795)
TDR	1.181*	0.826***	0.084*	0.174*
	(0.779)	(0.102)	(0.044)	(0.089)
LIFE	−0.647*	−1.114***	1.027***	0.133***
	(1.739)	(0.118)	(0.141)	(0.049)
FEMALE	−63.205***	−14.731***	−1.391***	−1.956*
	(4.198)	(1.240)	(0.500)	(1.125)
EDU	0.852	0.385**	0.020*	0.227***
	(0.587)	(0.159)	(0.032)	(0.067)
URBAN	3.633***	2.428***	0.251***	0.354**
	(1.024)	(0.336)	(0.084)	(0.172)
lnINCOME	0.768***	0.978***	0.566***	0.808***
	(0.137)	(0.036)	(1.421)	(0.193)
INF	−0.406	−0.042	−0.011*	−0.004
	(0.244)	(0.033)	(0.006)	(0.015)
SAVING	−0.428	−0.458***	−0.124***	−0.061
	(0.846)	(0.132)	(0.038)	(0.063)
RATE	0.127	0.075*	−0.323	−0.634
	(0.140)	(0.045)	(0.504)	(0.643)
Constant	2811.363***	541.528***	−2.633	69.216
	(304.499)	(47.776)	(28.033)	(59.020)
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	72	72	120	120
R-squared	0.921		0.774	
Sargan		0.9035		1.0000
AR (1)		0.0563		0.0859
AR (2)		0.2785		0.5334
Wald		0.0000		0.0000

Notes: *, **, *** indicate significant at the level of 10%, 5%, and 1% respectively, and the parentheses are the robust standard errors.
Source: Authors calculation based on the empirical analysis of the paper.

on life insurance consumption is significantly positive in Islamic countries, while it is significantly negative in non-Islamic countries. This is due to the fact that the higher the life expectancy, the more motivation the Muslims have to eliminate the uncertainty and sign insurance contracts. On the contrary, the higher the life expectancy of non-Islamic countries, the less eager the residents are to buy life insurance, so life insurance consumption is curbed (Wehby & Lyu, 2018). Other variables have no religious differences between Islamic samples and non-Islamic samples in the heterogeneity analysis.

4.3.2. Heterogeneity analysis of sub-samples with different degrees of aging

The degree of aging is an important analysis indicator in the population structure. As the aging degree among SCO member states varies a lot, we divide the samples by different degrees of aging to examine whether there is significant heterogeneity in life insurance consumption according to different degrees of aging. Pichat (1956) was the first scholar to systematically study the problem of population aging, and his earliest paper on the impact of aging on economic development marks the formal generation

Table 7. The classification of different degrees of aging.

Classification	The proportion of population over the age sixty-five	Countries	Dummy variable about degree of aging (DA)
Deeply aging	>14%	Russia	DA = 2
Aging	7%-14%	China, Kazakhstan	DA = 1
Non-aging	<7%	Pakistan, India, Tajikistan, Kyrgyzstan, Uzbekistan	DA = 0

Source: Authors calculation based on the empirical analysis of the paper.

of social gerontology. He proposed the internationally accepted aging standardization: When a country or region has less than 7% of the population aged 65 and over, it is a non-aging society; When a country or region has more than 7% but less than 14% of the population aged 65 and over, it is an aging society; When a country or region has more than 14% of the population aged 65 and over, it is a deeply aging society. Therefore, our empirical analysis introduces dummy variable about degree of aging called DA. Countries classification and dummy variable about degrees of aging are shown in Table 7. If it is a non-aging country, DA is set to 0; if an aging country, DA is set to 1; if a deeply aging country, DA is set to 2.

Table 8 presents the results of heterogeneity analysis in terms of different aging degrees. It can be seen that the old-age dependency ratio has a significant positive impact on life insurance consumption in non-aging and aging countries, but it is significantly negative in deeply aging countries. This is because residents in deeply aging societies have massive pensions burden. The increase of old-age dependency ratio inevitably exacerbates the economic burden, resulting in the unaffordability of families to purchase life insurance, which has a negative impact on life insurance consumption (Caspi et al., 2016). The teenager dependency ratio significantly stimulates life insurance consumption in deeply aging countries and aging countries, while has a prominent inhibitory effect on life insurance consumption in non-aging countries. The reason is that economic development and people's income are relatively better in deeply aging and aging countries, so the residents can afford the life insurance costs of their offspring, so they will be active in buying life insurance. On the contrary, non-aging countries have a relatively low level of economic development, and their people always have difficulties in the household expenditures, so they cannot afford future life insurance protection for their offspring, which has a significant negative impact on the purchase of life insurance (Ludvigsson et al., 2019).

