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Determinants of Croatian Non-Life Insurance Companies' Efficiency

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Abstract. Although a relatively large number of studies have been focused on evaluating the efficiency of insurance companies from different aspects, analysis of factors that determine the achieved level of insurers' efficiency is still in their inception. While these studies primarily encompass insurance companies operating in developed insurance markets, such research based on the sample of Croatian non-life insurers does not exist. Therefore, this paper is focused on the efficiency drivers of the insurance companies that operate in the Croatian non-life insurance market. The research is based on data for 18 insurance companies in the period from 2009 to 2021. Applying Data envelopment analysis (DEA) and Truncated regression, the research results show that age and ownership influence the efficiency of non-life insurance companies in Croatia, while the companies' size, leverage, and product diversification are not confirmed as significant determinants of the efficiency.

Keywords: Croatian non-life insurance companies, DEA, determinants of efficiency, Truncated regression

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1. Introduction

The liberalisation of the Croatian insurance market that came with the accession of Croatia to the European Union put insurers under pressure to increase their efficiency. Namely, by opening the market to foreign insurance companies, especially in the field of motor third-party liability insurance, which is the most significant line of non-life insurance in Croatia, the competition in the market increased. In this more competitive environment, efforts to increase efficiency became imperative. Additionally, the relevance of technology in all aspects of the insurance business, especially during the last two years of the pandemic, increases the importance of efficiency even more. Consequently, an important question that arises is what drives the efficiency of insurance companies in the Republic of Croatia. While the existing studies based on the Croatian insurance market are focused on the achieved efficiency level, there is no research on determinants of the non-life insurance companies' efficiency.

The existing studies of the determinants of an insurer's efficiency (e.g. [14], [33], [18], [6], [9]) are focused on various company-level factors, dominantly including size, ownership form (stock and mutual insurance companies or domestic and foreign insurers), insurance product diversification, premium growth, distribution channels, age, and financial leverage.

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The main aim of this research is to analyse company-level determinants of the efficiency of non-life insurance companies in the Republic of Croatia. The empirical analysis covers 18 insurance companies, including insurers conducting exclusively non-life insurance activities as well as the non-life segment of composite insurance firms that operated in the Croatian non-life insurance market from 2009 to 2021. The data are analysed by applying Data envelopment analysis and Truncated regression while following Simar and Wilson procedure. The results confirm that significant drivers of the efficiency of Croatian insurance companies are age and ownership. These findings are relevant to various stakeholders, including market regulators and researchers in the field, since they provide insight into the significance of factors affecting insurer's efficiency as well as to the managers of insurance firms, helping them to use their resource base more efficiently and, thus, to enhance their performance as well as the quality of services provided.

While there are studies of the factors that impact the efficiency of insurance firms in other countries (e.g., United States ([16], [18]); Germany ([33]); Switzerland ([6]); Poland ([30]); Taiwan ([9]); selected Central and Eastern European countries ([19]), according to the authors' knowledge there is no study on determinants of efficiency in the exclusively non-life insurance industry in Croatia. Precisely, Croatian insurance companies were included in the sample of a cross-country analysis of insurers' efficiency determinants ([19]). However, that study does not make it clear if it refers to life or non-life insurance, which is essential from the viewpoint of the differences in the insurance business models. Additionally, in comparison to ([19]) that applies OLS in the second stage of the analysis, we use Bootstrapped Truncated Regression following the procedure of Simar and Wilson. Therefore, this paper attempts to bridge the gap in the existing literature by identifying factors that determine Croatian non-life insurers' efficiency, thus providing valuable insight into the efficiency of this insurance market.

The structure of the paper is as follows. Section 2 presents hypotheses with an overview of the previous studies in the field of determinants of the efficiency of insurance companies. Section 3 describes the data and methodology. The results and discussion of the results are presented in Section 4. Section 5 provides concluding remarks.

2. Hypotheses and Previous Research

Following relevant literature, the authors postulate that insurers' efficiency is a function of a range of different variables, including the insurer's age and size based on total gross written premium, ownership, diversification, and leverage. Therefore, in this section, hypotheses are set up, and an overview of prior research related to the particular hypothesis is given as well.

