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Productivity Growth in Foods and Beverages Industry: Empirical Evidence from Indonesia

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The aim of this paper was to examine the total factor productivity (TFP) growth and its sources in Indonesian foods and beverages industry. Foods and beverages industry is one of the leading sectors that contribute substantially to manufacturing industry since the first modern industrialization has been implemented in early 1970s. The method used in this study was non-parametric technique by applying Färe and Primont productivity index. With broader components of total factor productivity growth, this method provides more advantage in decomposition approach. The data used in this study were medium and large scale manufacturing industry from 2000–2009. The primarily results showed that, in general, foods industry has higher total factor productivity growth than other industries. Meanwhile, in 3-digit ISIC, industry of processing and preserving of meat, fish, fruits, vegetables, cooking oil, and fat (ISIC 151) experienced highest productivity growth. General evidences showed that technical progress becomes the main driver of TFP growth following by scale efficiency change and technical efficiency change.

Keywords: Productivity Growth, Food Industry, Non-Parametric, Färe-Primont Index.

1. INTRODUCTION

Food and beverage industry is one of the leading sectors for Indonesian manufacturing since the first modern industrialization has been implemented by the Government of Indonesia (GOI) in early 1970s. According to the Ministry of Industry (2011),[1] on average, within the period of 1976–2009, foods and beverages industry contributed 13.80 percent to total manufacturing value-added, or the second largest contributor after the tobacco industry (14.69 percent). Even though, the contribution of foods and beverages industry tends to slightly decrease or fluctuates, this industry remains the major driver of Indonesian manufacturing growth. Beside the contribution on the value-added, this industry also contributes in labor absorption as its technology is still dominated by labor-intensive industry.

Figure 1 shows the contribution of food and beverages industry to the total manufacturing value added based on the stages of industrial development. In the period of 1976–1981, Indonesia experienced oil boom condition due to the climbing of world oil price, but within 1982–1996 Indonesia faced the reverse situation when oil price declined. From 1997–2004 was the financial crisis period and recovery, while from 2005–2009 was the period of recovery and development.

The data in Figure 1 indicates that the four largest industries have specific character on their productivity and efficiency level. As a result, their contribution to manufacturing as a whole is consistently substantial except for tobacco industry, which tends to decline from 24.32 percent in 1976–1981 to only 9.04 percent in 2005–2009. Based on this brief background, this study attempts to examine the sources of productivity growth in the manufacturing industry within the period of 2004–2009 after series of important industrial policies were implemented by the GOI to bring manufacturing back after severe crisis in 1998. The analysis will be focused on the food and beverages industry (ISIC 15). Previous empirical studies on productivity growth in Indonesia showed that there are various levels of productivity growth across manufacturing industries, for example, Suyanto et al.,[2] Ikhsan,[3] Margono and Sharma,[4] and Aswicahyono and Hill.[5]

2. METHODOLOGY

The concept of technical efficiency was firstly proposed by Farrel,[6] and then it was formally formulized by Meeusen and Broeck.[7] As explained by Coelli et al.[8] and Mahadevan,[9] efficiency measurement can be performed by parametric (stochastic) or non-parametric (deterministic) approach. Khumbakar and Lovell[10] provide a broad discussion on the decomposition of productivity using stochastic frontier approach. To decompose the total factor productivity growth (TFP), this study adopted the decomposition of productivity change within the aggregate quantity framework of O'Donnell.[11,12] The following paragraph briefly explains this framework. Let $x_{it} = (x_{1it}, \ldots, x_{Kit})$, and

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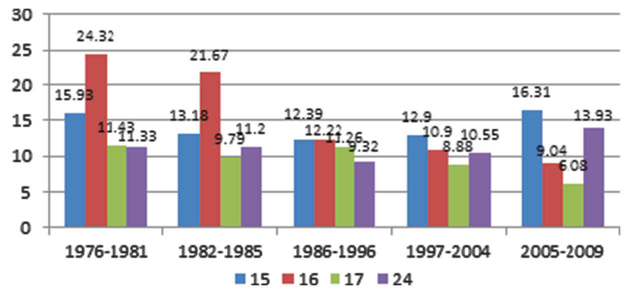

Fig. 1. Four largest manufacturing industries 1976–2009 (% of total value added.
Source: Large and medium manufacturing database 1976–2009, Indonesian statistics (BPS).
Notes: ISIC 15: Food and Beverages; ISIC 16: Tobacco; ISIC 17: Textile; ISIC 24: Chemical and chemical products. The ISIC is based on 2009 classification.

