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Efficiency and Productivity Asuransi kesehatan Badan Penyelenggara Jaminan Sosial (BPJS) in Indonesia

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Measuring the levels of efficiency and productivity within an organization is crucial for periodically assessing the sustainability of the Health Insurance Social Security Administration (BPJS Kesehatan) in Indonesia. This study aims to gauge the efficiency and productivity levels of BPJS health insurance from 2015 to 2022. The data analysis model employed in this research is quantitative analysis utilizing the Data Envelopment Analysis (DEA) method to calculate efficiency and productivity scores of BPJS. Input variables consist of capital, other operating expenses, general expenses, and administration costs, while the output variable is gross contribution. The research findings reveal that the efficiency values of BPJS from 2015 to 2022 reached optimal efficiency scores of 100%. This is attributed to the implementation of health social security, where BPJS Kesehatan enforces monthly premium payments from its participants. The productivity levels indicate that in the 2nd, 4th, 5th, and 6th years, the Total Factor Productivity Change (TFPCH) values were less than one. Meanwhile, in the 3rd, 7th, and 8th years, BPJS productivity values experienced an increase.

Keywords: Efficiency, Health, Productivity, Insurance.

1. Introduction

BPJS Kesehatan, functioning as an institution tasked with administering the National Health Insurance Program (JKN), is required to manage the Social Security Fund (DJS) effectively. Fund management in the insurance concept entails a high level of risk. This is because BPJS Kesehatan must ensure all registered participants, whose health needs or occurrences of illness are unpredictable, are provided for, alongside determining the number of participants accessing healthcare services and the extent of claim costs to be borne. Undoubtedly, the high

risk involved makes social security fund management challenging. The reality is that BPJS Kesehatan has consistently experienced financial deficits from 2014 to 2019. The financial condition of BPJS Kesehatan significantly affects the sustainability of the JKN program within the healthcare financing system. To assess the sustainability of BPJS Kesehatan in administering the JKN program, performance measurement is necessary. Efficiency and productivity are closely related aspects of performance, both measurable through the same method, which involves comparing output to input

Measuring the organization's efficiency and productivity levels is crucially important on a regular basis to gauge the sustainability of BPJS Kesehatan in implementing the National Health Insurance Program (JKN). This is due to the high financial deficit risk that BPJS Kesehatan faces in managing healthcare insurance funds. As there is currently a lack of research assessing the efficiency and productivity levels of BPJS Kesehatan, the objective of this study is to determine these levels.

Efficiency measurement in the insurance industry is crucial as it impacts performance, profitability, and competitiveness. Over the years, various methods have been employed to measure the efficiency of insurance companies, one of which is the nonparametric approach, with DEA being one of the widely used methods. According to Nourani et al. (2018), interest in measuring insurance efficiency using DEA models dates back to the early 1990s, with numerous studies conducted since then (Cummins and Zi, 1998). Since that time, the application of DEA to assess insurance efficiency has continued. These studies have contributed to our understanding of insurance efficiency from various perspectives. However, it is noteworthy that the number of studies related to insurance efficiency remains relatively limited compared to other financial institutions.

In Indonesia, research on efficiency and productivity levels remains scarce. This study aims to measure the efficiency and productivity of BPJS from 2015 to 2022. Therefore, assessing the efficiency levels of insurance companies becomes an important topic for discussion. Efficiency levels are crucial as they reveal the managerial capabilities of insurance companies in managing their operations. Another significant factor in evaluating the efficiency levels of BPJS is the competitive pressure from other insurance providers. Additionally, policyholders or potential customers are interested in knowing the efficiency performance of BPJS to establish trust for long-term agreements. Thus far, the commonly used method for measuring efficiency levels is through Data Envelopment Analysis (DEA). Efficiency measured using the DEA method possesses distinct characteristics compared to general efficiency concepts, as it identifies which variables contribute to inefficiency.