H1: The age of non-life insurers impacts their levels of efficiency.
Age variable has been included in our analysis as the difference between establishing year, i.e., the year when the insurer entered the court register and the year of the analysis plus one in order to avoid zero values. According to [6], a company that is present in the market for a long period, i.e., a well-established and reputable firm, is able to react successfully to changes in the market environment, resulting in higher efficiency levels. However, these authors also state the advantages of relatively young firms in terms of better use of innovative technologies and consequential enhanced efficiency. Moreover, using the sample of microinsurance programs that provide life and health insurance, [4] shows that older firms are the least efficient ones. The same is found by [26]. Specifically, the negative impact of age on technical efficiency is found in the sample of German life insurers, while the negative effect of age is evident in the allocative, technical, and cost efficiency of the UK life insurance firms. However, [6] find age, measured as the natural logarithm of operating years, to positively affect the efficiency in property-casualty insurance, whereas it is insignificant in the life insurance segment.

H2: The efficiency of non-life insurance companies is affected by their size.
Size variable is primarily employed potential determinant in insurers' efficiency studies ([26], [18], [6], [28], [19]). In our study, it is calculated as the logarithmic value of the total gross written premium. A large number of studies assume the positive effect of size on the efficiency that stems from exploiting advantages arising from economies of scale. Specifically, in the insurance industry, a larger scale of operation diminishes income volatility due to the fact that risk pooling performs better in the case of a larger risk pool (see, e.g., [14], [18], [6]). However, as suggested by [18], larger insurers are more probable to have gone over the constant returns to scale region and thus to have operated with decreasing returns to scale. The same authors justify this with the problems in running complex and large organizations, increased agency costs as well as management control and coordination costs. Specifically, [18] finds that a large fraction of insurers with a size below the median are functioning with increasing returns to scale, whereas the major part of insurers with a size above the median are conducting their activities with declining returns to scale. Nevertheless, a positive size-efficiency relationship is found by [33] in terms of cost and technical efficiency, while [6] shows the positive impact of size on cost, technical and revenue efficiency in both life and property-casualty segment. Having this in mind, an adverse effect of size on efficiency could be expected. Therefore, the sign of the size variable is ambiguous.

H3: Ownership is an important determinant of the efficiency of non-life insurance companies.
The ownership variable is encompassed with the research to analyse whether domestic or foreign-owned insurers achieve higher levels of efficiency since our sample consists of insurance undertakings with headquarters in the Republic of Croatia, which has been authorised by the Croatian regulatory body to pursue the insurance business but are either domestic - or foreign-owned. This variable is expressed as the percentage of shares held by domestic shareholders. [14] suggests that domestically-owned insurers are more probable to have advantages in their home markets due to reputable brand names, cultural affinities, and customers' perceptions that such insurers are more stable or have higher quality as opposed to foreign-owned insurers. It can be added that indigenous insurers might have a well-developed distribution network. However, the existing research analysing firms' profitability shows a positive relationship between foreign ownership and corporate performance. E.g., [32] proposes that a common perspective when investigating the determinants of foreign direct investment from the standpoint of the firm implies the expected possession of competitive or 'ownership' advantage that is frequently knowledge-based. [8] and [20] suggest that foreign firms have superior capabilities, know-how, and better access to technical and financial resources that may lead to enhanced performance. Therefore, either positive or negative sign of this variable can be expected.

