Measuring and Decomposing SMEs' Productivity in Creative Economic Sector in Indonesia

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Abstract. This study empirically measures productivity and its decomposition of the SMEs engaged in the creative economic sector across 23 districts/cities in Aceh province, Indonesia over the period 2014-2018. Using Data Envelopment Analysis (DEA) to measure the Malmquist Total Factor Productivity (TFP) index, the study documented a low productivity level SMEs across the province. Although the technical efficiency showed a positive trend, but the declining in their efficiency level has caused only a slight increase in the TFP of SMEs over the study period. These findings suggested that to improve their productivity; the SMEs should continuously enhance efficiency level and technical efficiency by implementing good business governance principles and extensively utilizing ICT facilities, such as online sales and internet of things in their marketing activities. The SMEs should fully utilize existing capital and properly selected and mixed inputs to produce maximum output. Finally, the government should give priority for promoting SMEs in the districts/cities that experienced lower productivity level by providing more financial assistance and regular entrepreneurial and managerial training programs.

1. Introduction
Small and Medium Enterprises (SMEs) play a vital role in the global economy, particularly in developing economies, such as Indonesia. In 2018, there existed 64,19 million units of SMEs in Indonesia, absorbed 97% of the labor force, contributed 13.37% to the total value of non-oil and gas exports, and 57.24% to the national economy [1]. Similarly, SMEs have also largely contributed to the economies of 34 provinces across the country. For example, a total 74,810 unit of SMEs in the Aceh province has absorbed 85% of the labor force and contributed 55.56% to the provincial economy [2]. Due to an increasing contribution of SMEs to the economy, governments at the national and regional level have continuously supported their presence and performances.

Many studies have explored the drivers of SMEs' performance and focused their analyses on SMEs' productivity globally in the last few decades as the level of productivity of SMEs determines their contribution to the national economy [3]. For example, the previous study identified the importance of heuristic and straightforward productivity improvement tool for SME managers who have a semi-literate workforce, little or no technical and mathematical training to promote the productivity of SMEs.
SMEs in India [4]. Research and development intensity enhanced process and product innovation and consequently contributed to SMEs’ productivity in Italy [5]. Lack of financial support, unskilled human resources, and technological incapability have contributed to the low level of productivity of SMEs in the Arab region [6]. Infrastructure access and business climate also determined the productivity of the SMEs’ in Africa [7]. However, for the case of SMEs in Canada, the study found no strong evidence suggesting credit constraints has led to slower productivity growth [8].

Furthermore, the SMEs in Vietnam that possess an internationally recognized standard certificate, supported by technological innovation, had led to their higher productivity [9]. Product innovation and tax incentive contributed positively to total factor productivity growth of SMEs in Thailand [10]. The inclusion of Information and Communication Technologies (ICT) in the SMEs entities has lead to increase their productivity [11] and [12]. Finally, entrepreneurship competencies, management and workforce skills, technology, innovation, and networks are also critical factors to enhance SMEs’ productivity [13]. In the Indonesian context, previous studies identified human resources [14], entrepreneurship training [15], use of appropriate production inputs [16], business capital, technology [17], business scale, educational level [18], and the use of ICT [19] have promoted productivity of the SMEs in the country.

The above-reviewed studies have explored the drivers of SMEs' productivity. Various determinants have been identified as the critical factors determining their productivity, ranging from infrastructure, financial, human resource, business climate, and technological dimensions. However, none of the above studies has investigated the sources of total factor productivity of the SMEs engaged in the creative economic sector in Indonesia. Besides, previous studies have not provided detailed sources of productivity of the co-operatives; thus, they failed to offer a holistic recommendation to enhance their performances and contribution to the national economy. Therefore, this study intends to fill the existing gaps by assessing the total factor productivity and its decomposition using the Malmquist Total Factor Productivity (TFP) index based on the Data Envelopment Analysis (DEA). Using the Malmquist index enables us to decompose TFP into two components, namely efficiency and technical changes. It also allows us to further decompose efficiency change into two sub-components, namely pure efficiency and scale efficiency changes. Besides, different to previous studies that only focused on specific SMEs in a particular region, the present study explores the productivity of SMEs in the creative economic sector all over 23 districts/cities in Aceh province, Indonesia.

The findings of this study are expected to provide recent references for the SMEs and government, in particular the Office of Co-operatives and SMEs of Aceh province, Indonesia in designing policies to promote productivity and the SMEs.

