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PRODUCT-LINE DIVERSIFICATION AND FINANCIAL PERFORMANCE: THE CASE OF THE MACEDONIAN NON-LIFE INSURANCE MARKET

Bojan Srbinoski, Klime Poposki, Jasmina Selimovic

Abstract

This study investigates the relationship between product-line diversification and financial performance among non-life insurers in North Macedonia over the period 2013–2022. Drawing on firm-level data and applying fixed and random effects two-stage least squares (IV-2SLS) models, we examine whether diversification improves profitability in a market characterized by low insurance culture and heavy reliance on the regulated motor third-party liability (MTPL) segment. We use two diversification measures: the Herfindahl-Hirschman Index (HHI) of insurers' product portfolios and a weighted HHI adjusted for market competition across lines of business. Our findings reveal a nonlinear relationship between diversification and profitability, supporting the coexistence of both diversified and specialized insurers. While initial diversification appears beneficial, excessive diversification may reduce returns, and evidence linking diversification away from competitive lines (e.g., MTPL) to higher profitability is weak. These insights carry important policy implications, suggesting that a measured liberalization of the MTPL market could support healthier diversification dynamics, while highlighting the need for careful monitoring of risk underpricing and solvency risks in evolving product strategies.

Keywords: *non-life insurance, diversification, performance, North Macedonia*

JEL Codes: *G22; L25; O50*

Bojan Srbinoski, PhD (Corresponding author)
Assistant Professor
Faculty of Tourism and Hospitality, University St. Kliment Ohridski Bitola, North Macedonia
E-mail: bojan.srbinoski@uklo.edu.mk
ORCID: 0000-0003-4815-3762

Klime Poposki, PhD
Associate Professor
Faculty of Tourism and Hospitality, University St. Kliment Ohridski Bitola, North Macedonia
E-mail: klime.poposki@uklo.edu.mk
ORCID: 0000-0002-7497-5826

Jasmina Selimovic, PhD
Professor
School of Economics and Business, University of Sarajevo, Bosnia and Herzegovina
E-mail: jasmina.selimovic@efsa.unsa.ba
ORCID: 0000-0001-8485-8642

1. INTRODUCTION

The aftermath of the Covid-19 pandemic brought a resurgence in inflation, significantly impacting the insurance industry. The inflationary pressures had an imminent impact on non-life insurers through rising future claims costs and downward pressures on insurance demand (Schanz and Treccani 2023). The persistently higher levels of inflation imposed significant challenges to insurers, which dominantly underwrite business in Motor and P&C insurance lines, negatively affecting their financial performance (Deloitte 2022). The low insurance culture in North Macedonia imposes constraints on non-life insurers' underwriting portfolios to be less diversified and pressures insurers to

compete within the mandatory lines of business, such as motor insurance. However, the recent dynamics in the underwriting portfolio of non-life insurers show tendencies toward greater diversification. The recent surge in inflation brings forward the question of the relevance of corporate diversification for insurers' performance in North Macedonia: Whether greater specialization brings efficiency gains, improving non-life insurers' financial performance, or greater diversification creates synergies arising from economies of scope, supporting the profitability and stability of insurers?

The extant literature provides mixed evidence regarding the diversification-performance relationship in insurance. One group of studies provide support to the so-called conglomeration hypothesis, i.e. a positive relationship between diversification and performance (e.g., Berry-Stölzle, Hoyt, and Wende 2013; Che and Liebenberg 2017; Che et al. 2017; Lee 2017; Meador, Ryan, and Schellhorn 2000; Rehman et al. 2021; Wu and Deng 2021), while another group of studies provide evidence for the so-called strategic focus hypothesis, i.e. a negative relationship between diversification and performance (e.g., Baggett and Cole 2023; Cummins and Nini 2002; Liebenberg and Sommer 2008; Shim 2011; Born et al. 2023; McShane and Cox 2009). Moreover, most of the studies investigate these hypotheses for the developed countries, however, just a few studies exist which examine the issue for the less developed Eastern European countries (e.g., Krivokapic, Njegomir, and Stojic 2017; Ortyński 2019; Pavić and Pervan 2010). None of the existing studies covers North Macedonia.

This article examines the relationship between product-line diversification and insurer performance in the Macedonian non-life insurance market for the period 2013 – 2022 using firm-level data. We use two measures of product diversification: a simple Herfindahl-Hirschman index of product portfolio and a weighted sum of product-line shares in the insurer's portfolio multiplied by the line-specific Herfindahl-Hirschman Index. The latter takes into account not only the level of product diversification but also the competition within each line of business. We employ a robust methodological approach, fixed effects and random effects two-stage least squares regressions using a unique set of instrumental variables (FE IV-2SLS/RE IV-2SLS).

This research contributes to existing literature in two aspects. Firstly, we add to the three-decade-long discussion of the diversification-performance literature. Secondly, different from the existing literature, which is largely focused on the developed world, we investigate the issue of a less-developed insurance market but with a more competitive structure, especially in the mandatory motor insurance lines. Similar to the Serbian, the Macedonian motor insurance market is still constrained by the tariff regulation, which creates significant challenges for insurers dominantly active in the motor insurance lines. North Macedonia's motor third-party liability (MTPL) insurance market remains under state-mandated tariff regulation, with all insurers charging a uniform premium set by the authorities. Regulators have openly acknowledged the need to liberalize this segment; a government commission was even established to guide the transition toward risk-based pricing, but no substantive deregulation has been implemented yet. Recent government interventions (e.g. capping a 2024 premium increase and reverting prices to prior levels) further underscore that MTPL pricing is still tightly controlled by the state (Todorovski 2024). The study provides policy implications concerning the regulatory constraints within the mandatory motor insurance lines.

The remainder of this article is organized as follows. The second section reviews the literature. The third section presents the data and the empirical methodology. The empirical results are presented in the fourth section, which is followed by the conclusions.