H4: There is a relationship between non-life insurers' product diversification and efficiency.
The diversification variable is introduced in the research to analyse whether specialised insurers focusing on a particular line of business or diversified insurance companies offering a wide range of insurance products perform better in terms of efficiency. Specifically, according to the conglomeration hypothesis, insurers, as explained by [6], can take advantage of economies of scope if operating a larger number of insurance business lines, whereas the strategic focus hypothesis asserts that specialised insurance firms achieve enhanced efficiency by orienting on core business in which they demonstrate competitive advantage. Specifically, the Croatian Insurance Bureau offers firm data on premiums of 18 business lines in the non-life insurance segment abridged in 10 lines, thus, this variable is expressed as the Herfindahl-Hirschman index after calculating the percentage of premiums in a particular business line. [6] documents that specialised life insurers achieve lower levels of technical and revenue efficiency as well as property/casualty insurers in terms of cost and technical efficiency, indicating the support of the conglomerate hypothesis. [12] finds a reason for a positive impact of diversification on efficiency in the cyclical

nature of the insurance business, adding that diversification benefits in cycle risk let insurers swap reduced risks for lower costs and thus be more cost-efficient. However, [6] also finds that specialised property/casualty insurers demonstrate enhanced revenue efficiency. Moreover, [33] finds that specialised insurers are more cost-efficient. Similarly, findings by [16] also supports the strategic focus hypothesis. Due to the rationale provided in the above-mentioned hypothesis and findings of the previous research, the sign of this variable is unclear.

H5: There is a relationship between non-life insurers' leverage and efficiency.
The net premiums to surplus ratio, is a frequently applied measure of leverage, as suggested by [13]. Furthermore, the same authors define surplus as an insurance term for the net worth of an insurer or equity. Moreover, such an approach was employed in papers by, e.g., [12], [18], [36], and [14]. According to [36], insurance companies should have satisfactory policyholders' surplus available if they tend to increase premiums since policyholders' surplus represents the financial buffer to absorb unexpected losses. Moreover, [12] add that high leverage is observed in terms of insurers' reduced capacity to absorb unexpected losses resulting in higher funding costs and lower levels of efficiency. They also add that highly leveraged insurers are more probable to be incapable of bearing shocks to their capital level resulting in a deteriorated financial situation and consequently reduced demand for insurance products and lower levels of revenue efficiency. On the other hand, as noted by [18], higher leveraged insurers suggest an efficient use of resources enabling insurers to use less capital resulting in a positive influence on efficiency. Moreover, in insolvency literature, high values of net premiums to policyholders' surplus ratio are often viewed in terms of higher insolvency risk ([11]; [36]). Therefore, the expected relation between the insurer's efficiency and the premium-to-surplus ratio is not clear.

In order to conduct the empirical part of the research, a two-step analysis is employed. In the first step of the analysis, a DEA (Data envelopment analysis) is applied, while in the second step of the analysis a truncated regression is performed. Both analyses, along with the results of their application, are presented and discussed below.

3. Methodology and Data

3.1. Data Envelopment Analysis (DEA)

DEA is a nonparametric methodology that, based on linear programming, evaluates the efficiency of the Decision Making Unit (DMU) - in this research, an insurance company - in the form of a single index. If an insurer is efficient, its efficiency score will amount to 100% and, it will form a part of the efficiency frontier against which all other inefficient insurers are evaluated. It is worth mentioning that efficient insurers will have no slacks (the output shortfalls or input excesses). Slacks will exist only for those insurers that are inefficient. Precisely, after the proportional decrease in inputs, if an inefficient insurer still cannot obtain its efficient target (positioned on the efficiency frontier), slacks are necessary to push the insurer to its target (frontier). According to the scale, a CCR model (established on constant returns to scale) and a BCC model (grounded on variable returns to scale) can be distinguished. On the other hand, giving the model orientation, an input-oriented model (which emphasises input minimization while keeping the output unchanged), an output-oriented model (which stresses output maximization with unchanged input), and a non-oriented model (which underlines simultaneous improvement of inputs and outputs) can be identified. In this research, the authors opted for BCC input-oriented model as this model is better at adjusting to real-world situations. Application of the BCC input-oriented model can be found in many previous research (e.g., [21], [18]). Moreover, in the research of [17], the authors emphasize the dominance of input-oriented models in the insurance industry.