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2. Literature Review

Interest in productivity and efficiency has rapidly increased in almost all sectors of industry in recent years (Tayebi et al., 2023). However, many authors do not differentiate between productivity and efficiency. For example, Sengupta (1995) and Cooper et al. (2000) define productivity and efficiency as the ratio of output to input (Daraio and Simar, 2007), whereas the concept of efficiency refers to the comparison between observed values and optimal values of output and input, determining optimal productivity and technical efficiency (Lovell, 1993). Farrell's research in 1957 is considered the first significant contribution to the literature developing approaches to measure efficiency and relied on the works of Koopmans (1951) and Debreu (1951). However, they did not reference these prominent authors (Lee and Heshmati, 2009). It took about 20 years after Farrell's contribution for researchers to develop methods to estimate efficiency. Important contributions include the development of stochastic frontier analysis by Aigner et al. (1977) and the development of nonparametric mathematical programming bounds by Charnes et al. (1978). Since then, the growth of efficiency measurement methodologies has been explosively rapid (Dionne, 2013).

Abduh et al. (2012) addressed the performance of insurance companies by comparing Shariah-compliant insurance companies with conventional insurance companies in Malaysia. The results indicated that conventional insurance was slightly more efficient than Shariah-compliant insurance. This is attributed to the differing products offered by Shariah-compliant insurance compared to conventional insurance, and Shariah-compliant insurance still relies on conventional insurance in terms of operational and financial systems. Furthermore, Rahman (2013) conducted a study in Bangladesh on efficiency using a non-parametric approach for conventional life insurance companies compared to Shariah-compliant life insurance companies. The results showed that Shariah-compliant insurance or takaful demonstrated better operational efficiency compared to conventional insurance.

Khan and Noreen (2014) compared the efficiency levels of conventional insurance with Shariah-compliant insurance through a case study in Pakistan. The research findings indicated that Shariah-compliant insurance was more efficient due to the optimal utilization of inputs by the companies. Miniaoui and Chaibi (2014) conducted research on the technical efficiency of Shariah-compliant insurance companies by comparing those in Malaysia with those in Gulf Cooperation Council (GCC) countries. This study was motivated by the legal differences supporting Shariah compliance between Malaysia and GCC countries. The results showed that legal influence had no correlation with efficiency, likely due to the absence of legal variables included in the efficiency analysis. The last study, by Al-Amri (2015), focused on the efficiency of Shariah-compliant insurance in GCC countries for the period 2004-2009. The research revealed that the United Arab Emirates (UAE) and Qatar had the highest scores of technical efficiency compared to other GCC countries.

Rustyani et al. (2023) examined the efficiency and productivity of BPJS Kesehatan. The research findings indicated that BPJS Kesehatan experienced inefficiency in the years 2014,

2016, 2017, and 2018. However, in the years 2015, 2019, 2020, and 2021, BPJS Kesehatan achieved optimal efficiency scores of 100%. Measurement of the Malmquist Index showed that BPJS Kesehatan had increased productivity with scores > 1 except for the second year, 2015-2016.

Tuffahati et al. (2016) examined the efficiency of Shariah-compliant insurance in Indonesia. The research findings indicated that no company achieved optimal efficiency levels across all three measurement types. However, within the Shariah General Insurance Unit group, 2 companies achieved optimal efficiency, accounting for 28.57% of the total sample companies within this group. Similarly, within the Shariah Life Insurance Unit group, 4 companies demonstrated optimal efficiency across all three measurements, comprising 25% of the total sample companies within this group.

Dwijayanti et al. (2022) conducted research on conventional insurance companies and Shariah reinsurance. The research findings indicated that in the year 2015, the efficiency level or efficiency value was 87%, in 2016 and 2017 the efficiency level was 100%, in 2018 it was 95%, and in 2019 it was 84%..

3. Data Envelopment Analysis (DEA):

Data Envelopment Analysis (DEA) is a mathematical programming optimization method used to measure the technical efficiency of a Decision Making Unit (DMU). In this context, a DMU could be various units, including insurance companies. DEA analysis technique is specifically employed to measure the relative efficiency of a DMU under conditions of multiple inputs or outputs. Relative efficiency is determined by comparing a DMU to other DMUs within the same sample that utilize the same types of inputs and outputs.