2. LITERATURE REVIEW

The debate about corporate diversification and financial performance in insurance revolves around two competing hypotheses. The conglomeration hypothesis states that operating across multiple lines of business can improve the efficiency of insurers by realizing revenue or cost scope and scale economies, reducing the information costs from external financing by creating internal capital markets, and reducing the (default) risk by risk diversification (Berger et al. 2000). In contrast, the strategic focus hypothesis states that corporate diversification creates agency problems, stimulating cross-subsidization to poor-performing units in the firm (Liebenberg and Sommer 2008). Thus, the insurer focuses on its core business lines to avoid the profit scope diseconomies from greater diversification (Fier, Liebenberg, and Liebenberg 2017). However, the empirical evidence shows that the relationship between corporate diversification and performance in insurance is far from clear, as the relationship may be non-linear and moderated by various internal or external factors.

The pro-conglomeration evidence shows that product-line diversification in non-life insurance contributes to overcoming the barriers to growth,

reducing the volatility of underwriting results, affecting risk-taking behavior and improving profitability. Berry-Stölzle, Hoyt, and Wende (2013) argue that insurers may expand their product lines into unrelated markets to circumvent barriers to growth. This is in line with Li and Greenwood's (2004) mutual forbearance hypothesis, which states that multiline competition enables a reduction in competition intensity. Alternatively, Shim (2017a) claims that product and geographical diversification improve the financial stability of insurers by reducing the volatility of underwriting results. Regele (2022) extends this view further, suggesting that the diversification across non-life and life segments lowers the contribution to systemic risk. Similarly, recent evidence shows that business diversification enables insurers to reduce underwriting risks while improving their investment profitability (e.g., Che and Liebenberg 2017; Che et al. 2017; Lee 2017; Meador, Ryan, and Schellhorn 2000). While the previous studies mainly relate to developed countries, pro-conglomeration evidence also exists for developing countries (e.g., Krivokapic, Njegomir, and Stojic 2017; Ortyński 2019; Rehman et al. 2021; Wu and Deng 2021).[1]

The evidence that product specialization boosts financial performance in insurance is mainly present in the US insurance market. Hoyt and Trieschmann (1991) find that individual life-health and property-liability insurers tend to have higher performance compared to diversified insurers due to efficiency losses related to operating larger entity. Fier, Liebenberg, and Liebenberg (2017) argue that product expansion can be an expensive process for insurers, affecting the decision-making process of expanding insurers. The strategic focus hypothesis holds even within the US property-liability insurance market (e.g., Baggett and Cole 2023; Cummins and Nini 2002; Liebenberg and Sommer 2008; Shim 2011) as well as within the US health insurance market (e.g., Born et al. 2023; McShane and Cox 2009). Additionally, Pavić and Pervan (2010) provide evidence of the positive impact of product specialization on profitability by focusing on a small developing insurance market (Croatia).

However, the coexistence of diversified and specialized insurers may indicate potential non-linearities regarding the diversification-performance link (Du 2017; Shim 2017b). The relationship might be moderated by external (country-specific) and internal (firm) characteristics. For instance, insurers consider financial constraints and economic conditions in determining their diversification strategies (González-Fernández, Rubio-Misas, and Ruiz 2020). For instance, Berry-Stölzle, Hoyt, and Wende (2013) find that product diversification boosts performance in countries with well-developed capital markets, better property rights protection and stronger competition. Moreover, Elango, Ma, and Pope (2008) argue that the effects of corporate diversification on financial performance also depend on the extent of geographical diversification. Besides external factors, firm characteristics play an important role in maximizing the value of product diversification strategies. For example, Lee (2017) finds that larger insurers tend to benefit more from product diversification compared to their smaller counterparts. Additionally, the quality of the Enterprise Risk Management (ERM) reinforces the positive effects of diversification on performance (e.g., Ai, Bajtelsmit, and Wang 2018; Altuntas, Berry-Stölzle, and Cummins 2021). Finally, the interplay between leverage and product diversification significantly impacts the insurers' performance in more constrained insurance markets (Foong and Idris 2012). Thus, the impact of product diversification on the financial performance of insurers is market-specific and conditional on the institutional setting and market environment.

