



# Potential Spillover from Foreign Companies Evidence from the Indonesian Convection Industry

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**Abstract.** The textile industry in Indonesia is fascinating to study due to its essential role in the Indonesian economy and as a strategic sector for employment. While imported items continue to dominate raw material supply in this sector, Foreign Direct Investment (FDI) inflows will bring about externality effects on a firm's efficiency. This current study examines the spillover effect of Foreign Direct Investment on firms' technical efficiency in Indonesia's convection industry (ISIC 14111). The study used Data Envelopment Analysis (DEA) models to calculate technical efficiency scores for each firm in the convection sector from 2010 to 2013. Changes in productivity levels are projected to occur due to technical efficiency changes. The findings indicate that Foreign Direct Investment can positively affect changes in technical efficiency through capital-labor ratio, foreign ownership, and imported material.

**Keywords:** Foreign Direct Investment · Technical Efficiency · Indonesian convection sector

## 1 Background

The textile industry is one of the most important manufacturing sectors in Indonesia. The industry is not only capable of increasing export potential but is also known as Indonesia's third-largest strategic industry, employing 1.516 million people in 2017 [1]. Increased competitiveness is necessary for firms in this sector to keep up with technological advancements and be revitalized. The performance in the textile industry must be evaluated deeper by scrutinizing the firm-level performance. This has been a topic of interest for several researchers recently. One way to assess performance is to look into the firm-level efficiency for several years [2].

Some recent studies on technical efficiency focus on the channels of FDI spillovers to firm efficiency. A study on the technical efficiency of the U.S. pharmaceutical sector shows that pharmaceutical companies require an innovation process to enhance their efficiency [3]. The innovation process occurs when investments increase industrial value-added, such as through Foreign Direct Investment (FDI). The presence of FDI increases the economies of scale and therefore triggers efficiency improvement [4]. In addition, the pressure of foreign market competition can be another catalyst for firm efficiency improvement, including improvement in product quality, management skills, and customer service.

An important question that has been long discussed is whether FDI effect is positive or negative. Several studies found that FDI effect from MNC to domestic firms in the same sector (horizontal spillovers) is beneficial [4–10]. In addition, FDI can also benefit firms in other sectors (vertical spillover) through organizational and technological knowledge. In the presence of MNCs in buyer sectors (backward), domestic firms are expected to increase their value addition and achieve higher economies of scale [11]. Several studies supported the existence of FDI backward linkages [12–14]. In contrast, Koning [15] and Hu & Jefferson [16] found that spillovers had a negative or no effect on firm performance.

In order to contribute to this ongoing debate, this current study examines the spillover effects of FDI on firm-level technical efficiency in a particular sector at the five-digit ISIC level, namely the convection industry. The study is expected to shed light on FDI spillovers on firm-level technical efficiency in a homogenous sector.

## 2 Research Method

This study used survey data of the Indonesian manufacturing industry conducted by the Indonesian central board of statistics. The final dataset was constructed from convection firms with ISIC code 14111. The data period was from 2010 to 2013. The period was chosen based on the same industrial code.

The Malmquist Index Data Envelopment Analysis (DEA) was employed to calculate firm-level technical efficiency scores. Technical Efficiency scores were obtained through linear programming iterations following [17].

After obtaining the Technical Efficiency estimation results from the DEA model in Eq. (1), it is necessary to determine the extent to which technical efficiency impacts the textile industry. This study used STATA 14 to estimate the panel regression. The panel data model shown below can then be written:

$$TE_{it} = \alpha_0 + \alpha_1 X1_{it} + \alpha_2 X2_{it} + \alpha_3 X3_{it} + \alpha_4 X4_{it} + \varepsilon_{it} \quad (1)$$

where  $TE_{it}$  is technical efficiency score of the firm  $i$  at time  $t$ ,  $X1_{it}$  is the percentage of foreign ownership of the firm  $i$  at time  $t$ ,  $X2_{it}$  represents the capital-labor ratio of the firm  $i$  at time  $t$ ,  $X3_{it}$  represents the percentage of imported material of firm  $i$  at time  $t$ , and  $X4_{it}$  represents the percentage of exported output of firm  $i$  at time  $t$ ,  $\varepsilon$  represents *error term*.