2. Material and Methods

2.1. Site and time

This study measures the sources of productivity of the SMEs in the creative economic sector across 23 districts/cities in Aceh, Indonesia over the period from 2014-2018. SMEs in this sector are those prioritizing creativity, information, and puts forward human resources who have ideas and knowledge as the main factors in their business activities. Most of SMEs are engaged in culinary, technology, computer, souvenir, web design, confection business, etc.

2.2. Sampling and measurement

Of 941 units of SMEs engaged in this sector in 23 districts/cities in Aceh, Indonesia, 115 of them were selected as the sample of the study using a stratified random sampling technique. These comprise five units of SMEs in every 23 districts/cities. Since the study covers a five-year period, thus in totality, the data investigated in this study comprises 575 observations.

In measuring the productivity of the SMEs, this study uses three inputs (i.e., own capital, external capital, and managerial board) and one output (i.e., profits). The inputs and output is selected based on the Indonesian Co-operative Act, No. 25 (1992), which states that the SME is operated using own and external capital, supported by its managerial member to profit. These data are gathered by distributing questionnaires to the SMEs' management across 23 districts/cities in Aceh, Indonesia. The description of the input-output specification and their definitions are reported in Table 1.
2.3. Data and analysis

Previous studies have utilized three major approaches (i.e., traditional, parametric, and non-parametric approaches) to measure the productivity and efficiency of a decision-making unit [3]. Due to its superiorities, a non-parametric of DEA has been widely adopted to measure productivity in various scientific disciplines and operational activities [21]. DEA is not only able to discover the sources of inefficiency, but it also able to take into account a wide range of inputs or outputs, technology, scientific disciplines and operational activities [21].

Thus, this study measures the generalized output-oriented Malmquist Total Factor Productivity (TFP) index using the DEA program [23] using the following equations:

$$M_o(x_t, y_t, x_{t+1}, y_{t+1}) = (a)x(b)$$

(1)

where:

$$a = \frac{D_o^{t+1}(x_{t+1}, y_{t+1})}{D_o(x_t, y_t)}$$

and

$$b = \left[ \frac{D_o(x_t, y_t)}{D_o^{t+1}(x_{t+1}, y_{t+1})} \right]^{1/2}$$

where $M_o$ is the TFP; $D_o$ is the distance function, $x$ and $y$ are the input and output for $t$ and $t+1$ periods, respectively; $a$ is the technical change and $b$ is the efficiency change.

The TFP is decomposed into two components, namely: efficiency change (EFch) and technical efficiency change (TEch). EFch is further decomposed into two sub-components, namely: pure efficiency change (PEch) and scale efficiency change (SEch). The following equations measure these decompositions:

$$M_o(x_t, y_t, x_{t+1}, y_{t+1}) = (a)x(cxd)$$

(2)

where:

$$a = \left[ \frac{D_o^{t+1}(x_{t+1}, y_{t+1})}{D_o(x_t, y_t)} \right]^{1/2}$$

$$c = \frac{D_o(x_t, y_t)}{D_o^{t+1}(x_{t+1}, y_{t+1})}$$

and

$$d = \left[ \frac{D_o^{t+1}(x_{t+1}, y_{t+1})}{D_o^{t+1}(x_{t+1}, y_{t+1})} \right]^{1/2}$$

$a$ is the technical change (TEch), $b$ is the efficiency change, $c$ is the pure efficiency change (PEch), and $d$ is the scale efficiency change (SEch).

The study measures the sources of productivity of the SMEs in the creative economic sector across 23 districts/cities using Constant Return to Scale (CRS) and Variable Return to Scale (VRS). Unlike

| Variable          | Definition                                                                 | Remark   |
|-------------------|-----------------------------------------------------------------------------|----------|
| Own capital       | The number of co-operative-owned capital comprises principal savings, mandatory savings, reserves, and grants. | Input    |
| External capital  | The number of capital from external sources consists of loans from members, other co-operatives, banks, financial institutions, and issuances of bonds and securities. | Input    |
| Managerial members| A person who is appointed to manage the firm through the annual general meetings. | Input    |
| Profit            | Overall revenue minus total cost within a year.                            | Output   |

Source: Adapted from [20] (presented with modification).

Table 1. Inputs-output definitions and their measurements
CRS, the VRS assumes the ratio between additional input and output is dissimilar. This implies that the additional inputs by x times do not necessarily increase the output by x times. It can be smaller or larger than x times [24].