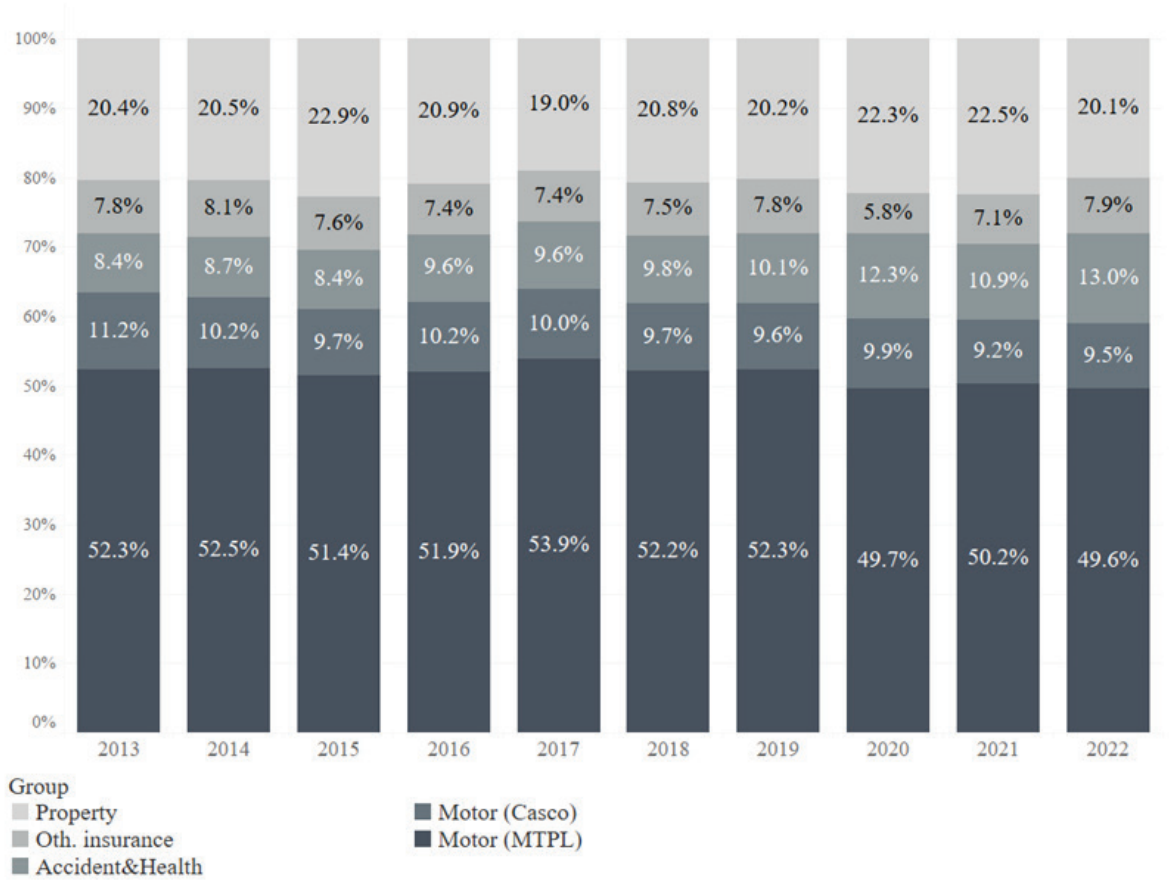
3. DATA AND METHODOLOGY

3.1. Data, sample and main variables

The Macedonian non-life insurance market has a peculiar setting for examining the diversification-performance link. Firstly, insurers must establish separate entities to write business in non-life or life segments, making insurers constrained to diversify only within one segment. Secondly, the Macedonian non-life insurance market is relatively competitive compared to other developing insurance markets and does not have significant market entrance/exit dynamics.[2] Throughout the observed period, the number of non-life insurance companies remained unchanged. Thirdly, the underdeveloped insurance culture constrains insurers to concentrate predominantly on mandatory or semi-mandatory lines of business, most notably motor third-party liability (MTPL) insurance, which consequently accounts for the largest proportion of the market portfolio. The tariffs in the MTPL market are regulated and without significant changes for the period of analysis, making the MTPL business less profitable in times of rising costs and increasing competition. Thus, the pressure on non-life insurers to reconsider their product mix strategy is significant.

The dataset is derived from official industry reports published by the Insurance Supervision Agency (ISA) of North Macedonia. It comprises 110 firm-year observations covering 11 non-life insurance companies over the period 2013–2022, encompassing all business lines within the non-life insurance segment.[3]

Figure 1. The structure of the market portfolio in North Macedonia during 2013-2022



Authors' calculations based on the Macedonian ISA's data

Figure 1 shows the tendencies in the structure of the market portfolio in North Macedonia. In aggregate, motor insurance (Casco and MTPL) slowly loses its importance over time, while accident and health insurance gain a larger share in the market portfolio. This process of a more diversified market portfolio was accelerated by the Covid-19 crisis.

Performance measures. In line with prior research, we employ commonly applied performance indicators, namely return on assets (ROA) and return on equity (ROE) (e.g., Liebenberg and Sommer, 2008). Nonetheless, as elevated profitability may stem from increased risk-taking, numerous studies adjust performance measures to account for risk exposure. A conventional approach involves correcting the performance indicators by their variability across a specified period. Alternatively, risk measures can be incorporated directly into the regression models to control for risk levels. For reasons of interpretability regarding the impact of diversification on performance, we adopt the latter strategy. Accordingly, we compute the standard deviations of ROA and ROE over rolling three-year intervals and introduce these values as control variables in the respective regressions.

Diversification measures. To assess the degree of product diversification among insurers, we employ two distinct measures. Firstly, we compute the Herfindahl–Hirschman Index (HHI) using Gross Premiums Written (GWP) for each insurer (i=1,…,11) across all lines of business (j=1,…,18) in each year (t). A lower value of HHI_{it} indicates a greater degree of diversification in the insurer's product portfolio. Consequently, a negative relationship between HHI_{it} and performance measures would provide support for the conglomeration hypothesis.

$$HHI_{it} = \sum_{j=1}^{18} \left(\frac{GWP_{ijt}}{GWP_{it}}\right)^2 \quad (1)$$

Additionally, we use the weighted sum of product-line shares in the insurer's portfolio multiplied by the line-specific Herfindahl-Hirschman Index (e.g., Krivokapic, Njegomir and Stojic 2017). Firstly, we

calculate each business line's (j = 1,...,18) participation in each firm's (i = 1,...,11) portfolio in each year (t).

$$w_{ijt} = \frac{GWP_{ijt}}{GWP_{it}} w_{ijt} = \frac{GWP_{ijt}}{GWP_{it}} \quad (2)$$

Using w_{it} as weights, we then calculate the weighted sum of a firm's exposure to industry concentration across all business lines in which it operates.

$$WHHI_{it} = \sum_{j=1}^{18} w_{ijt} * HHI_{jt} \quad (3)$$

The lower the value of the $WHHI_{it}$, the insurer has a more concentrated product portfolio in more competitive lines of business. Given the dominance of the MTPL in the Macedonian non-life insurance market, lower $WHHI_{it}$ would indicate a greater concentration of the insurer's portfolio in the MTPL business. Thus, the positive relationship between $WHHI_{it}$ and performance measures would indicate support for the conglomeration hypothesis.

3.2. Control variables

Firm size. To account for revenue scope economies, we employ the natural logarithm of total assets as a proxy for firm size. Larger insurers are generally expected to derive greater benefits from revenue scope economies than smaller ones. Prior studies document a positive association between firm size and financial performance (e.g., Nini, 2002; Elango, Ma, and Pope 2008; Liebenberg and Sommer, 2008).