DEA formulates DMUs as fractional linear programs to find solutions. Charnes et al. first introduced DEA in 1978. Data Envelopment Analysis emphasizes an approach oriented toward evaluating the performance of units as decision-makers. The analysis conducted in this method is based on the evaluation of comparable DMUs. Subsequently, the efficient DMUs establish the frontier line. DEA can also identify which units are triggering inefficiency in others.

Health economics can be used to analyse healthcare expenses for patient treatments. By applying many approaches to analyses the data, health economics can be used: the Data Envelopment Analysis (DEA) method. DEA has its own character compared to other methods. DEA is an analytical tool based on linear programming to measure the relative efficiency of a set of Decision Making Units (DMU) or comparable units.

4. Malmquist Productivity Index (MPI)

The Malmquist Productivity Index (MPI) was first introduced by Caves, Christensen, and Diewert in 1982, as a distance function approach to depict technology in defining input, output, and productivity indices. Estimating Total Factor Productivity (TFP) using the DEA approach involves utilizing index-based methodologies. For instance, if a company utilizes the same inputs in periods t and t+1, but produces different outputs—where the output in period t+1

increases by 25% compared to the output in period t—then the TFP index would be 1.25 (Rustyani & Rosyidi, 2018). Additionally, TFPCH (Total Factor Productivity Change) can be formulated as follows:

TFPCH = EFFCH+TECHCH+SECH …… (3)

Given that the calculation of MPI is based on the assumption of Constant Returns to Scale (CRS), there are only two sources of productivity growth: efficiency change and technical change. Total factor productivity is the result of the multiplication of the change in technical efficiency (EFFCH) and the change in technology (TECHCH). Therefore, increases and decreases in productivity can be determined by comparing the values of EFFCH and TECHCH. This can be formulated as follows:

TFPCH = EFFCH X TECHCH ……..…… (4)

In other words, productivity growth can be explained as the result of increases or decreases in efficiency, increases or decreases in technology, or both. Similarly, overall efficiency change, indicated by the value of EFFCH, is the result of the multiplication of pure technical efficiency (PECH) and scale efficiency change (SECH). In other words, the value of scale efficiency is highly determined by the values of EFFCH and PECH, which can also be formulated as follows:

EFFCH = SECH X PECH atau SECH = EFFCH / PECH …… (5)

5. Research Methodology

The data utilized in this study consist of panel data comprising annual financial reports of BPJS for the period from 2015 to 2022. The data analysis model employed is quantitative analysis using the Data Envelopment Analysis (DEA) method, which is used to compute the efficiency and productivity scores of BPJS. The operational variables used in this study are as follows:

Table 1: Operational variables

Variable	Definition	Data Source	References
Input			
Capital	One of the factors of production involved in the production process	Balance Sheet	Dwijayanti et al (2022)
Other Operating Expenses General and Administrative Expenses Marketing Expenses	Ketiganya merupakan salah satu beban operasional pad kegiatan produksi asuransi umum dan reasuransi syariah.	Company Profit and Loss Statement	(Rahman, 2013)
Output			
Gross Contribution	The gross amount that participants are obliged to pay for the risk portion and ujrah	Surplus (Deficit) Underwriting Dana Tabarru'	Eling & Jia (2019); Greene & Segal (2004); Leverty & Grace (2010); Swink et al., (2005); Wagener (2004); Hasanita et al (2021)

Data analysis in this study involves::

1. Data envelopment analysis (DEA)

Data Envelopment Analysis (DEA), proposed by Charnes et al. (1978), is a nonparametric approach widely used to measure the efficiency of health insurance and services. DEA assesses the efficiency of utilizing inputs to produce outputs. The objective of this study is to evaluate the efficiency level of BPJS Kesehatan using a non-parametric technique. The DEA method, introduced by Charnes, Coopers, and Rhodes (1978), computes cost efficiency for a particular BPJS Kesehatan (j) by finding the minimum cost of producing outputs given input prices (w). Assuming there are n BPJS Kesehatan, utilizing m different inputs to produce s different outputs, the minimum cost is determined through the following linear programming problem:

$$Min_{I_i} \sum_{i=1}^{m} w_i I_i,$$

s.t $\sum_{j=1}^{n} \lambda_j O_{rj} \geq O_{rjo}$

$$\sum_{j=1}^{n} \lambda_j I_{ij} \leq I_{ijo}$$

$$\sum_{j=1}^{n} \lambda_j = 1,$$

$$\lambda_j \geq 0.$$

For BPJS Kesehatan j, λj and wj represent the intensity variables and input prices, respectively. Orj denotes the rth output variable of BPJS Kesehatan, while Iij represents the ith input variable of BPJS Kesehatan. Orjo indicates its observed output vector, and Iijo denotes its observed input vector. Cost efficiency for BPJS Kesehatan j is determined by the ratio of minimum cost to the actual cost incurred by BPJS Kesehatan. To specify the most relevant input and output variables, this study selects assets, other operating expenses, general and administrative expenses as input variables, while the output variable chosen is gross contribution.

2. Malmquist Productivity Index (MPI)

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TFPCH = EFFCH+TECHCH+SECH

TFPCH = EFFCH X TECHCH

EFFCH = SECH X PECH atau SECH = EFFCH / PECH

6. Result and Discussion

Table 2: Efficiency Scores of BPJS for the years 2015-2022 (in percentage)

Year	CRS	VRS
2015	1.000	1.000
2016	1.000	1.000
2017	1.000	1.000
2018	1.000	1.000
2019	1.000	1.000
2020	1.000	1.000
2021	1.000	1.000
2022	1.000	1.000
Mean	1.000	1.000

Based on Table 2 above, it is evident that the efficiency scores of BPJS from 2015 to 2022 reached optimal efficiency values of 100%. This can be attributed to the implementation of the health social security scheme, whereby BPJS Kesehatan enforces the payment of premiums by its participants on a monthly basis. According to data from BPJS Kesehatan, participants of this insurance scheme include every individual, including foreigners who have worked in Indonesia for at least six months. These participants are divided into two groups: recipients of health insurance premium assistance and non-recipients of health insurance premium assistance (BPJS Kesehatan, 2019).

Referring to the latest data presented by BPJS Kesehatan, in 2014, at the inception of this health insurance scheme, there were 121.6 million participants (49% of Indonesia's population). The number of participants increased to 171.9 million in 2016. By 2019, the entire Indonesian population had become participants in this national insurance managed by BPJS Kesehatan. This aligns with the government's target of achieving universal health coverage of 100% by 2019. As the administrator of Indonesia's social health insurance, BPJS Kesehatan continues to enhance its services. This is evidenced by the improvement in services and ease of access to membership cards, with participant satisfaction indexes steadily increasing from 75% in 2014 to 78.6% in 2016.

Furthermore, the Covid-19 pandemic that occurred in 2020 had a significant impact, with many companies experiencing losses and even bankruptcy. Surprisingly, BPJS Kesehatan recorded a surplus in its financial report for the year 2020 after facing deficits from 2014 to 2019. Research by Azizah et al. (2021) reveals that one reason for the surplus of BPJS Kesehatan in 2020 is the Covid-19 pandemic, which led to a decrease in non-Covid-19 healthcare services at healthcare facilities. This occurred because people were reluctant to visit healthcare facilities due to the higher risk of virus transmission. The decrease in the number of visits also resulted in decreased claim costs.

Meanwhile, productivity measurement using the DEAP software can yield five values as follows: first, EFFCH: efficiency change (relative to CRS calculation), second, TECHCH: technological change, third, PECH: pure technical efficiency change (relative to VRS calculation), fourth, SECH: scale efficiency change (EFFCH/PECH), and fifth, the TFPCH table: total factor productivity change, and this value indicates the level of productivity. TFPCH has three interpretations: TFPCH < 1 indicating a decrease in productivity, TFPCH = 1 indicating no increase or decrease in productivity (stagnation), and TFPCH > 1 indicating an increase in productivity. Here are the results of productivity scores using the DEAP 2.1

application:

Table 3: Data Processing Results on Malmquist Productivity Index (MPI)