When selecting the variables that would adequately represent the outputs, the authors adhered to the prevailing view in the relevant literature, i.e., the value-added approach, which categorizes insurance services into risk pooling and risk-bearing, intermediation activities as well as financial services. Insurance can be observed as a mechanism providing risk diversification for those exposed to losses through pooling ([16]), and according to [27], premiums create the foundation for both the expenses and profits of the insurance firms capturing major features of real insurance services. Thus, in this paper, premiums written are selected to represent activities aimed to pool and bear insurance risks, which is also done by, e.g., [7] and [40]. Since the insurers perform intermediation activities as well, i.e., the funds received in the form of insurance premiums are invested until they are needed in order to pay benefits or claims ([16], [4]), this function is represented with total investments which is also done by, e.g., [5], [24] and [1]. Moreover, as suggested by [22], these outputs denote two major functions of insurance companies, risk pooling, and financial intermediation. Due to its resemblance with the previously mentioned functions, the function referring to financial services is not being separately modelled in the research. When considering the selection of inputs, the authors opted for labour and capital since these are, according to [29], the most often employed input variables. Thus, the number of employees, following [25], [35], and [31], and paid-in capital, following [25], were used as inputs. All inputs and outputs relate to the non-life insurance segment since composite insurers are obliged to compile financial reports for life and non-life activities separately. However, since the data on the number of employees are not available separately for these two segments at the company level, the distribution was performed on the basis of non-life net earned premiums share in total premiums. Furthermore, Performance Improvement Management Software (PIM-DEA) has been employed to estimate efficiency scores.

3.2. Truncated Regression

In the second part of the research, a truncated regression is performed following the procedure described in [23], and efficiency scores that were calculated in the previous step of the analysis were now applied in the form of a dependent variable. Truncated regression is commonly applied in research in which the sample is truncated for some specific ranges of the predicted variable, meaning that observations above or below the specific value of the dependent variable are omitted from further consideration. Contrary to classical (multiple or simple) regression analysis that is based on OLS, a truncated regression uses the Maximum likelihood (ML) method. Independent variables (described earlier in the part of the paper in which hypotheses were presented) used in truncated regression analysis are the size of the insurance company, age, ownership type, product diversification, and leverage. With the aim of conducting this regression, STATA software was used.

4. Results and Discussion

4.1. Discussion of DEA Results

Once the inputs and outputs have been selected and the value of capital, investments, and gross written premiums deflated, a correlation analysis should be performed in order to test for the association among chosen variables. According to the results presented in Table 1, there is a strong positive and statistically significant relationship among the variables (all correlation coefficients are above 0.8). The positive relationship between the inputs and outputs confirms isotonicity ([39], [34]) which is a prerequisite for applying DEA methodology.

Descriptive statistics for chosen inputs and outputs are presented in Table 2. Both inputs and outputs show notable variation during the analysed period (2009-2021). The average value of the insurer's capital was 10,180,694.8, while the average number of staff employed was 425.

		Inputs		Outputs	
		CAP	EMP	GWP	INV
Inputs	CAP	1			
	EMP	0.807**	1		
Outputs	GWP	0.831**	0.963**	1	
	INV	0.831**	0.924**	0.944**	1

*** Correlation is significant at the 0.01 level (2-tailed).*

Table 1: *Correlation analysis.*

The mean value of investments (88,835,264.3 EUR) was almost 70 percent higher than the mean value of the gross insurance premiums (52,330,856.0 EUR).

		N	Minimum	Maximum	Mean	Std. Deviation
Inputs	CAP	200	2,823,559.8	69,669,579.3	10,180,694.8	14,199,312.4
	EMP	200	4	2,522	425	530
Outputs	GWP	200	17,621.4	358,434,329.6	52,330,856.0	70,247,291.3
	INV	200	476,937.0	687,714,444.9	88,835,264.3	137,934,060.5

Note. All values (paid-in capital, gross written premiums, and investments) are presented in EUR and deflated with the consumer price index (CPI) obtained from the World Bank.