Capitalization. Financial stability allows insurers to charge higher premiums and thereby achieve greater profitability (Sommer 1996). Previous studies have employed various indicators of capitalization, including the capital-to-asset ratio (e.g., Krivokapic, Njegomir, and Stojic 2017) and the policyholder-surplus-to-asset ratio (e.g., Liebenberg and Sommer 2008). In contrast, we adopt the ratio of capital to the minimum solvency margin, as defined by the Insurance Supervision Agency, as a risk-based indicator of financial stability. A higher value of this ratio reflects a more stable insurer.

Business growth. Excessive business expansion may increase the riskiness of an insurer's underwriting portfolio if sufficient time is not available to adjust risk-based capital or surplus to accommodate the growth in premium inflows (Killins 2020). To account for business growth, we measure the change in inflation-adjusted Gross Written Premiums (GWP).

Reinsurance. An insurer's riskiness depends on reinsurance utilization (Weiss and Choi 2008). On one side, reinsurance can be an expensive mechanism for underwriting portfolio management and may lead to inefficiencies, resulting in lower profitability. On the other side, reinsurance may improve risk diversification and lead to improved underwriting results. We calculate the retention ratio as the difference between GWP and the part of GWP ceded to reinsurance divided by the total GWP.

Cost efficiency. Given the level of market competitiveness, more efficient firms are able to achieve higher profitability without necessarily increasing prices (Weiss and Choi 2008). Accordingly, cost efficiency allows insurers to expand their market share while sustaining profitability. We employ the proportion of administrative expenses relative to total Gross Written Premiums (GWP) as a proxy for cost efficiency, where lower ratios denote higher efficiency.

3.3. Regression methodology

We adopt a rigorous methodological framework to address the structure of our data and potential endogeneity concerns. The panel nature of the dataset enables the application of fixed-effects models to account for time-specific influences and mitigate unobserved variable bias. Instead of relying solely on the Hausman test to determine the appropriate specification, we estimate both fixed-effects and random-effects models.[4] Moreover, endogeneity concerns may emerge as a result of potential simultaneity bias. The product-diversification strategy may also depend on the performance of insurers (Elango, Ma, and Pope 2008). Thus, we employ fixed effects and random effects two-stage least squares regressions using instrumental variables (FE IV-2SLS/RE IV-2SLS). In the first stage, we regress the diversification measure on the other independent and selected instrumental variables. In the second stage, we estimate Equation (4) using the predicted values of the diversification measure estimated in the first stage. To check for potential non-linearities, we also include the squared version of the main independent variable.

$$PERFORMANCE_{i,t} = \beta_0 + \beta_1 DIVERSIFICATION_{i,t} + \beta_2 DIVERSIFICATION_{i,t}^2 + \beta_3 SIZE_{i,t} + \beta_4 CAPITALIZATION_{i,t} + \beta_5 RETENTION_{i,t} + \beta_6 EFFICIENCY_{i,t} + \beta_{7\text{-}15} YEAR_{i,t} + \varepsilon_{i,t} \quad (4)$$

Implementation of the 2SLS methodology necessitates the identification of valid instruments. Instrument validity requires that the chosen instruments exhibit a strong partial correlation with the diversification measures while remaining uncorrelated with the error term. Accordingly, an appropriate identification strategy involves determining the treatment of the key independent variables and constructing a suitable set of instruments. We treat corporate

diversification variables as endogenous; thus, the squared term of the diversification variable results in an endogenous variable. In that case, the estimation of Equation 4 represents a system nonlinear in endogenous variables. As suggested in Wooldridge (2010), such a system requires a different or extended set of instruments for proper identification. Wooldridge suggests a general approach in dealing with systems nonlinear in endogenous variables through the inclusion of squares and cross-products of the exogenous variables.

The dataset enables the construction of potential instruments by examining dynamics within the brokerage market. We use the share of GWP generated through brokers, the ratio of commission costs to GWP and their product as instruments in Equation 4. The chosen instruments plausibly influence an insurer's diversification strategy while remaining orthogonal to direct profitability outcomes. These variables capture the insurer's distribution-channel intensity, which can shape product-line decisions (insurers heavily reliant on brokers may broaden their offerings via broker networks) without inherently improving profitability. Crucially, the Macedonian non-life market's institutional context underpins the exclusion restriction: the dominant motor third-party liability (MTPL) line operated under a fixed-tariff regime during the sample period. With premium rates administratively set (i.e. no risk-based price competition), insurers primarily compete through volume and distribution rather than pricing. Insurers often boost broker commissions to capture market share in mandatory MTPL business, effectively using acquisition costs as a competitive lever, given the fixed pricing. While such commission structures clearly affect insurers' incentive to diversify (firms weighed down by high MTPL acquisition costs have stronger motives to expand into other, less constrained lines), they are unlikely to directly spur profitability. In fact, high commission outlays tend to uniformly erode underwriting margins across the industry, meaning any performance impact of broker dynamics is felt broadly rather than conferring an idiosyncratic advantage to specific firms. Moreover, the tariff-imposed uniformity in MTPL margins implies that differences in broker use and commission ratios reflect strategic allocation (focus on MTPL vs. other lines) rather than intrinsic efficiency differences. In sum, the Macedonian market's features – fixed tariffs in key lines, intense intermediary competition, and unregulated commission arrangements – ensure that the selected instruments drive diversification decisions but do not independently influence profitability, satisfying the exclusion restriction. We assess the validity of the instruments through Hansen's J-test for overidentifying restrictions. Under this test, the null hypothesis posits that the instruments are exogenous, meaning they are uncorrelated with the error term. The definitions and summary statistics of the selected variables are included in Table 1.