3. Results and Discussion

This study measures and analyzes sources of productivity of SMEs engaged in the creative economic sector across 23 districts/cities in Aceh, Indonesia over the 2014-2018 period. Table 2 illustrated the Return to Constant Return to Scale (CSR) and Variable Return to Scale (VRS) - productivity level of the investigated SMEs. The value of 1.000 signified that the co-operative is productive (on the frontier line), while the value of smaller than 1.000 indicated non-productive (below the frontier line).

| No. | District/City   | 2014 CRS | 2014 VRS | 2015 CRS | 2015 VRS | 2016 CRS | 2016 VRS | 2017 CRS | 2017 VRS | 2018 CRS | 2018 VRS |
|-----|----------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| 1.  | Banda Aceh     | 0.942    | 1.000    | 0.837    | 0.958    | 1.000    | 1.000    | 0.847    | 0.914    | 1.000    | 1.000    |
| 2.  | Aceh Besar     | 0.525    | 0.571    | 0.435    | 0.571    | 0.179    | 0.179    | 0.407    | 0.455    | 0.268    | 0.340    |
| 3.  | Pidie          | 0.391    | 0.732    | 0.311    | 0.465    | 0.192    | 0.413    | 0.463    | 0.767    | 0.287    | 0.545    |
| 4.  | Pidie Jaya     | 0.574    | 0.644    | 0.471    | 0.518    | 0.255    | 0.255    | 0.489    | 0.539    | 0.349    | 0.349    |
| 5.  | Bireuen        | 0.306    | 0.457    | 0.309    | 0.326    | 0.266    | 0.339    | 0.428    | 0.648    | 0.452    | 0.655    |
| 6.  | Lhokseumawe    | 0.346    | 0.410    | 0.276    | 0.284    | 0.148    | 0.216    | 0.362    | 0.436    | 0.272    | 0.375    |
| 7.  | Aceh Utara     | 0.633    | 0.886    | 0.635    | 0.642    | 0.350    | 0.497    | 0.823    | 1.000    | 0.641    | 0.844    |
| 8.  | Aceh Timur     | 0.161    | 0.165    | 0.126    | 0.163    | 0.098    | 0.116    | 0.187    | 0.193    | 0.164    | 0.165    |
| 9.  | Langsa         | 0.700    | 1.000    | 0.496    | 0.857    | 0.260    | 0.260    | 0.638    | 0.664    | 0.370    | 0.370    |
| 10. | Aceh Tamiang   | 0.136    | 0.143    | 0.133    | 0.133    | 0.102    | 0.138    | 0.154    | 0.168    | 0.124    | 0.139    |
| 11. | Aceh Tenggarra | 0.306    | 0.453    | 0.263    | 0.326    | 0.146    | 0.285    | 0.327    | 0.490    | 0.263    | 0.418    |
| 12. | Gayo Lues      | 1.000    | 1.000    | 0.813    | 0.813    | 0.542    | 0.744    | 1.000    | 1.000    | 0.981    | 1.000    |
| 13. | Aceh Tengah    | 0.131    | 0.143    | 0.148    | 0.200    | 0.153    | 0.500    | 0.181    | 0.200    | 0.116    | 0.116    |
| 14. | Bener Meriah   | 0.127    | 0.128    | 0.110    | 0.127    | 0.284    | 0.284    | 0.407    | 0.416    | 0.559    | 0.559    |
| 15. | Aceh Singkil   | 1.000    | 1.000    | 1.000    | 1.000    | 1.000    | 1.000    | 1.000    | 1.000    | 1.000    | 1.000    |
| 16. | Sabang        | 1.000    | 1.000    | 1.000    | 1.000    | 0.628    | 0.834    | 1.000    | 1.000    | 1.000    | 1.000    |
| 17. | Aceh Barat     | 1.000    | 1.000    | 1.000    | 1.000    | 1.000    | 1.000    | 1.000    | 1.000    | 1.000    | 1.000    |
| 18. | Nagan Raya     | 0.448    | 0.515    | 0.375    | 0.407    | 0.251    | 0.251    | 0.424    | 0.445    | 0.278    | 0.350    |
| 19. | Abdia          | 0.385    | 0.454    | 0.451    | 0.537    | 0.213    | 0.213    | 0.357    | 0.364    | 0.215    | 0.272    |
| 20. | Aceh Selatan   | 0.296    | 0.343    | 0.305    | 0.317    | 0.230    | 0.230    | 0.670    | 0.688    | 0.447    | 0.447    |
| 21. | Subulussalam   | 1.000    | 1.000    | 0.761    | 1.000    | 0.326    | 1.000    | 0.563    | 1.000    | 0.471    | 1.000    |
| 22. | Simeulue       | 0.109    | 0.167    | 0.106    | 0.145    | 0.080    | 0.118    | 0.111    | 0.181    | 0.092    | 0.119    |
| 23. | Aceh Jaya      | 0.620    | 1.000    | 0.444    | 1.000    | 1.000    | 1.000    | 1.000    | 1.000    | 1.000    | 1.000    |

