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Efficiency and Productivity of Textile Industries and Products in Central Java

Hertiana Ikasari[1*], Ida Farida[2], Ngatindriatun[3]

Faculty of Economics and Business, Dian Nuswantoro University, Jl. Nakula I/ 5-15, Semarang, Indonesia

*E-mail of the corresponding author: ihertiana@yahoo.co.id

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Abstract

The aim of this research was to analyze the efficiency and productivity of textile industries and textile products of Central Java in 2010-2011. The data used was 10 Indonesian Standard Industrial Classification (ISIC) four digits of the Central Bureau of Statistics, Central Java. The variables used in this research were output value for output variable, and the input variables were the cost of raw and auxiliary materials, labor expenses, purchased electricity, and fuel and lubricant expenses. This research used the analysis tools of Data Envelopment Analysis (DEA) and Malmquist Productivity Index. The results are, for the years of 2010-2011, the efficient industries, according to the measurement of CRS and VRS were the industries of processing and spinning of textile fibers, other textile industries and the industries of knitted and embroidered apparel. Overall the total productivity factors of textile industries and textile products have increased mainly due to the changes in technology. To develop the textile industries and products in Central Java in order to have the competitiveness power, improvement and repair are necessary both internally within the companies and in the business environments/ climate in the country which includes the fields of finance, energy, labor, marketing, technology and infrastructure.

Keywords: Efficiency, productivity, textile, DEA, Malmquist Index

1. Introduction

Textile industries and products are some of the pioneers industries and Indonesian manufacturing backbones. The strategic position of the industry is increasingly apparent when viewed from the side of its contribution to the economy, especially in the form of export earnings and employment (www.regionalinvestment.bkpm.go.id//). Textile industries and textile products were selected to be one of 32 priority industries declared by the government in the National Industrial Development Policy (KPNI) (Kuncoro, 2009).

Textile industries and textile products do not only play an important role for the national economy but also to the economy of Central Java Province. The industries are the priority industrial sectors for the province of Central Java. The data of the Industry and Trade Agency (Disperindag) of Central Java shows that in 2009 in sector of textile industry there were 718 business units which were able to employ 154,964 workers and generates the output of IDR 30,531 billion. In other hand, from the apparel sector in the same year, there were 913 business units that employed 95,236 workers and generated the output of IDR 9.35 billion (www.regionalinvestment.bkpm.go.id//).

The importance of the roles of textile industries and products to the economy of Central Java is also seen in this industry's contribution to the total exports of Central Java. The contribution of this sector was the biggest compared to other sectors. Based on table 1, the contribution of textile industry exports in Central Java was 40.65% in 2010 and decreased to 39.74% in 2011.

In the development of recent years, the exports of textile industries and products grew more slowly than the main competitor country such as China. The above shows that the textile industries and products in Indonesia in general and Central Java in particular should have high competitiveness in order to compete with similar industries from competing countries like China. In building strong textile industries and products with high competitiveness, many challenges or problems must be faced. These problems include: the old machineries of domestic textile industries and products, labor problems, high cost of energy, dependence on imported raw materials, the rise of legal and illegal imports, and others.

Two basic things as the causes of low competitiveness are relatively low efficiency and high cost economy. In addition to these reasons, the competitiveness of Indonesian products in general and Central Java in particular is still low because the quality and quantity and continuity of industrial product supply are mostly not qualified for world trade. It is, therefore, important to conduct research related to the efficiency and productivity of textile industries and products of Central Java in order to have high competitiveness in the world market so as to improve the regional economic growth.

The rest of the paper is organized as follows: section 2 provides material and method. Section 3 presents result and discussion of the research. In Section 4 provides concluding remarks.

2. Material dan Method

Efficiency is one of the performance parameters which is theoretically one of the performances underlying overall performance of an organization. The ability to generate maximum output with existing input is an expected performance measure. When an efficiency measurement is conducted, industries are faced with the challenges of how to get optimum output level with existing input level, or to get minimum input level with certain output level. In addition, the separation between unit and price can be identified the level of technological efficiency, allocation efficiency, and total efficiency. With the identification of input and output allocation, it can be analyzed further to see the causes of inefficiencies (Hadad, et al, 2003).