Table 1. Variable definitions and basic statistics

Variable	Definition	Obs	Mean	Std. Dev.	Median
ROA	Return on assets	110	.009	.065	.020
ROE	Return on equity	110	-.023	.365	.064
HHI	Herfindahl-Hirschman Index of insurer's portfolio	110	.398	.175	.364
WHHI	Weighted Herfindahl-Hirschman Index of insurer's portfolio	110	.124	.019	.119
Assets (Ln)	Natural logarithm of total assets	110	14.006	.495	14.090
Rgrowth (GWP)	Real GWP growth	110	.037	.129	.031
Solvency ratio	Capital to Solvency margin	110	4.145	3.091	3.062
Retention ratio	Share of non-ceded GWP	110	.819	.144	.874
Admin. costs (% of GWP)	Share of administrative costs in GWP	110	.185	.039	.182
SDROA	Standard deviation of ROA (3-year_	110	.027	.036	.015
SDROE	Standard deviation of ROE (3-year)	110	.139	.265	.047
SBroker	Share of premium generated via brokers	110	.251	.098	.232
Comm. costs (% of GWP)	Share of commission costs in GWP	110	.112	.056	.095

Authors' calculations

Finally, to address the potential reverse causality problem, that insurer profitability in year t-1 might influence diversification strategies in year (t), we extended our empirical analysis by incorporating a lagged dependent variable in the model specifications. This approach allows us to capture the dynamic nature of firm performance and control for unobserved factors that persist over time, thereby enhancing the robustness of our results. The inclusion of $ROA(-1)$ and $ROE(-1)$ in separate model variants serves to mitigate endogeneity concerns by accounting for the possibility that past profitability could drive diversification decisions.

4. Empirical results

We report the estimated effects of product diversification on ROA using the FE IV-2SLS and RE IV-2SLS methods in Table 2. We devise eight models based on the inclusion and exclusion of time dummies, a lagged dependent variable, and a risk measure. Panel A presents the fixed effects estimates of HHI and HHI squared on ROA. The Herfindahl-Hirschman Index is consistently negatively related to ROA, and the squared term is consistently positively related, but they are only statistically significant at the 10% confidence level in Model 1. Expectedly, the FE models are more restrictive, and many of the coefficients are insignificant. The F-statistics show that the models are properly estimated, and the Hansen J-test confirms that the instruments are valid. Panel B shows the RE estimates of HHI and HHI squared on ROA. The RE estimates provide stronger results for the non-linear relationship between corporate diversification and profitability. The negative relationship between HHI and ROA supports the conglomeration hypothesis, that greater product diversification (lower HHI) leads to improved performance, however, there is a threshold level after which the relationship reverses.

We conduct a similar analysis using ROE as a dependent variable. Table 3 reports the FE (Panel A) and RE (Panel B) estimates. The results are qualitatively similar to the results in Table 2, showing a nonlinear relationship between HHI and ROE. Our results corroborate the view that product diversification stimulates financial performance in less developed and more concentrated markets (e.g., Krivokapic, Njegomir, and Stojic 2017; Ortyński 2019; Rehman et al., 2021; Wu and Deng 2021). Given that there are demand constraints in the Macedonian non-life insurance market, leading to higher competition in the mandatory motor insurance lines, Macedonian insurers may circumvent the barriers to growth by expanding in other (non-mandatory) lines of business, resulting in improved performance (e.g., Berry-Stölzle, Hoyt, and Wende 2013). However, at the other extreme of product specialization, the increase in portfolio specialization

Table 2. Impact of diversification (HHI) on ROA (FE IV-2SLS (Panel A) and RE IV-2SLS (Panel B))

Panel A: FE IV-2SLS								
Dependent variable	ROA							
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
HHI	-4.411*	-4.940	-2.791	-3.592	-4.651	-4.426	-3.086	-2.832
	(-1.754)	(-1.552)	(-1.496)	(-1.177)	(-1.633)	(-1.535)	(-1.041)	(-0.751)
HHI squared	4.590*	5.179	3.051	3.975	4.874	4.630	3.622	3.341
	(1.676)	(1.504)	(1.418)	(1.142)	(1.570)	(1.475)	(1.009)	(0.741)
Controls	Included	Included	Included	Included	Included	Included	Included	Included
ROA (-1)					Included	Included	Included	Included
SDROA		Included		Included		Included		Included
Time dummies			Included	Included			Included	Included
Obs.	110	110	110	110	99	99	99	99
R-squared	0.181	0.313	0.311	0.200	0.188	0.123	0.289	0.329
No. of insurers	11	11	11	11	11	11	11	11
F-stats	1.933	1.488	2.691	2.113	1.471	1.461	2.392	2.444
Hansen J (p-value)	0.660	0.629	0.768	0.795	0.669	0.610	0.388	0.357

Table 2. ***Continued***

Panel B: RE IV-2SLS								
Dependent variable	ROA							
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
HHI	-2.946*	-1.031	-2.079*	-0.716	-1.238*	-1.018**	-0.721*	-0.586*
	(-1.799)	(-1.598)	(-1.655)	(-1.493)	(-1.797)	(-1.970)	(-1.760)	(-1.687)
HHI squared	2.961**	0.939*	2.252**	0.672*	1.096*	0.860*	0.675	0.513*
	(2.001)	(1.651)	(1.983)	(1.655)	(1.733)	(1.918)	(1.513)	(1.721)
Controls	Included	Included	Included	Included	Included	Included	Included	Included
ROA (-1)					Included	Included	Included	Included
SDROA		Included		Included		Included		Included
Time dummies			Included	Included			Included	Included
Obs.	110	110	110	110	99	99	99	99
No. of insurers	11	11	11	11	11	11	11	11
R-squared	0.003	0.212	0.010	0.339	0.070	0.197	0.223	0.336
Chi-squared	23.13	53.26	118.7	177.6	63.66	945.6	245.9	265.8
Sargan-Hansen (p)	0.462	0.858	0.915	0.607	0.776	0.929	0.732	0.545

Note: HHI is the Herfindahl-Hirschman Index of each insurer's underwriting portfolio based on the share of each business line in the total GWP. The controls include: Assets (Ln) is the natural logarithm of insurer's assets; Rgrowth (GWP) is the growth of inflation-adjusted GWP; Solvency ratio is the ratio of capital to the minimum solvency margin; Retention ratio is the difference between GWP and the part of GWP ceded to reinsurance divided by the total GWP; Administrative costs (% of GWP) is the share of administrative costs charged in the total GWP; SDROA is the standard deviation of ROA in the previous three years; ROA (-1) is the lagged dependent variable. Z-statistics are given in the parentheses below the coefficient estimates. Statistical significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *, respectively.