4.4. Robustness test

In order to verify the reliability of the regression results of the above model, this paper uses variable replacement, sample replacement and regression method replacement to verify the accuracy of the conclusions (Millo & Carmeci, 2015; Zhang et al., 2013).

The first method is replacing the variables. This study replaces life insurance density (LID) with life insurance penetration (LIP). Life insurance penetration is one of the most important indicators to measure life insurance consumption. It refers to the proportion of annual life insurance premium of a country or region in GDP, which is

Table 8. Heterogeneity analysis in terms of different aging degrees.

	Non-Aging countries		Aging countries		Deeply Aging countries	
Variables	TW-FE (1)	SYS-GMM (2)	TW-FE (3)	SYS-GMM (4)	TW-FE (5)	SYS-GMM (6)
L.LID		0.899***		0.712***		0.880***
		(0.046)		(0.150)		(0.034)
ODR	5.609***	2.827***	29.473***	1.987*	−1.572**	1.367*
	(0.634)	(2.055)	(1.988)	(5.794)	(1.506)	(1.551)
TDR	−0.190**	−0.098*	1.962**	0.909**	5.233*	0.080*
	(0.080)	(0.105)	(0.902)	(1.202)	(2.646)	(0.154)
LIFE	1.159***	1.345*	1.645	1.312***	−0.896	−0.802
	(0.390)	(1.001)	(1.630)	(1.569)	(4.432)	(0.648)
FEMALE	−7.304***	−2.664**	21.282	13.360	−5.773	−6.532
	(1.075)	(3.279)	(10.915)	(14.703)	(6.368)	(2.540)
EDU	0.135*	0.492**	1.953***	0.152*	5.498***	0.274*
	(0.076)	(0.409)	(0.358)	(0.554)	(1.712)	(0.286)
URBAN	1.709***	0.995**	1.263	2.238	1.065	0.978
	(0.198)	(0.784)	(1.208)	(2.458)	(0.878)	(0.579)
lnINCOME	1.182	1.144	1.110	1.027	1.467	1.930**
	(0.975)	(0.896)	(0.538)	(0.575)	(1.771)	(0.636)
INF	0.038***	0.017*	−0.067	−0.098	−0.048	−0.003
	(0.014)	(0.017)	(0.282)	(0.304)	(0.116)	(0.007)
SAVING	0.759***	−0.050**	2.077	0.123	−3.836	−0.103
	(0.099)	(0.116)	(2.158)	(2.422)	(2.518)	(0.109)
RATE	−1.436	−0.776	−0.019	−0.557	−0.414	−0.043
	(2.232)	(0.801)	(0.078)	(0.666)	(0.333)	(0.084)
Constant	300.413***	192.722	−1326.347**	−201.973	1082.287	228.262**
	(51.005)	(55.695)	(59.175)	(89.565)	(69.333)	(112.777)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	120	120	48	48	24	24
R-squared	0.870		0.982		0.865	
Sargan		1.0000		1.0000		1.0000
AR (1)		0.0398		0.0468		0.0578
AR (2)		0.2625		0.3105		0.3173
Wald		0.0000		0.0000		0.0000

Notes: *, **, *** indicate significant at the level of 10%, 5%, and 1% respectively, and the parentheses are the robust standard errors.
Source: Authors calculation based on the empirical analysis of the paper.

widely used in insurance research. As for explanatory variables, the study replaces old-age dependency ratio (ODR) with old-age population ratio (OPR), that is, the proportion of the population over the age of 65 in the total population is used to replace the proportion of the population over the age of 65 in the labor force. And the paper replaces the teenager dependency ratio (TDR) with the teenager population ratio (TPR), which means the proportion of the population under the age of 14 in the labor force is replaced by the proportion of the population under the age of 14 in the total population (Yuan & Cui, 2020; Zhang & Shang, 2011). Table 9 presents the descriptive statistics of the three surrogate variables in the robustness test.