$q_{it} = (q_{1it}, \ldots, q_{Jit})$, denotes the vectors of input and output quantities for firm i and period t. The TFP of a firm in the aggregate quantity framework of O'Donnell[12, 13] is defined as:

$$\text{TFP}_{it} = \frac{Q_{it}}{X_{it}} \tag{1}$$

where $Q_{it} \equiv Q(q_{it})$ represents the aggregate output, and $X_{it} \equiv X(x_{it})$ is an aggregate input, and $Q(\cdot)$ and $X(\cdot)$ are non-negative, non-decreasing and linearly-homogenous aggregator functions.

Based on the Eq. (1), the definition means that measures of efficiency and productivity can be defined as ratios of measures of TFP. If the maximum TFP that can be achieved using the technology available in period t is defined as TFP_t^*, then the measure of productive efficiency is the ratio of observed TFP to the maximum TFP that is possible:[12, 13]

$$\text{TFPE}_{it} = \frac{\text{TFP}_{it}}{\text{TFP}_t^*} = \frac{Q_{it}/X_{it}}{Q_t^*/X_t^*} \leq 1 \text{ (TFP efficiency)} \tag{2}$$

where Q_t^* and X_t^* are aggregates of the output and input vectors that maximise TFP.

3. DATA

The data used in this study were medium and large manufacturing industry from 2000–2009 from Indonesian Statistics (BPS). This time horizon selected was intended to cover the crucial period after economic crisis in 1998 when several industrial policies were implemented by the GOI to bring back the manufacturing industry as a leading sector for national economy.

4. RESULTS AND DISCUSSION

Table I shows the results of productivity growth decomposition using Fare and Primont productivity index as mentioned in Eqs. (1) and (2). In 3-digit ISIC, there were six sub-industries in foods and beverages. Based on Table I, sub-industry processing and preserving of meat, fish, fruits, vegetables, cooking oil and fat (ISIC 151) experienced highest productivity growth 3.70 percent, following by grain products, flour and animal feed (ISIC 153) 3.67 present, other food industry (ISIC 154) 3.34 percent, beverages (ISIC 155) 0.68%, and processed tobacco (ISIC 160) 0.55 present. One industry, milk and food made from milk (ISIC 152), experienced negative productivity growth −1.44 percent.

Table I. Decomposition of total factor productivity (TFP) growth using fare-primont index approach.

ISIC	Industry	TFP change (dTFP) (1) = (2) + (3)	Technical change (dTECH) (2)	Efficiency change (dTPFE) (3) = (4) + (5)	Technical efficiency change (dITE) (4)	Scale-mix efficiency change (dISME) (5)
151	Processing and preserving of meat, fish, fruits, vegetables, cooking oil and fat	3.70	3.58	0.12	0.00	0.12
153	Grain mill products, flour and animal feed	3.67	3.58	0.09	1.45	−1.36
154	Other food	3.34	3.58	−0.24	1.56	−1.80
155	Beverages	0.68	3.58	−2.90	−0.33	−2.57
160	Processed tobacco	0.55	3.58	−3.03	0.00	−3.03
152	Milk and food made from milk	−1.44	3.58	−5.02	0.11	−5.13

Notes: The productivity and efficiency scores of the foods and beverages industry are calculated relative to all 3-digit ISIC level industry within the period of 2000–2009. The decomposition of TFP growth is performed by using DPIN 3.0 software published by center of productivity and efficiency analysis (www.cepa.uq.edu).[14]

Technological progress or technical change (dTech) contributed the highest value to productivity growth. As shown in Table I, all industries had same level of technological progress; 3.58 percent, because the basic assumption in Fare-Primont productivity index is that all unit measurement experience same level. In addition, efficiency change (dTFPE) and scale-mix efficiency change (dISME) showed various numbers. Two industries (ISIC 151 and 153) had positive growth, while others sub-sectors had negative growth. For scale efficiency (dISME), only sub-sector ISIC 151 had experience positive growth. Negative dISME growth indicated that probably, those industries was unable to maximize the organizational management and capacity building for employee or staff. In this case, the management level of company should encourage the exit strategy for optimizing total factor productivity (TFP) growth.

5. CONCLUSION

The brief analysis shows that during 2000–2009 foods and beverages industry experience dynamic total factor productivity (TFP) growth. In general, technical change or technological progress becomes the main driver of TFP growth for all sub-sectors industries, which indicates that technological upgrading was sustainably performed by firms in foods and beverages industry. In addition, scale efficiency change becomes the major negative contributor to the TFP growth. The feature indicates that, probably, firms in this industry have obstacles in optimizing the managerial aspects, so that they cannot get advantage from exploiting the economies of scale. The foods and beverages industry is one of the most competitive industries in Indonesian medium-large manufacturing structure. With this market environment, a firm's professional managerial is a necessary condition to optimize the benefit from economies of scale.

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