Table 2: *Descriptive statistics for inputs and outputs.*

Pure technical efficiency (PTE) scores that indicate how well (i.e., efficiently) inputs are transformed into outputs ([38]) and that resulted from the input-oriented BCC model are presented in Table 3. For insurers that did not operate in a particular year due to nonexistence in an earlier period (like DMU10 or DMU16) or due to merger and acquisition activities in the later years (like DMU15 or DMU17), the efficiency scores are omitted from the table. According to the results of the analysis (presented in the last column of Table 3), after the decline of the pure technical efficiency score in 2011 (in comparison to the score in 2010), PTE was increasing continually during the next three years and then showed volatile movement for the following three years. Still, from 2018 onward, increasing values of PTE are recorded again. A possible reason for that can be found in the fact that the average growth rate of gross written premiums during that period amounted to approximately 10% annually while investments increased by 3.7%, whereas at the same time, the number of employees decreased by 2.4% on average. In 2021 the efficiency score reached 91.7%, implying that given the scale of operation, insurance companies in the Croatian non-life insurance market can reduce inputs by 8.3% in order to become pure technically efficient. Additionally, out of 12 insurers that operated in 2021, nine were efficient (efficiency score of 100%), while the remaining three were inefficient. The least efficient insurer in 2021 was DMU12, whose efficiency score amounted 39.0%, implying a significant potential for further improvement. Taking into consideration insurance companies from the efficiency frontier, which represents benchmarks for inefficient insurers, the results show that there are five insurance companies (DMU3, DMU4, DMU5, DMU8, and DMU9) that were pure technically efficient during the whole analysed period. Three additional insurance companies (DMU11, DMU13, and DMU16) were efficient in the whole period except for one to three years. In addition, one insurance company (DMU2) reached its efficiency in later years of operation.

BCC	DMU 1	DMU 2	DMU 3	DMU 4	DMU 5	DMU 6	DMU 7	DMU 8	DMU 9	DMU 10	DMU 11	DMU 12	DMU 13	DMU 14	DMU 15	DMU 16	DMU 17	DMU 18	Average
2009	89.6	77.0	100	100	100	61.0	66.3	100	100		100	52.1	100	72.2	34.1		100	64.3	82.3
2010	88.8	80.7	100	100	100	70.0	69.8	100	100		100	64.0	99.2	71.3	30.4		99.9	64.4	83.7
2011	85.5	61.7	100	100	100	59.1	67.4	100	100	56.3	100	41.6	99.2	49.7	25.0	67.7	80.7	50.8	74.7
2012	89.4	77.3	100	100	100	72.3	71.1	100	100	56.3	100	57.8	75.4	59.7	81.8	84.8	88.1	64.2	82.1
2013	94.3	81.4	100	100	100	76.7	81.0	100	100	72.6	97.0	97.4	100	57.9	64.1	100	92.8	79.3	88.6
2014	93.8	100	100	100	100	92.1	84.4	100	100	71.0	100	100	100	99.4	62.5	100	89.8	100	94.1
2015	92.5	100	100	100	100	78.3	81.2	100	100	74.8	100	45.1	100	69.5	63.6	100		77.4	87.2
2016	93.3	100	100	100	100	83.8	87.6	100	100	76.3	100	33.8	100	51.1		100		100	89.1
2017	100	100	100	100	n.a.	82.6	91.8	100	100	75.8	100	29.9	100	48.2		100			87.7
2018	100	100	100	100	n.a.	94.0	97.0	100		76.1	100	31.4	100	55.2		100			88.7
2019	95.5	100	100		100	100	89.9	100			100	29.3	100	73.2		100			90.7
2020	100	100	100		100	91.9	93.7	100			100	40.3	100	69.9		100			91.3
2021	100	100	100		100	100	94.0	100			100	39.0	100	67.3		100			91.7
Average (2009-2021)	94.0	90.6	100	100	100	81.7	82.7	100	100	69.9	99.8	50.9	98.0	65.0	51.6	95.7	91.9	75.1	-

n.a. = not available for the observed year

Table 3: *Results of the DEA (VRS – input-oriented model) for the period 2009-2021.*

Efficiency scores (for selected insurers) from Table 3 are presented in Figure 1.