Furthermore, the second method is replacing the samples. To test whether the regression results are robust, the study selects entire sample, non-Islamic sample, Islamic sample, non-aging sample, aging sample and deeply aging sample to conduct robustness test after variable replacement. Additionally, the third method is replacing the regression methods. In terms of estimation methods used for robustness test of entire sample, non-Islam sample, Islam sample, non-aging sample, aging sample and deeply aging sample, the static panel still adopts two-way fixed effect, while the

Table 9. The descriptive statistics of surrogate variables.

Variables	Observations	Means	Standard Deviation	Min	Max
LIP	192	0.886458	1.133473	0.1	4.2
OPR	192	6.413021	3.164002	2.94	15.09
TDR	192	37.99917	17.43844	14.72	84.43

Source: Authors calculation based on the empirical analysis of the paper.

dynamic panel adopts Difference GMM instead of System GMM, to test whether the regression results are robust. Overall, the estimated results of robustness test including the above three methods are shown in Table 10.

As shown in Table 10, the old-age population ratio, teenager population ratio and the first-order lagged term of life insurance penetration (L.LIP) all have significant positive effect on life insurance penetration in columns (1) and (2), which are consistent with the conclusions drawn from Table 4. It can be seen in columns (3)-(6) that the Islamic faith has inhibitory effect on life insurance penetration. In Islamic countries, the old-age population ratio has a negative impact on life insurance penetration, while enhances life insurance penetration in non-Islamic countries. The teenager population ratio has significant positive effects both in Islamic samples and non-Islamic samples. The results in columns (3)-(6) are consistent with the conclusions drawn from Table 6. In columns (7)-(12), the old-age population ratio has significant positive impact on life insurance penetration in non-aging and aging societies, but it is not significant in a deeply aging society, and even adverse. Teenager population ratio has significantly negative impact in a non-aging society, and it has significant stimulated effect for an aging society or even a deeply aging society. The results in columns (7)-(12) are consistent with the conclusions drawn from Table 8. Therefore, based on the robustness test, the empirical results are robust in the benchmark regression analysis of the entire sample and heterogeneity analysis of sub-samples.

5. Discussion and conclusions

5.1. Conclusions

This study makes a significant contribution to exploring the impact of demographic changes on life insurance consumption, which expands the research perspective from a certain country to the member states of Shanghai Cooperation Organization (SCO). Based on the panel data of the eight SCO member states from 1996 to 2019, this study analyzes the effect of demographic changes on ordinary life insurance consumption under the static panel model and dynamic panel model. Two-way fixed effect is used to estimate static panel model and System GMM is adopted to estimate dynamic panel model for benchmark regression and heterogeneity analysis. Due to large differences of the religions and the aging degrees among different member states of SCO, we conduct heterogeneity analysis to test whether the demographic changes of SCO member countries have the above two heterogeneous impacts on ordinary life insurance consumption. To verify the accuracy of regression conclusions, we use

Table 10. Robustness test.

