Jurnal Ekonomi Pembangunan
Volume 19 (1): 1-16, June 2021
P-ISSN: 1829-5843; E-ISSN: 2685-0788

Research article

The Impact of Service Liberalization on Manufacturing Productivity in Indonesia

Wulan Oktabriyantina[1]* and Maddaremmeng A. Panennungi[1]

[1] Department of Economics, Faculty of Economics and Business, Universitas Indonesia
* Correspondence author email: owulan2016@gmail.com

Article Info: Received: 26 September 2020; Accepted: 22 February 2021; Published: 30 June 2021

Abstract: This study examined the impact of service liberalization on manufacturing productivity firms in Indonesia through mode three (commercial presence) during 2006–2014. It used firm-level data sourced from the manufacturing census published by the Indonesian Bureau of Statistic (BPS). To address the problem of endogeneity in service reform, this research uses an Instrumental Variables (IV) estimation of the fixed-effect model variety and utilized two types of data (FDI and STRI OECD) to compare the result. The findings show that service liberalization in Indonesia has a positive impact on manufacturing productivity at the firm level. Furthermore, this study estimates each service sector (e.g., electricity, gas, and water; construction; transportation, warehouse, and telecommunication), the results indicated that each service had a significant impact on improving firm performance. This research suggests that reducing restrictions on the service market will improve manufacturing productivity.

Keywords: manufacturing, productivity, service liberalization

JEL Classification: F21, L8

Abstrak: Penelitian ini mengkaji dampak liberalisasi jasa terhadap produktivitas perusahaan manufaktur di Indonesia melalui mode tiga (kehadiran komersial) selama 2006–2014. Ini menggunakan data tingkat perusahaan yang bersumber dari sensus manufaktur yang diterbitkan oleh Badan Pusat Statistik (BPS). Untuk mengatasi masalah endogenitas dalam reformasi layanan, penelitian ini menggunakan estimasi instrumental variables (IV) dari variasi model fixed-effect dan menggunakan dua jenis data (FDI dan STRI OECD) untuk membandingkan hasilnya. Temuan menunjukkan bahwa liberalisasi layanan di Indonesia berdampak positif pada produktivitas manufaktur di tingkat perusahaan. Selanjutnya, studi ini memperkirakan setiap sektor jasa (misalnya, listrik, gas, dan air; konstruksi; transportasi, gudang, dan telekomunikasi), hasilnya menunjukkan bahwa setiap layanan memiliki dampak yang signifikan terhadap peningkatan kinerja perusahaan. Penelitian ini menunjukkan bahwa mengurangi pembatasan pada pasar jasa akan meningkatkan produktivitas manufaktur.

Kata kunci: manufaktur, produktifitas, liberalisasi layanan

How to Cite:
Oktabriyantina, W. & Panennungi, M. A. (2021). The Impact of Service Liberalization on Manufacturing Productivity in Indonesia. *Jurnal Ekonomi Pembangunan, 19*(1), 1-16. DOI: 10.29259/jep.v19i1.12613.

1. INTRODUCTION

The services sector plays significant role as an input for other sectors and serves as an enabler for all economic activities. Production activities in manufacturing firms are inseparable from the service sector, as it plays a crucial role in facilitating the production process. For example, in managerial activities, firms need internet, telephone, water, sewer, trash collection, and electricity.

In addition to production activities, firms need telecommunications services to contact raw material suppliers along with transportation to facilitate the distribution of goods.

The correlation between service liberalization and manufacturing productivity has been a topic of interest since the 1970s. Some of the neo-industrialists (Baumol et al., 1985; Gershuny, 1978) argued that the service sector may lead to a slowdown in productivity growth in a country. There is a productivity imbalance between stagnant sectors (e.g., the service sector) and progressive sectors (e.g., the manufacturing sector). The service sector is stagnant because the increase in the prices of its services is higher than the increase in productivity generates. For example, the real cost of education continues to increase every year, but is not accompanied by an increase in the productivity of teachers. In aggregate, the stagnant service sector will slow down economic growth. One of the critics of this study argued that it only considered one service sector, education. However, in reality, the service sector is heterogeneous, embodied with other sectors. Hence, it is difficult to conclude that the service sector will slow aggregate productivity if only considering one type of service. Moreover, service products are not just final goods but also intermediate ones.

However, Bell (1976) found that service liberalization leads to an increase in manufacturing productivity. Ethier (1982) and Markusen (1989) provided theories and Francois (1990) brought empirical arguments that using specialized service input will influence the performance of manufacturing industries. According to Francois, specific service input is a workforce that is differentiated based on its tasks in the production process. Furthermore, considering that service products as the intermediate input production processes in manufacturing companies are growing, Amiti & Konings (2007) developed the theory using the service sector as an intermediate input and provided empirical evidence that they improved the performance of manufacturing firms in Indonesia.

Recently, the issue of service liberalization became a subject of debate among academics and policymakers. Since the GATS agreement was entered into by the WTO member countries, they have committed to open their service trade to global markets. In the GATS agreement, the service sector is categorized into four groups based on the type of service trade distribution channel. Mode one is cross-border supply, i.e., services are available to consumers without consumers or producers having to move between countries, such as shipping services. Mode two is consumption abroad, where consumers must go to the available services, e.g., tourism or health services abroad. Mode three is a commercial presence where a service manufacturer establishes a services company on the host or foreign investment into the service sector. Furthermore, Mode four is the temporary movement of natural persons that occurs if someone works to provide services in another country.