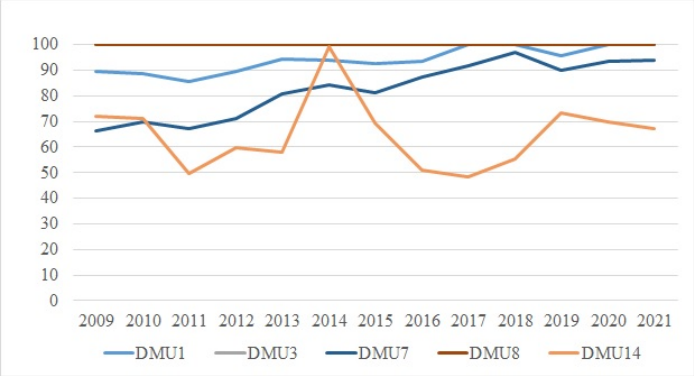

Figure 1: *Dynamics of efficiency scores of selected insurers (DMUs).*

As evident from Figure 1, insurers labelled DMU3 and DMU8 had constant values of efficiency scores (100%) during the whole period covered by the analysis, indicating they were the most efficient insurers in transforming inputs into outputs. On the other hand, for insurers labelled as DMU 1 and DMU 7, it can be stated that despite some minor oscillations, these insurers registered growth in the observed period, as their output growth was more noticeable than growth in inputs. Finally, DMU 14 shows a decline in efficiency during the period 2014-2017, as well as during 2019 onward, mainly because a high increase in inputs was not followed by an above-proportional increase in outputs. However, a closer look at the peak this insurer recorded in 2014 shows that the rise in efficiency was due to a simultaneous decline in inputs and an increase in outputs.

4.2. Discussion of Truncated Regression's Results

Results of the descriptive statistics for the whole period (2009-2021) are presented in Table 4, from which it is clear that the average efficiency obtained in 2021 (91.7%) is larger than the one calculated for the whole period (2009-2021), i.e., 86.69%. On average, an insurance company operated for approximately 17 years in the industry, while product diversification (measured with the Herfindahl-Hirschman index) amounted to around 3,193 points, indicating relatively moderate diversification of insurers operating in the Croatian non-life insurance industry.

Variable	Mean	Std. Dev.	Min	Max
BCC	86.69735	19.21845	25.02	100
SIZE	18.94707	1.625268	11.78611	21.7065
AGE	17.23	8.252735	1	32
OWN	45.31665	48.02121	0	100
HHI	3,192.518	3,125.512	28.8621	10,000
LEV	158.0228	218.8566	0.1016846	2,501.014

Table 4: *Descriptive statistics of dependent and independent variables used in truncated regression (2009-2021).*

The results of the truncated regression are presented in Table 5. Still, according to [37], the results of the analysis could be affected by incorrectly estimated standard errors. Hence, the Bootstrapped Truncated Regression procedure of Simar and Wilson is performed, and 2000 bootstrap replications were used in order to compute the bias-corrected estimates (Table 6).

As Simar and Wilson's procedure requires efficiency scores not to be presented as a percentage, all efficiency scores (obtained by PIM-DEA software) were divided by 100, which in turn resulted in estimated coefficients that are 100 times smaller than those presented in Table 5. Although Simar and Wilson's procedure affects only the confidence interval and standard errors ([2]), both tables are presented (Table 5 and Table 6) in order to draw attention to the importance of using this procedure and the influence it has on the obtained results. Precisely, while age and ownership variables continued to have a statistically significant influence on insurers' efficiency, the influence of leverage variable became insignificant after the application of the Simar and Wilson's procedure.