Authors' calculations

contributes to higher profitability. This is in line with Li and Greenwood (2004) who argue that the multi-line competition may reduce competition intensity, especially in motor insurance, leading to the coexistence of more specialized and diversified insurers.

While the Hansen's J-tests indicate that the selected instruments are valid and uncorrelated with the structural error term, we acknowledge that the relatively small sample size (110 firm-year observations) may limit the statistical power of the overidentification tests. In finite samples, particularly with a modest number of cross-sectional units and multiple instruments, these tests may lack sufficient power to detect weak violations of the exclusion restriction. Similarly, although our instruments exhibit strong first-stage relevance, the potential for finite-sample bias remains. We mitigate these concerns by using a limited set of instruments and by verifying robustness across model variants (e.g., with and without lagged dependent variables, risk controls, and time dummies).

We re-run Equation 4, replacing the HHI with the weighted Herfindahl-Hirschman Index of the insurer's portfolio (WHHI). We initially estimated the regressions, including the WHHI squared; however, the regressions were not properly estimated, and the coefficients of the main variables were insignificant. We report the estimated effects of WHHI on ROA without including the WHHI squared in Table 4. Similarly, the F-statistic (Panel A) and Chi-squared (Panel B) show that the models are properly estimated, and the Hansen J-test/Sargan-Hansen test show that the assumption of exogenous instruments is not violated, except in models 5 and 6 in Panel A. The coefficient of WHHI is mainly positive but statistically significant at the 10% confidence level only in model 5 in Panel A, and models 5 and 6 in Panel B. These results, while weak, support the consolidation hypothesis, suggesting that insurers, having a product mix in business lines characterized by less competitive market structures, secure higher profitability.

Table 3. Impact of diversification (HHI) on ROE (FE IV-2SLS (Panel A) and RE IV-2SLS (Panel B))

Panel A: FE IV-2SLS								
Dependent variable	ROE							
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
HHI	-23.574*	-20.800	-13.902	-12.043	-17.775	-12.021	-5.365	2.353
	(-1.688)	(-1.097)	(-1.306)	(-0.662)	(-1.286)	(-0.894)	(-0.336)	(0.111)
HHI squared	24.322	21.337	15.094	12.894	18.501	12.389	6.488	-2.225
	(1.600)	(1.023)	(1.226)	(0.606)	(1.197)	(0.823)	(0.330)	(-0.088)
Controls	Included	Included	Included	Included	Included	Included	Included	Included
ROE (-1)					Included	Included	Included	Included
SDROE		Included		Included		Included		Included
Time dummies			Included	Included			Included	Included
Obs.	110	110	110	110	99	99	99	99
R-squared	0.109	0.179	0.429	0.441	0.269	0.370	0.448	0.398
No. of insurers	11	11	11	11	11	11	11	11
F-stats	2.902	2.995	3.899	3.723	4.773	5.709	2.871	1.831
Hansen J (p-value)	0.582	0.540	0.958	0.927	0.715	0.957	0.880	0.836

Panel B: RE IV-2SLS								
Dependent variable	ROE							
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
HHI	-13.373*	-4.035	-8.893*	-3.435	-10.743	-3.885	-4.589	-1.909
	(-1.762)	(-1.342)	(-1.658)	(-1.469)	(-1.571)	(-1.626)	(-1.278)	(-1.472)
HHI squared	13.702*	3.704	10.015**	3.155	10.428*	3.362	5.152	1.670*
	(1.937)	(1.306)	(2.098)	(1.538)	(1.664)	(1.644)	(1.349)	(1.699)
Controls	Included	Included	Included	Included	Included	Included	Included	Included
ROE (-1)					Included	Included	Included	Included
SDROE		Included		Included		Included		Included
Time dummies			Included	Included			Included	Included
Obs.	110	110	110	110	99	99	99	99
No. of insurers	11	11	11	11	11	11	11	11
R-squared	0.003	0.308	0.025	0.396	0.001	0.314	0.045	0.446
Chi-squared	23.01	300.5	109.5	14.65	16.39	338.0	29.52	344.1
Sargan-Hansen (p)	0.45	0.942	0.91	0.964	0.733	0.81	0.847	0.55

Note: HHI is the Herfindahl-Hirschman Index of each insurer's underwriting portfolio based on the share of each business line in the total GWP. The controls include: Assets (Ln) is the natural logarithm of insurer's assets; Rgrowth (GWP) is the growth of inflation-adjusted GWP; Solvency ratio is the ratio of capital to the minimum solvency margin; Retention ratio is the difference between GWP and the part of GWP ceded to reinsurance divided by the total GWP; Administrative costs (% of GWP) is the share of administrative costs charged in the total GWP; SDROE is the standard deviation of ROE in the previous three years; ROE (-1) is the lagged dependent variable. Z-statistics are given in the parentheses below the coefficient estimates. Statistical significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *, respectively.

Authors' calculations

Table 4. Impact of diversification (WHHI) on ROA (FE IV-2SLS (Panel A) and RE IV-2SLS (Panel B))