	Entire sample		Non-Islamic countries		Islamic countries		Non-Aging countries		Aging countries		Deeply Aging countries	
Variables	TW-FE (1)	DIFF-GMM (2)	TW-FE (3)	DIFF-GMM (4)	TW-FE (5)	DIFF-GMM (6)	TW-FE (7)	DIFF-GMM (8)	TW-FE (9)	DIFF-GMM (10)	TW-FE (11)	DIFF-GMM (12)
L.LIP		0.850***		0.743***		0.508***		0.837***		0.378***		0.413
		(0.032)		(0.093)		(0.126)		(0.091)		(0.013)		(0.198)
OPR	0.528***	0.123**	1.059***	0.168*	−1.273***	−0.012**	1.094**	0.286	0.213***	0.042***	−1.184**	−1.779**
	(0.079)	(0.058)	(0.284)	(0.444)	(0.343)	(0.080)	(0.773)	(0.358)	(0.109)	(0.002)	(0.450)	(0.635)
TPR	0.073***	0.058**	0.198***	0.181***	0.024*	0.017*	−0.362*	−0.174***	0.029**	0.048***	0.043*	0.032
	(0.007)	(0.030)	(0.038)	(0.037)	(0.023)	(0.012)	(0.044)	(0.014)	(0.009)	(0.017)	(0.139)	(0.445)
LIFE	0.051*	0.051*	−0.034*	−0.159*	0.083*	−0.018*	0.106**	0.109**	0.007	0.026*	−0.204	−0.193
	(0.036)	(0.041)	(0.074)	(0.105)	(0.134)	(0.011)	(0.011)	(0.042)	(0.010)	(0.014)	(0.167)	(0.198)
FEMALE	−0.888***	−0.081**	−2.536**	−0.735*	−14.142***	−0.002	−16.543*	−2.189	0.150	0.447***	−3.722	−5.167
	(0.324)	(0.456)	(0.963)	(1.518)	(1.446)	(0.221)	(2.005)	(2.152)	(0.032)	(0.132)	(4.872)	(4.476)
EDU	0.021*	0.025***	0.078**	0.030*	0.065*	0.002	0.089*	0.075***	0.004*	0.008	0.134*	0.134*
	(0.011)	(0.015)	(0.032)	(0.062)	(0.037)	(0.004)	(0.087)	(0.023)	(0.002)	(0.005)	(0.063)	(0.063)
URBAN	0.037*	0.025*	0.345**	0.082*	0.692***	0.082**	0.170**	0.244***	0.091	0.079***	0.811	1.004
	(0.043)	(0.046)	(0.143)	(0.230)	(0.160)	(0.032)	(0.277)	(0.088)	(0.044)	(0.021)	(1.403)	(1.482)
lnINCOME	0.908	0.010**	0.823*	0.032	0.118**	0.044***	0.892**	0.469***	1.093***	0.061***	0.180	0.926
	(0.557)	(0.034)	(0.162)	(0.071)	(0.007)	(0.038)	(0.350)	(0.256)	(0.542)	(0.268)	(0.395)	(0.678)
INF	0.004	0.001	−0.001	−0.003**	0.002	0.001	0.002*	0.011	−0.001	−0.004	−0.003	−0.004
	(0.005)	(0.002)	(0.005)	(0.001)	(0.006)	(0.001)	(0.006)	(0.001)	(0.002)	(0.004)	(0.003)	(0.003)
SAVING	−0.053***	−0.020**	−0.224***	−0.053	−0.114***	−0.042	0.087**	−0.006*	0.215*	0.194***	−0.112	−0.111
	(0.010)	(0.009)	(0.024)	(0.041)	(0.026)	(0.031)	(0.034)	(0.003)	(0.049)	(0.044)	(0.073)	(0.075)
RATE	−0.152	−0.012	−0.061	−0.042	−0.094***	−0.043	−0.150	−0.026***	−0.077	−0.056	−0.013***	−0.069
	(0.182)	(0.019)	(0.042)	(0.018)	(0.019)	(0.023)	(0.071)	(0.007)	(0.038)	(0.035)	(0.049)	(0.023)
Constant	44.786***	−4.206	127.613***	−34.904	663.561***	−39.506**	805.132*	111.308	8.953	−20.128***	162.420	172.249
	(16.194)	(21.916)	(45.633)	(73.316)	(72.548)	(0.812)	(90.325)	(100.540)	(1.595)	(5.649)	(274.649)	(270.497)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	192	192	72	72	120	120	120	120	48	48	24	24
R-squared	0.875		0.952		0.977		0.909		0.872		0.802	
Sargan		0.8062		0.9035		0.9126		0.9342		0.9014		0.8249
AR (1)		0.0546		0.0573		0.0106		0.0558		0.0078		0.0751
AR (2)		0.1680		0.1696		0.7962		0.2721		0.6079		0.3173
Wald		0.0348		0.0000		0.0962		0.0000		0.0983		0.0000

Notes: *, **, *** indicate significant at the level of 10%, 5%, and 1% respectively, and the parentheses are the robust standard errors.
Source: Authors calculation based on the empirical analysis of the paper.

three methods in the robustness test, including variable replacement, sample replacement and regression method replacement.