Data Envelopment Analysis (DEA) utilizes data as input and output quantities of a group of firms or Decision Making Unit (DMUs) to construct a piece-wise frontier over the data points. This frontier is constructed by the solution of a sequence of linear programming problems, one for each DMU in the sample. Efficiency scores or measures are then estimated relative to this frontier, which corresponds to an efficient technology. Thus this method is an ideal measure for broad measurement of efficiency. DEA allows efficiency to be estimated without having to stipulate either the structure of production function or the weights for input and output used (Viverita and Wibowo, 2009).

Coelli (1996) stated that Charnes, Cooper and Rhodes (1978) proposed a model which had an input orientation and assumed constant returns to scale (CRS). Subsequent papers have considered alternative sets of assumptions, such as Banker, Charnes and Cooper (1984) who proposed a variable returns to scale (VRS) model.

The productivity measurement was conducted by the approach of Malmquist Productivity Index. Coelli (1996) stated that the Charnes, Cooper and Rhodes (1978) proposed a model of the which had an input orientation and assumed constant returns to scale (CRS). Subsequent papers have Considered alternative sets of Assumptions, such as Banker, Charnes and Cooper (1984) WHO proposed a variable returns to scale (VRS) model.

Malmquist TFP index to measure productivity change and to decompose this productivity change into technical change and technical efficiency change. Fare et al (1994) in Coelli (1996), specifies an output –based Malmquist productivity change index as:

$$m_i(q_t, q_{t+1}, X_t, X_{t+1}) = \frac{d_i^t(Q_{t,Xt})}{d_t^{t+1}(q_{t+1,X_{t+1}})} \left[\frac{d_i^{t+1}{}_{(qt+1,t+1)}}{d_i^t{}_{(qt+1,xt+1)}} \times \frac{d_i^{t+1}{}_{(qt,Xt)}}{d_i^t{}_{(qt,xt)}} \right]^{1/2} \quad \text{.....(1)}$$

This represents the productivity of production point (x_{t+1}, y_{t+1}). A value greater than one will indicate positif TFP growth from periode t to periode t+1. This index is, in fact, the geometric mean of two output-based Malmquist TFP indices. One index uses periode t technology and the other period t+1 technology (Coelli, 1996).

Several researches related to the efficiency and productivity of an industry had already been conducted, such as by: Atmanti (2004), Rejekiningsih (2006), Jajri and Ismail (2006), Ray and Neogi (2007), Ali et al (2009), Viverita and Wibowo (2009), Rahbar and Memarian (2010), Alviya (2011), and Ray and Ray (2012).

To analyze efficiency, the analysis tools used were Data Envelopment Analysis (DEA), whereas productivity was analyzed using Malmquist Productivity Index (MPI). The data used was based on Indonesian Standard Industrial Classification (ISIC) of four digits of the Central Bureau of Statistic (BPS) for the groups of textile industries and products, which consists of the industries of processing and spinning textile fibers (ISIC 1311), textile weaving industries (ISIC 1312) , the industries of textile final finishing (ISIC 1313), knitted fabrics and embroidery industries (ISIC 1391), the industries of textile products, not apparel (ISIC 1392), the industries of rope and the products made of rope (ISIC 1394), other textile industries of YTDL (ISIC 1399), apparel industries (instead of tailoring and the industries of clothing) (ISIC 1411), the industries of clothing accessories, mainly made of textile (ISIC 1413) and the industries of knitted and embroidery/ border apparel (ISIC 1430). Tailoring and garment-making industries by orders (ISIC 1412) are not included because of incomplete data. The output variable in this research was the output value of textile industries and products. The input variables used were: the cost of raw and auxiliary materials, expenditures for labor, electricity energy purchased, and fuel and lubricants expenses.