As illustrated in Table 2, the SMEs have experienced a relatively low level of productivity with an average of 48.56% (CRS) and 57% (VRS) in Aceh during the period 2014-2018. This shows that the SMEs is only able to operate half productively, thus there exist an ample space for them to improve their level of productivity. Only SMEs in the districts of Aceh Singkil and Aceh Barat has operated in fully productive (on frontier line) using both CRS and VRS assumptions. Meanwhile, based on the VRS estimation, the study only found SMEs located in Subulussalam city and Aceh Jaya district have been fully productive during the 2014-2018 period. The SMEs in Simeulue district are found to record to have the lowest productivity level (CRS = 9.96% and VRS = 14.60%). However, in terms of VRS, SMEs in Benar Meriah district was documented to have the lowest productivity level in 2014 and 2015, SMEs in Aceh Timur district in 2016, SMEs in Aceh Tamiang district in 2017, and SMEs in Simeulue district in 2018.

The SMEs experienced an unsteady level of productivity and failed to continuously maintain and improve their productivity level. Their small scale, capital inadequacy, and mismanagement have been among the contributors to the low productivity level of the co-operatives in Aceh, Indonesia.

To further identify the sources of their productivity in more detail, Table 3 presents the decompositions of the TFP. The TFP change (TFPch) of less than 1.000 shows a decline in the
productivity level, equal to 1.000 indicates a constant productivity level, and the value of greater than 1.000 implies a rise in the productivity level of the SMEs.

As observed from Table 3, the SMEs in Aceh have recorded varying TFP changes. On average, it has increased by 2.3% in 2014-2015, decreased by -0.8% in 2015-2016, decreased by -3.5% in 2016-2017, and increased by 2.5% in 2017-2018 periods. In view of the TFP decomposition, as a whole, except for the period 2016-2017 (-42.5%), the improvement in technical efficiency (TEch) has contributed positively to the increase in TFP during the periods of 2014-2015 (14.4%), 2015-2016 (32.2%), and 2017-2018 (24.6%). Conversely, the level of efficiency (EFch) increased by 66.8% in 2016-2017, deteriorated by -24.8% and -17.8% in 2014-2015 and 2017-2018, respectively, has caused the SMEs' TFP to deteriorate over the study period. The efficiency sub-components, namely pure efficiency (PEch) and the scale efficiency (SEch) decreased between -0.4% to 17-2% during the 2014-2016 period and 2017-2018 period. Only in the 2016-2017 period, pure efficiency and efficiency scale have improved by 46.7% and 13.7%, respectively.

Overall, the TFP of SMEs across 23 districts/cities in Aceh province, Indonesia has only experienced an increase of 0.1% during the study period. Judging from the composition of the TFP, SMEs have experienced a decrease in the level of efficiency (EFch) by -2.0%, but experienced an increase in technical efficiency (TEch) by 2.1%. Furthermore, viewed from the efficiency (EFch) sub-component of the SMEs, their pure efficiency (PEch) has decreased by -2.2%, while the scale efficiency (SEch) has increased only by 0.1%.

Individually, SMEs in Benar Meriah district are found as the highest increase in TFP (46.0%), while SMEs in Subulussalam city experienced the largest decrease in TFP (15.7%). In term of TFP composition, SMEs in Benar Meriah district is recorded to have the highest efficiency improvement (4.47%), while SMEs in Subulussalam city had the highest efficiency deterioration (-17.2%). SMEs in Banda Aceh city is found to experience the highest technical efficiency progress (9.2%), while the SMEs in Sabang city is documented to experience the highest technical efficiency regress (-13.4%).