The empirical results show that both old-age dependency ratio and teenager dependency ratio have positive impacts on life insurance consumption in the SCO countries. Besides, the current consumption of ordinary life insurance significantly stimulates the future consumption of ordinary life insurance, indicating that residents' life insurance consumption has the inertia of continuous payment and renewal. In terms of religious heterogeneity, the old-age dependency ratio is significantly positive for life insurance consumption in non-Islamic countries, but it is significantly negative in Islamic countries. And the impact of teenager dependency ratio on life insurance consumption is significantly positive both in Islamic countries and non-Islamic countries. Distinct from other control variables, the impact of life expectancy on life insurance consumption is significantly positive in Islamic countries, while it is significantly negative in non-Islamic countries. Other variables have no religious differences between Islamic samples and non-Islamic samples in the heterogeneity analysis. In terms of heterogeneity of aging degrees, the old-age dependency ratio has a significant positive impact on life insurance consumption in non-aging and aging countries, but it is significantly negative in deeply aging countries. The teenager dependency ratio significantly stimulates life insurance consumption in deeply aging countries and aging countries, while has a prominent inhibitory effect on life insurance consumption in non-aging countries.

5.2. Managerial implications

Our findings not only add new evidence regarding the impact of demographic changes on ordinary life insurance consumption, but also provide some managerial implications for insurance companies that carry out life insurance business in SCO member states. The managerial implications of the empirical findings are as follows.

First, insurance companies should take into account whether the SCO member state believes in Islam. If life insurance business is conducted in Islam countries, the sales of life insurance products that protect the life of the elderly in their late years should be reduced, and insurance companies should attach more importance to innovative life insurance products that protect the health and lives of teenagers. Life insurance business should be widely developed in regions with lower life expectancy, and more sales outlets should be transferred from regions with higher life expectancy to areas with lower life expectancy. If life insurance business is conducted in the SCO member countries that do not believe in Islam, the life insurance sales strategy is quite the opposite.

Second, insurance companies should take different strategies in accordance with different degrees of aging in SCO member states. To develop life insurance business in non-aging SCO member states, insurance companies should focus on life insurance products that comprehensively protect the life of the elderly in their later years to guarantee long-term care, reduce the supply of teenagers' health insurance and life insurance, sell and introduce more life insurance products to male policyholders and reduce marketing to female policyholders. To implement life insurance business in

SCO aging countries, insurance companies should provide life insurance products in line with changes in the old-age dependency ratio and the teenager dependency ratio, which simultaneously issue life insurance products that protect the long-term care and elderly disease services as well as the health of children. To carry out life insurance business in the deeply aging SCO member states, insurance companies should appropriately reduce the life insurance products services and long-term care that protect the life of the elderly in their later years, then invest more to develop innovative life insurance products that protect children's health and lives.

Overall, insurance companies that conduct life insurance sales in SCO member states should consider the policyholders' life insurance consumption in accordance with demographic changes of both old-age dependency ratio and teenager dependency ratio, meanwhile, take differentiated life insurance sales strategies according to different degrees of aging and whether the residents believe in Islam.

5.3. Limitations and future research

Apart from contributing to the extant literature, this study has some limitations and we attempt to make up for these deficits in the future research. Firstly, the range of data used in the empirical analysis is eight SCO member states, thus the number of countries in our study is limited. Future analysis is needed to further validate our findings by adding other regional organizations like EU, NAFTA, OPEC and so on. We should extend the research by using more regional organizations to further examine the effects of demographic changes on life insurance consumption. Secondly, the causal relationship between demographic changes and life insurance consumption may operate both ways. In the future research, we should further testify the causality relationship on both sides between demographic changes and life insurance consumption, by means of choosing appropriate instrumental variables and using two-stage least square. Thirdly, we fail to find out the mechanism of demographic changes affecting life insurance consumption. And there is a lack of mechanism of the correlation between demographic changes and life insurance consumption in the extant literature. Therefore, we attempt to explore the impact mechanism by virtues of the moderating effect or mediating effect in the future research.

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