Panel A: FE IV-2SLS								
Dependent variable	ROA							
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
WHHI	1.343	1.274	0.672	0.605	1.366*	1.193	0.509	-0.055
	(1.462)	(1.423)	(0.602)	(0.545)	(1.703)	(1.613)	(0.501)	(-0.055)
Controls	Included	Included	Included	Included	Included	Included	Included	Included
ROA (-1)					Included	Included	Included	Included
SDROA		Included		Included		Included		Included
Time dummies			Included	Included			Included	Included
Obs.	110	110	110	110	99	99	99	99
R-squared	0.159	0.185	0.317	0.331	0.137	0.201	0.316	0.350
No. of insurers	11	11	11	11	11	11	11	11
F-stats	3.541	3.376	2.175	2.147	2.452	2.303	1.800	1.993
Hansen J (p-value)	0.126	0.165	0.343	0.453	0.0829	0.097	0.298	0.445
Panel B: RE IV-2SLS								
Dependent variable	ROA							
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
WHHI	1.972	1.576	1.077	1.278	2.223*	1.890*	1.922	1.518
	(1.459)	(1.377)	(0.725)	(1.001)	(1.676)	(1.676)	(1.286)	(1.154)
Controls	Included	Included	Included	Included	Included	Included	Included	Included
ROA (-1)					Included	Included	Included	Included
SDROA		Included		Included		Included		Included
Time dummies			Included	Included			Included	Included
Obs.	110	110	110	110	99	99	99	99
No. of insurers	11	11	11	11	11	11	11	11
R-squared	0.129	0.337	0.227	0.406	0.183	0.299	0.254	0.367
Chi-squared	9.922	610.4	63.60	2142	130.6	421.3	1169	193.4
Sargan-Hansen (p)	0.121	0.16	0.127	0.403	0.475	0.6	0.536	0.674

Note: WHHI is the weighted sum of product-line shares in the insurer's portfolio multiplied by the line-specific Herfindahl-Hirschman Index. The controls include: Assets (Ln) is the natural logarithm of insurer's assets; Rgrowth (GWP) is the growth of inflation-adjusted GWP; Solvency ratio is the ratio of capital to the minimum solvency margin; Retention ratio is the difference between GWP and the part of GWP ceded to reinsurance divided by the total GWP; Administrative costs (% of GWP) is the share of administrative costs charged in the total GWP; SDROA is the standard deviation of ROA in the previous three years; ROA (-1) is the lagged dependent variable. Z-statistics are given in the parentheses below the coefficient estimates. Statistical significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *, respectively.

Authors' calculations

Figure 2. HHI by class over the period 2013 - 2022

Class	Year 2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Accident	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.11	0.11
Health	0.48	0.36	0.29	0.40	0.42	0.43	0.36	0.26	0.18	0.16
Motor vehicles (Casco)	0.14	0.13	0.14	0.15	0.13	0.12	0.12	0.12	0.11	0.11
Aircrafts (Casco)	0.85	0.77	0.77	0.77	0.44	0.46	0.54	0.60	0.79	0.70
Vessels (Casco)	0.21	0.20	0.21	0.28	0.21	0.25	0.19	0.21	0.19	0.32
Cargo	0.22	0.19	0.20	0.21	0.22	0.21	0.20	0.20	0.23	0.19
Property (fire and nat. forces)	0.16	0.15	0.17	0.16	0.16	0.14	0.14	0.14	0.15	0.13
Property (other)	0.15	0.18	0.17	0.17	0.15	0.15	0.16	0.15	0.14	0.15
Motor third-party liability (MTPL)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Aircraft third-party liability	0.69	0.63	0.55	0.54	0.31	0.32	0.45	0.55	0.39	0.46
Vessel third-party liability	0.18	0.19	0.20	0.20	0.20	0.19	0.16	0.17	0.15	0.15
General liability	0.15	0.16	0.17	0.17	0.15	0.17	0.16	0.16	0.15	0.14
Credit					1.00	1.00	0.93	0.33	0.33	0.54
Suretyship	0.43	0.39	0.23	0.32	0.75	0.82	0.48	0.24	0.27	0.40
Financial losses	0.44	0.67	0.65	0.49	0.45	0.58	0.52	0.51	0.54	0.53
Legal expenses	1.00				1.00	1.00	1.00	0.53	0.52	1.00
Travel assistance	0.11	0.11	0.12	0.12	0.12	0.12	0.12	0.13	0.14	0.15

Authors' calculations based on the Macedonian ISA's data

In the case of North Macedonia, insurers who tend to diversify away from the motor insurance lines improve their profitability. Figure 2 shows that the MTPL line has the lowest HHI, indicating a competitive market. Thus, insurers with a higher extent of product specialization in MTPL have lower WHHI. As the insurers diversify away from the competitive lines of business (higher WHHI), the competition intensity relaxes (Li and Greenwood 2004) and the less competitive market structure enables earning higher profits as predicted by the structure-conduct-performance hypothesis (Krivokapic, Njegomir, and Stojic 2017; Liebenberg and Sommer 2008).

We conduct a similar regression analysis of the effects of WHHI on ROE and report the results in Table 5. Regardless of the specification, we fail to find any significant relationship between WHHI and ROE. Hence, the results of the effects of WHHI on profitability are not robust. We cannot confirm that the diversification away from the competitive lines of business brings higher profitability to Macedonian insurers.

In summary, the empirical findings reveal a nonlinear relationship between product-line diversification and insurer profitability in the Macedonian non-life insurance market, supporting the coexistence of both diversified and specialized insurers. The Herfindahl-Hirschman Index (HHI) and its squared term show that while greater diversification initially improves performance, there is a threshold beyond which further diversification may reduce profitability. This indicates that both strategies, diversification and specialization, can be effective, depending on the insurer's positioning and market focus. However, when using the weighted HHI (WHHI), which accounts for the competitiveness of each business line, the evidence becomes

Table 5. Impact of diversification (WHHI) on ROE (FE IV-2SLS (Panel A) and RE IV-2SLS (Panel B))

Panel A: FE IV-2SLS								
Dependent variable	ROE							
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
WHHI	8.425	7.791	4.110	5.028	6.875	4.145	1.113	-3.327
	(1.353)	(1.352)	(0.652)	(0.740)	(1.438)	(1.322)	(0.213)	(-0.629)
Controls	Included	Included	Included	Included	Included	Included	Included	Included
ROE (-1)					Included	Included	Included	Included
SDROE		Included		Included		Included		Included
Time dummies			Included	Included			Included	Included
Obs.	110	110	110	110	99	99	99	99
R-squared	0.235	0.303	0.349	0.398	0.215	0.337	0.337	0.411
No. of insurers	11	11	11	11	11	11	11	11
F-stats	2.924	2.998	1.876	1.976	2.133	2.239	1.722	1.883
Hansen J (p-value)	0.271	0.559	0.522	0.796	0.716	0.770	0.966	0.996