Furthermore, in terms of the efficiency sub-components, SMEs in Benar Meriah district is documented to have the highest increase in pure efficiency (PEch) by 44.5%. In contrast, the SMEs in Langsa city is recorded to experience the highest deterioration in pure efficiency (PEch) by -2.2%. In terms of SEch, SMEs in Aceh Jaya district is found to register the highest improvement (12.7%). In comparison, SMEs in Subulussalam city is recorded to experience the highest regress in their scale efficiency (SEch) by -17.2%.

The findings of the low level of productivity of the SMEs are in harmony with previous studies [25] and [26]. However, our of results of different productivity level of SMEs across 23 districts/cities contradicted the finding of relatively similar productivity level of the SMEs across 29 provinces/regions in the mainland China during the 1991-1995 period [27]. Thus, it is enormously essential for the government to formulate suitable policies to advance all SMEs to have a relative similar productivity level that, consequently, contribute to the just regional economic development.

Our finding shows that the technical progress is found as the main contribution to the improvement of TFP of the SMEs province-wide. The adoption of information and communication technology by the SMEs has contributed to the advancement of SMEs across 23 districts/cities in Aceh, Indonesia. Our findings are in harmony with the findings of the previous studies which found the TEch mainly contributes the TFP change as opposed to the EFch [26]. The results of different productivity level of SMEs across the districts/cities are in line with previous studies [5], [9], and [28]. These studies found that SMEs in different regions in a particular country has recorded different level of their productivity.
activities. should be encouraged to adopt relevant and updated technology intensively into their daily business. Entrepreneurial skills through ongoing certified training should be recurrently provided. The SMEs should be provided with attractive promotion packages to promote entrepreneurial productivity. Improving administrative and management packages for the SMEs' performance should be implemented to a performance-based reward and incentive system.

Due to their small scale, the SMEs are vulnerable to the economic cycles. Traditional operations can lead to low productivity levels. Our findings show that the SMEs in Aceh, Indonesia, have low productivity levels. The productivity levels are calculated using different methods, including fixed effects (EFch), technical coefficients (Tech), labor productivity (PEch), and total factor productivity (SEch). The table below presents the productivity levels for each district/city in Aceh, Indonesia, for the years 2014-2015 and 2015-2016.

Table 3. Overall total factor productivity and its decomposition

| No  | District/City          | EFch  | Tech | PEch | SEch | TFPch | EFch  | Tech | PEch | SEch | TFPch |
|-----|------------------------|-------|------|------|------|-------|-------|------|------|------|-------|
| 1   | Banda Aceh             | 0.888 | 1.229| 0.958| 0.928| 1.091 | 1.195 | 1.803| 1.044| 1.144| 2.154 |
| 2   | Aceh Besar             | 0.829 | 1.207| 0.829| 1.000| 0.411 | 1.540 | 0.313| 1.315| 0.633|       |
| 3   | Pidie                  | 0.796 | 1.257| 0.635| 1.253| 1.000 | 0.619 | 1.387| 0.887| 0.698| 0.858 |
| 4   | Pidie Jaya             | 0.819 | 1.203| 0.804| 1.019| 0.986 | 0.541 | 1.569| 0.492| 1.100| 0.849 |
| 5   | Bireuen                | 1.008 | 0.992| 0.713| 1.415| 1.000 | 0.860 | 1.473| 1.041| 0.826| 1.267 |
| 6   | Lhokseumawe            | 0.798 | 1.236| 0.693| 1.153| 0.987 | 0.537 | 1.633| 0.761| 0.706| 0.877 |
| 7   | Aceh Utara             | 1.062 | 0.998| 0.724| 1.384| 1.000 | 0.552 | 1.717 | 0.775 | 0.712 | 0.948 |
| 8   | Aceh Timur             | 0.780 | 1.282| 0.988| 0.789| 1.000 | 0.776 | 1.108 | 0.714 | 1.087 | 0.860 |
| 9   | Langsa                 | 0.708 | 1.210| 0.857| 0.826| 0.857 | 0.525 | 0.125 | 0.304 | 1.729 | 0.638 |
| 10  | Aceh Tamiang           | 0.978 | 0.984| 0.929| 1.052| 0.962 | 0.769 | 1.061 | 0.103 | 0.741 | 0.816 |
| 11  | Aceh Tengah            | 0.858 | 1.006| 0.719| 1.193| 0.863 | 0.556 | 1.524 | 0.874 | 0.636 | 0.847 |
| 12  | Gayo Lues              | 0.813 | 1.250| 0.813| 1.000| 1.017 | 0.667 | 1.022 | 0.915 | 0.729 | 0.681 |
| 13  | Aceh Tengah            | 1.131 | 1.238| 1.400| 0.808| 1.400 | 1.031 | 1.286 | 2.500 | 0.412 | 1.326 |
| 14  | Bener Meriah           | 0.560 | 1.163| 0.989| 0.870| 1.000 | 2.593 | 1.588 | 2.243 | 1.156 | 3.600 |
| 15  | Aceh Singkil           | 1.000 | 1.000| 1.000| 1.000| 1.000    | 1.000    | 1.167    | 1.000    | 1.167    | 1.000 |
| 16  | Sabang                 | 1.000 | 0.950| 1.000| 1.000| 0.950    | 0.628    | 0.904    | 0.834    | 0.753    | 0.568 |
| 17  | Aceh Barat             | 1.000 | 1.225| 1.000| 1.000| 1.225    | 1.000    | 0.982    | 1.000    | 1.000    | 0.982 |
| 18  | Nagan Raya             | 0.837 | 1.194| 0.791| 1.058| 1.000    | 0.669    | 1.476    | 0.616    | 1.085    | 0.987 |
| 19  | Abduya                 | 1.170 | 1.222| 1.183| 0.989| 1.430    | 0.472    | 1.536    | 0.396    | 1.192    | 0.725 |
| 20  | Aceh Selatan           | 1.032 | 1.147| 0.924| 1.117| 1.183    | 0.754    | 1.326    | 0.883    | 0.854    | 1.000 |
| 21  | Subulussalam           | 0.761 | 1.042| 1.000| 0.761| 0.793    | 0.428    | 1.335    | 1.000    | 0.428    | 0.571 |
| 22  | Simeulue               | 0.976 | 1.025| 0.869| 1.123| 1.000    | 0.747    | 1.203    | 0.814    | 0.918    | 0.899 |
| 23  | Aceh Jaya              | 0.717 | 1.395| 1.000| 0.717| 1.000    | 2.250    | 1.189    | 1.000    | 2.250    | 2.675 |