Variable	Coef.	Std. Err.	z	$P > \|z\|$	[95% Conf.	Interval]
SIZE	-7.422992	5.583502	-1.33	0.184	-18.36645	3.52047
AGE	2.266063	0.8946429	2.53	0.011	0.5125955	4.019531
OWN	0.2968841	0.1376589	2.16	0.031	0.0270777	0.5666906
HHI	-0.0019696	0.0019792	-1	0.32	-0.0058487	0.0019094
LEV	-0.0158509	0.0094483	-1.68	0.093	-0.0343693	0.0026674
cons	180.6115	96.39688	1.87	0.061	-8.322903	369.5459
/sigma	23.09249	3.104153	7.44	0	17.00846	29.17652

Table 5: *Results of truncated regression (2009-2021).*

Variable	Coef.	Bootstrap Std. Err.	z	$P > \|z\|$	[95% Conf.	Interval]
SIZE	-0.0749993	0.0583383	-1.29	0.199	-0.195931	0.0278702
AGE	0.0231657	0.0094211	2.46	0.014	0.006601	0.0434219
OWN	0.0030227	0.0014514	2.08	0.037	0.0004072	0.005968
HHI	-0.0000199	0.0000213	-0.94	0.349	-0.0000595	0.0000226
LEV	-0.000176	0.0001268	-1.39	0.165	-0.0004427	0.0000394
cons	1.817962	1.0126870	1.8	0.073	-0.0084128	3.957161
/sigma	0.2347428	0.0332338	7.06	0.000	0.1717006	0.29673

Table 6: *Results of Bootstrapped truncated regression (2009-2021).*

The authors find that the longer persistence of the insurer in a particular insurance market positively affects efficiency. [6] also finds a positive effect of the insurer's age on efficiency in the Swiss non-life insurance industry, including cost, technical, and revenue efficiency, rationalizing such a finding with reputation and adaption capability. Moreover, the findings of [3] show that the efficiency of Angolan insurance companies can be predicted by age using neural networks. Specifically, the efficiency levels of Angolan insurers increase with age and Portuguese origin.

The positive sign of the ownership variable suggests that domestically-owned insurers perform better in terms of efficiency in comparison to foreign-owned ones. Besides their reputation, clients' affinities, and well-developed sales networks, [14] also notes that domestic insurers may be at an advantage due to their familiarity with the underwriting characteristics of customers exposing foreign-owned insurers to adverse selection. E.g., [10] investigates Chinese life insurers' efficiency by comparing foreign insurance companies with domestic ones and shows that indigenous life insurers demonstrate pure technical and scale efficiency advantages. Furthermore, [9] also finds that domestically-owned insurers outperform foreign-owned ones while investigating the efficiency of Taiwanese life insurers. Moreover, when comparing average efficiency scores between domestic- and foreign-owned life insurance companies in Taiwan, they observed that in the period 2010-2013, the efficiency levels of domestic companies increased steadily while,

on the other hand, the efficiency of foreign insurers was largely affected by the global financial crisis.

Variables size, leverage, and product diversification were not found to be statistically significant.

5. Conclusion

In this paper, the authors analysed the determinants of the efficiency of non-life insurance companies in the Republic of Croatia. The analysed factors covered the insurance companies' age, size, ownership, product diversification, and leverage. The data were collected for 18 insurance companies for the period 2009-2021. Still, due to M&A activities, the number of companies varied over the years.

According to the results of the analysis, age and ownership affect the efficiency of Croatian non-life insurance companies. Older insurers have a higher level of efficiency in comparison to the younger ones, implying the importance of their reputation and experience. Domestic insurers are more efficient than foreign insurance companies, which suggests that domestic companies have advantages over foreign insurers in terms of the trust of domestic customers and a more developed distribution network.

Our paper, however, is not exempt from limitations. Although the sample used in the analysis comprises all specialist non-life insurers as well as the non-life segment of composite insurance firms that operated in the observed period, the sample is still rather small. Also, the limitations of the study refer to the limited data for some other variables that could be added to the model. Consequently, in future work, depending on the data availability, it is suggested to broaden the variables that potentially could influence the efficiency. In that sense, affiliation, distribution systems, technology assets, and acquisition costs can be included in the analysis. Additionally, since some Croatian insurance companies operate in the foreign insurance markets, it would be useful to compare the effect of international diversification on the efficiency of insurers. Due to the specific differences between life and non-life insurance, comparing the efficiency of the companies operating in these two insurance fields could be a subject of future work.

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