Panel B: RE IV-2SLS								
Dependent variable	ROE							
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
WHHI	8.750	5.534	2.461	7.421	9.457	6.116	4.650	5.301
	(1.414)	(1.284)	(0.338)	(1.258)	(1.612)	(1.489)	(0.776)	(0.986)
Controls	Included	Included	Included	Included	Included	Included	Included	Included
ROE (-1)					Included	Included	Included	Included
SDROE		Included		Included		Included		Included
Time dummies			Included	Included			Included	Included
Obs.	110	110	110	110	99	99	99	99
No. of insurers	11	11	11	11	11	11	11	11
R-squared	0.108	0.394	0.223	0.427	0.103	0.404	0.204	0.459
Chi-squared	21.08	691.8	164.7	4550	46.71	802.5	75.13	236.9
Sargan-Hansen (p)	0.161	0.241	0.07	0.613	0.361	0.659	0.44	0.751

Note: WHHI is the weighted sum of product-line shares in the insurer's portfolio multiplied by the line-specific Herfindahl-Hirschman Index. The controls include: Assets (Ln) is the natural logarithm of insurer's assets; Rgrowth (GWP) is the growth of inflation-adjusted GWP; Solvency ratio is the ratio of capital to the minimum solvency margin; Retention ratio is the difference between GWP and the part of GWP ceded to reinsurance divided by the total GWP; Administrative costs (% of GWP) is the share of administrative costs charged in the total GWP; SDROE is the standard deviation of ROE in the previous three years; ROE (-1) is the lagged dependent variable. Z-statistics are given in the parentheses below the coefficient estimates. Statistical significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *, respectively.

Authors' calculations

weaker. Although some models suggest that insurers operating more in less competitive lines may earn higher profits (supporting the consolidation hypothesis), these effects are only marginally significant and not robust across all specifications. Notably, we do not find consistent evidence that diversification away from the highly competitive motor insurance lines leads to improved profitability. These results imply that in the Macedonian insurance market, diversification is not uniformly advantageous, and both product-focused and diversified strategies may coexist as viable approaches under different market conditions.

5. Conclusions

The recent inflationary pressures have imposed critical challenges on the non-life insurance sector in North Macedonia, particularly in relation to the insurers' product-line strategy and its effects on financial performance. The purpose of this study was to assess whether increased product-line diversification enhances the financial performance of insurers or whether a more focused specialization strategy yields superior results. To achieve this, we conducted an empirical analysis using firm-level data spanning the period from 2013 to 2022, employing a rigorous methodological framework involving fixed effects two-stage least squares (FE IV-2SLS) and random effects two-stage least squares (RE IV-2SLS) regression models with uniquely identified instrumental variables. The results indicate a nonlinear link between diversification and profitability, suggesting that both specialized and diversified insurers can thrive in the Macedonian market. While initial diversification appears beneficial, beyond a certain point it may reduce profitability. Although some evidence supports higher returns for insurers operating in less competitive lines, these effects are weak and not consistently significant. Importantly, we cannot confirm that diversifying away from competitive segments like MTPL consistently leads to better performance, reinforcing the idea that multiple strategic approaches can coexist in this market.

Our study provides important insights into the debate over the liberalization of the MTPL insurance market. The pro-liberalization view suggests that the current rate regulation holds the prices below levels that would have occurred underpricing freedom, hurting the insurers' profitability, however, the extant literature argues that deregulation in highly competitive automobile insurance markets brings down the unit price, intensifying the competitive forces in that line of business (e.g., Grabowski, Viscusi, and Evans 1989). In light of our findings, a cautious and gradual approach to market reform is needed. Specifically, a measured, phased liberalization of the MTPL market, rather than abrupt deregulation, could allow insurers to adapt gradually, supporting healthier diversification dynamics without triggering destructive price competition. Rapid diversification efforts under expanded pricing freedom should be carefully monitored to prevent risk underpricing and associated market conduct or solvency risks. The prospective adoption of Solvency II in North Macedonia further underlines the importance of robust risk management and adequate capitalization amid these changes. However, evidence from our study indicates that certain insurers with low diversification and heavy MTPL concentration still achieve strong profitability, suggesting that specialization remains viable under current conditions. Overall, these insights counsel a balanced regulatory approach where diversification is encouraged alongside prudent oversight, ensuring market stability while enhancing insurer performance.

This study is subject to several limitations that should be acknowledged. First, the analysis is confined to a single country, North Macedonia, which limits the generalizability of the findings to broader regional or international contexts. Second, while our instrumented models address endogeneity concerns, the relatively small sample size may constrain the statistical power of the identification strategy. Third, the availability of firm-level data restricted the analysis to certain performance indicators and diversification measures. Future research could benefit from cross-country comparisons within the Western Balkan or broader Eastern European region to test the robustness of the diversification–performance relationship under varying regulatory regimes. Additionally, expanding the scope to incorporate dynamic panel estimators or alternative identification strategies could further validate the findings.

Endnotes

1 Additionally, Peng et al. (2017) find that the conglomeration hypothesis holds also for insurance intermediaries in Taiwan.

2 We note that two foreign-owned insurers were acquired by other two foreign insurers.

3 The non-life insurance classes are Accident, Health, Motor vehicles (Casco), Railway vehicles (Casco), Aircrafts (Casco), Vessels (Casco), Cargo, Property (fire and nat. forces), Property (other), Motor third-party liability (MTPL), Aircraft third-party liability, Vessel third-party liability, General liability, Credit, Suretyship, Financial losses, Legal expenses, and Travel assistance.

4 The fixed-effects models are estimated using the IV-2SLS fixed-effects panel data approach, implemented through the xtivreg2 command in STATA, which supports estimation of fixed-effects and first-differences models only (Schaffer 2020). These models are estimated without the cluster option to permit adjustment of the covariance matrix and regression statistics for the number of fixed effects. In addition, random-effects models are estimated with clustered standard errors via the xtivreg command in STATA.

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