Year	EFFCH	TECHCH	PECH	SECH	TFPCH
2	1.000	0.918	1.000	1.000	0.918
3	1.000	1.218	1.000	1.000	1.218
4	1.000	0.683	1.000	1.000	0.683
5	1.000	0.983	1.000	1.000	0.983
6	1.000	0.030	1.000	1.000	0.030
7	1.000	1.010	1.000	1.000	1.010
8	1.000	1.033	1.000	1.000	1.033
Mean	1.000	0.839	1.000	1.000	0.839

The analysis of MPI in the 2nd, 4th, 5th, and 6th years indicates that BPJS Kesehatan had TFPCH values less than one. The lowest value occurred in the 6th year, which was 0.030, implying a productivity decline of 97%. This decline was attributed to a decrease in technical change (TECHCH) or the level of technology used by 97%. This could be due to BPJS Kesehatan's efforts to maintain its efficiency by cost-cutting measures, including reducing expenses related to technology. The acquisition of technology can incur costs, and if not utilized optimally, the incurred costs may not justify the obtained results. Additionally, the decision not to utilize certain technologies should align with improvements in the quality and quantity of human resources. Enhancing the quality of human resources also entails costs, such as training expenses.

In the 3rd, 7th, and 8th years, the TFPCH values of BPJS experienced productivity growth, with the highest increase occurring in the 3rd year at 21.8%. This increase consisted of a 21.8% rise in technical change (TECHCH). The advancement in technology aimed to enhance efficiency, such as BPJS Kesehatan investing in the development of e-learning technology for its employees, exemplified by the "DIAN SIPINTAR" application. This initiative aimed to reduce operational costs associated with offline training, including venue rental, refreshments, transportation, and others. Overall, BPJS Kesehatan witnessed productivity enhancement through technological advancements, driven by internal regulations or policies concerning employee innovation and the demands for digitalization in public service agencies.

In the 7th and 8th years, BPJS Kesehatan experienced productivity growth originating from a 1% increase in technology in the 7th year and a 3.3% increase in the 8th year. Although these increases were relatively low, they could be attributed to BPJS Kesehatan's efforts to enhance technology, yet its utilization remained suboptimal. The low productivity levels may stem from the organization's lack of readiness in terms of technology procurement due to the impact of regulatory changes. Furthermore, decisions regarding technology acquisition must be accompanied by the quality of human resources (HR) capable of leveraging the technology optimally. If the HR is not adequately prepared, it may decrease efficiency levels due to the costs incurred in technology procurement. For instance, BPJS Kesehatan developed an automated telephone application via a website to enhance premium collection through telecollecting and reduce costs for phone credit and handset procurement for telecollectors. However, its usage has not been effective yet, resulting in suboptimal utilization of the technology development costs in achieving these objectives (Rustyani et al., 2023).

7. Conclusion

The efficiency of BPJS from 2015 to 2022 reached optimal levels of 100%. This is attributed to the implementation of health social security, where BPJS Kesehatan applies monthly contributions or premiums to be paid by its participants. The MPI analysis for the 2nd, 4th, 5th, and 6th years indicates that BPJS Kesehatan had TFPCH values less than one. The lowest value occurred in the 6th year, at 0.030, indicating a 97% decrease in productivity. This decline is attributed to a 97% decrease in technical change (TECHCH) or the level of technology used. It may have occurred because BPJS Kesehatan aimed to maintain its efficiency by cost-saving measures, such as reducing technology expenses. In contrast, in the 3rd, 7th, and 8th years, BPJS experienced productivity increases, with the highest increase occurring in the 3rd year at 21.8%. This increase consisted of a 21.8% increase in technological change (TECHCH). The enhancement of technology aimed to improve efficiency; for instance, BPJS Kesehatan incurred costs to develop e-learning technology for employees, such as the "DIAN SIPINTAR" application. In the 7th and 8th years, BPJS Kesehatan saw productivity gains stemming from a 1% increase in technology in the 7th year and a 3.3% increase in the 8th year. Although these increases were relatively low, they occurred as BPJS Kesehatan endeavored to enhance technology, albeit its usage remained suboptimal.

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