Mean: 0.894 | 1.144 | 0.898 | 0.996 | 1.023 | 0.752 | 1.320 | 0.828 | 0.908 | 0.992

In addition, our findings of the low productivity level of the SMEs in Aceh, Indonesia, are not surprising. Due to their small scale, the SMEs are vulnerable to the economic cycles. Traditional business culture and lacking managerial skills among SMEs managers has been disadvantageous for being a productive SMEs entity [29]. A performance-based reward scheme and attractive promotion packages for the SMEs management should be implemented to a performance-based reward and attractive promotion packages to promote entrepreneurial productivity. Improving administrative and entrepreneurial skills through ongoing certified training should be recurrently provided. The SMEs should be encouraged to adopt relevant and updated technology intensively into their daily business activities.
Finally, the government should give priority for promoting SMEs in the districts/cities that experienced productivity deterioration by providing more funds and free of charge entrepreneurial and managerial training regularly. The non-productive SMEs are encouraged to benchmark the highest productive SMEs achievers to learn how to improve their productivity level. The government might offer training avenues for the entrepreneurs from the districts/cities that experienced lower productivity level by exhibiting the best practices of SMEs. Finally, the SMEs have to fully utilize their capital for productive activities, select and mix inputs appropriately to produce maximum output.

4. Conclusion
This study empirically measured and decomposed total factor productivity of the SMEs engaged in the creative economic sector across 23 districts/cities in Aceh, Indonesia over the period from 2014 to 2018 using Data Envelopment Analysis (DEA). Overall, the study recorded the low productivity level of SMEs across the province during the study period. The total factor productivity index of the SMEs has slightly improved, contributed mainly by an increase in technical efficiency. On the other hand, the deterioration of the efficiency level has lowered the TFP of the SMEs. These findings implied that to promote TFP, the SMEs need to improve their pure and technical efficiency by implementing good business governance principles and extensively utilizing ICT facilities, such as online sales and internet of things in their marketing activities. The SMEs have also to fully utilize their own capital for productive activities, select and mix inputs appropriately to produce maximum output. Finally, the government should give priority for promoting SMEs in the districts/cities that experienced lower productivity level by providing adequate financial assistance and regular entrepreneurial and managerial training programs.

Future studies are suggested to explore the productivity of the various sectors of SMEs nationwide to offer a holistic portrait of their sources of productivity. Finally, future researches might combine both parametric and non-parametric approaches to measure the productivity of the SMEs to enrich the existing findings.

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