## 3 Results and Discussion

Based on the analysis results using DEAP 2.1 software, and refers to Coelly et al. [18], the estimated FDI spillovers at the technical efficiency level are shown in Table 1. During the data construction process, the formation of balanced panel data eliminates several observations. The balanced panel data construction includes 120 observations. Table 1 shows the average value of Technical Efficiency (TE), while Table 2 shows panel data for FDI spillover.

Table 2 explains a positive impact on technical efficiency on the capital-labor ratio. A unit increase in the capital-labor ratio will increase the TE score by 0.0457, which is

**Table 1.** Regression Results of Common Effect, Fixed Effect, and Random Effect using an independent variable: Technical Efficiency Scores.

Variable	Common Effect	Fixed Effect	Random Effect
Constants	1.135*** (0.000)	0.211* (0.763)	1.035*** (0.000)
Foreign Ownership (X1)	0.4184 (0.803)	0.3124* (0.093)	0.6184* (0.080)
Capital Labor Ratio (X2)	0.0547** (0.013)	0.0261 (0.198)	0.0457** (0.012)
Import (X3)	0.0534* (0.092)	0.0193 (0.709)	0.0434* (0.089)
Export (X4)	0.1502 (0.808)	0.156789 (0.145)	0.1602 (0.808)
R <sup>2</sup>	0.0902	0.0047	0.0902
Chow Test		<i>Fixed Effect</i>	F- Test : 1.10 (0.0363)
Hausman Test		Chi - Square : 0.3229 (0.9308)	<i>Random Effect</i>
LM Test		Random Effect	Chi-Bar <sup>2</sup> : 1.0 (0.000)
Companies	24	24	24
Observation	120	120	120

Source: Author’s calculation using the model in Equations (1) and (2). Note: \* indicates a level of significance at  $\alpha = 10\%$ . \*\* indicates a level of significance at  $\alpha = 5\%$ , \*\*\* indicates a level of significance at  $\alpha = 1\%$ . The numbers in the parentheses represent the probability of t-statistic.

**Table 2.** Technical Efficiency Measurement

Year	Min	Max	Mean	Std Deviation
2010–2011	0.832	0.944	0.892	0.023
2011–2012	1.074	1.407	1.329	0.064
2012–2013	0.772	1.076	0.883	0.052

in line with Harianto & Sari [19] and Suyanto & Sugiarti [20] research. While there is a positive impact on technical efficiency in foreign ownership, which can be interpreted as if there is an increase in one unit in foreign ownership, it will increase the TE score by 0.6184. These findings are consistent with the findings of Prasetha et al. [17], Suyanto & Salim [21], and Sari et al. [7]. Moreover, the import has a significant positive effect on technical efficiency (TE). That coefficient value shows 0.0434; when imports increase by 1%, the TE score increases by 0.0434. The results of this study are also in line with findings by Javorcik [11] and Ai et al. [22]. Meanwhile, the export variable does not have a significant effect on technical efficiency because the significance level exceeds 10%.

## 4 Conclusion

This study analyzes FDI spillovers through an indirect effect on technical efficiency scores of Indonesian convection firms. The key determinants that significantly affect Technical Efficiency are Capital Labor Ratio, Foreign Ownership, and Import. These variables have a positive and significant effect on technical efficiency. The positive effect of foreign ownership on technical efficiency indicates a positive spillover effect of FDI on domestic firms in the convection industry.

These findings have three implications. Firstly, firms with foreign ownership have higher average technical efficiency. Secondly, firms in the convection industry need to increase their capital-labor ratio in order to increase their efficiency. Thirdly, firms that actively use imported materials in production have higher technical efficiency.

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