3. Results and Discussions

3.1. The efficiency of textile industries and products in Central Java

Based on table 1, in 2010, more than 60% of textile industries and products of Central Java were able to produce outputs with a number of existing inputs. Of the 10 ISICs of the textile industries and products in Central Java, six ISICs worked efficiently based on the measurement of CRS and eight ISICs worked efficiently based on the measurement of the VRS in the year of 2010. In other hand, in 2011, more than 50% of textile industries and products of Central Java could produce output with a number of existing inputs. Of the 10 ISICs of textile

industries and products in Central Java, five ISICs worked efficiently based on the measurement of CRS and five ISICs worked efficiently based on the measurement of the VRS in 2011.
During 2010-2011, the industries consistently efficient under CRS and VRS measurements were the industries of processing and spinning textile fibers (ISIC 1311), other textile industries (ISIC 1399) and the industries of knitted and embroidery apparel (ISIC 1430). The inefficient industries in 2011 according to CRS and VRS were knitted and embroidered fabrics industries (ISIC 1391) and the industries of rope and rope products (ISIC 1394). The efficient industries according to CRS measurements are the industries which are efficient in technical and scale, while the efficient industries based on VRS are the industries which are technically efficient.

Table 1. The Efficiency Value of Textile Industries and Products in Central Java

No	DMU	CRS Efficiency		VRS Efficiency	
		2010	2011	2010	2011
1	1311	1	1	1	1
2	1312	0.786	0.77	0.864	1
3	1313	1	0.876	1	1
4	1391	0.736	0.748	1	0.784
5	1392	0.829	1	0.883	1
6	1394	1	0.846	1	0.855
7	1399	1	1	1	1
8	1411	0.993	1	1	1
9	1413	1	0.894	1	1
10	1430	1	1	1	1
Mean		0.9344	0.9134	0.9747	0.9639

Source: Processed Data, 2014

3.2. Productivity of Textile and Clothing Industry in Central Java
The productivity analysis in this research used Produtivity Malmquist Index (MPI) processed with the software of DEAP 2.1. The results obtained are shown in Table 2

Table 2. The Calculation of *Malmquist Productivity Index* to the Textile Industries and Products in Central Java

ISIC	EFFCH	TECHCH	PECH	SECH	TFPCH
1311	0.430	2.196	0.124	3.471	0.945
1312	1.564	1.091	1.000	1.564	1.706
1313	0.583	1.247	1.000	0.583	0.727
1391	0.690	1.428	0.553	1.249	0.985
1392	0.384	1.039	0.500	0.768	0.399
1394	1.000	2.392	1.000	1.000	2.392
1399	1.000	0.508	1.000	1.000	0.508
1411	1.000	1.962	1.000	1.000	1.962
1413	1.000	1.205	1.000	1.000	1.205
1430	1.000	0.890	1.000	1.000	0.890
Mean	0.797	1.275	0.714	1.117	1.016

Source: Processed Data, 2014

Based on Table 2, during the year of 2010-2011, the overall growth of total productivity factor (TFPCH) of textile industries and products has increased by an average of 1.016. This is mainly due to changes in technology (TECHCH) with the average growth of 1.275. At the change value (factor) of total productivity (tfpch), there were four industries that experienced an increase in total productivity change. The industries with the highest *tfpch* value were the industries of rope and materials of rope (ISIC 1394) then apparel industries (ISIC 1411), textile weaving industries (ISIC 1312) and clothing accessory industries which mainly made of textile (ISIC

1413).

4. Concluding Remarks

4.1 Conclusion

- Based on DEA, during the years of 2010-2011, the efficient industries by CRS and VRS measurements were the industries of processing and spinning of textile fibers (ISIC 1311), other textile industries (ISIC 1399) and knitted and embroidery apparel industries (ISIC 1430).
- Based on Malmquist Productivity Index (MPI), the overall growth of total productivity factor (TFPCH) of textile industries and products had increased mainly due to changes in technology
- There are four industries that experienced an increase in total productivity changes such as the industries of rope and material of rope (1394) then apparel industries (1411), textile weaving industries (1312) and clothing accessory industries primarily made of textile (1413).

4.2 Recommendation

In order to develop the textile industries and products in Central Java, the improvement and repair are required both within the companies and in their environments/ business climates in the country which includes the fields of finance, energy, labor, marketing, technology and infrastructure. The strategies that could be performed, for example, are improving investment climate, promoting cooperation among upstream, intemerdiate and downstream industries, saving electricity and fuel costs, enhancing human resource skills, increasing market penetration through trade cooperation, encouraging the growth of integrated textile industry regions in the terms of efficiency and environmentally friendly.

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