Some studies showed that service trade openness will lead to the entry of foreign producers into the domestic market especially through mode three (Jens M. Arnold et al., 2011; Duggan, 2013; Fernandes & Paunov, 2012). The foreign providers enter the domestic service market due to reduced restrictions in the service sector. The reduction of restrictions changes the market structure that was controlled by the government to be more competitive. The foreign presence brings new knowledge about products and advanced technology (Arnold et al., 2011). These advantages put pressure on domestic firms to make improvements to compete with foreign ones (Javorcik & Narciso, 2008). Augmented competition brings higher quality products, lower-priced service, and many varieties of products. These benefits drive manufacturing productivity.

Moreover, Duggan (2013) identified a policy of reducing foreign investment restrictions in Indonesia that would increase the productivity of manufacturing firms. Fernandes & Paunov (2012) did the same research in Chile. The results indicated that policy reforms in the upstream industry, the service sector, will have an impact on increased productivity in the downstream or manufacturing sectors. Beverelli, et al. (2017) and Francois & Hoekman (2010) identified the role of institutions in the openness of trade in services. Furthermore, Arnold et al. (2011); Bas (2014); Crozet, et al. (2016) observed through the channels of policy reform in the service sector. According to Beverelli, et al. (2017), the impact is stronger on firms that are dependent on the use of service inputs. Empirical research from Arnold, Javorcik, et al. (2012); Arnold, et al. (2011); Arnold, et al. (2008) used OECD STRI data. The STRI data was based on a country's policy of regulating trade in the service sector. This STRI data was not available for every country and, every year. In their

research, Arnold, et al. tried to measure the openness of trade in the service sector by considering the three channels of openness: the presence of a foreign-service provider, privatization, and the level of competition.

Duggan (2013) used the FDI regulatory restrictiveness index indicator of the OECD. The purpose of Duggan using this FDI restrictive data is to observe the level of restriction of foreign investment policy applied in the service sector concerning manufacturing productivity. FDI restriction data was only available for 1997, 2003, 2006, and 2010 for the service sectors of electricity, construction, distribution, transportation, and communications. While his study was conducted during 1997–2009. He matched the data between the FDI restriction index for 1997 and the average productivity of firms in 1998, 1999, and 2000.

Fernandes & Paunov (2012) used the FDI penetration approach in the service sector. Since the opening of the service sector, a vertical effect has emerged resulting from the inclusion of FDI towards manufacturing firms. In their study, Fernandes & Paunov used FDI stock data obtained from FDI inflows reduced by FDI outflows that were then calculated using the perpetual inventory method. After obtaining FDI stocks in each service sector, the stock of FDI was deflated by the GDP deflator to obtain the FDI penetration ratio in the service sector. Although using different approaches in measuring service liberalization, the next step was to create a specific index of service liberalization that remains the same for certain prior studies Arnold et al., (2012); Arnold et al. (2011); Arnold et al. (2008); Duggan (2013); and Fernandes & Paunov (2012). There will be a specific index of service openness by weighing the FDI penetration ratio or the STRI index with the share of service inputs. The input of services was derived from the input-output table by calculating the value of service inputs used by each manufacturing sector divided by the total inputs used.

In addition to the above main variables, this study also used other variables as a control. For controlling the international integration factor, this study used output tariffs. The researchers in this study measured the level of competition in each industry by the Herfindahl index. To calculate the capital intensity in the industry sector, this study measured the ratio of capital to wage-bill. A firm's age also is considered to be a control variable in this study because the firm's age is the determining factor of its productivity and efficiency. The proxy used to determine the age of the firm is the number of years of operation derived from the difference between the research period year and its first year in business. The percentage of exports affecting manufacturing productivity also used as a control variable. This variable is important because, generally, export firms have a higher level of efficiency than non-export ones. This fact is because exporters must face the country's product standards and international competition, so they need to strictly supervise their product's quality (Kasahara & Rodrigue, 2008)

The majority of service openness policies in Indonesia began after 1997 (crisis year), due to an agreement based on a letter of intent with the IMF. This service openness became increasingly widespread due to trade agreements with the WTO, ASEAN, and ASEAN+. The decline in trade restrictions caused the trade in the service sector to increase. However, the Indonesian Government provides many rules that limit the number of foreign providers. Also, granting exclusive rights to services owned by the state or *Badan Usaha Milik Negara*. The reason that developing countries like Indonesia do not open full-service trade is because of market failures such as monopolies, incomplete markets, and asymmetric information. It provides a hypothesis that the impact of service liberalization will increase TFP firms in Indonesia, even though not fully opened.

During the 2000–2014 period, FDI inflows into the service sector took a leading role in electricity, gas, and water; construction; transportation, warehouse, and telecommunications. Their growth increases in all three service sectors, especially in transportation, warehouse, and telecommunication services. It is the positive effect of FDI with the assumption that the entry of foreign firms leads to higher competition, higher quality products, lower-priced services, and more product varieties. The hypothesis tested in this study is whether service liberalization has improved the productivity of the manufacturing industry in Indonesia because those firms depend on service sectors such as input production.

A more productive service sector will not only benefits those who are directly connected with it (e.g., in terms of employment and investment), but also for other sectors that use input services

intensively. One of the sectors that require such inputs is the manufacturing industry (Lanaspa et al., 2016). For example, manufacturing industries need services in coordinating complex production processes and reaching input allocation between firms. In other words, the growth of the service sector is one of the foundations of the international network in the process of producing goods. Therefore, the openness of the service sector benefits manufacturing performance (Amiti & Wei, 2009; Greenhalgh & Gregory, 2001; Kox & Rubalcaba, 2007).

This study identified the openness of trade in services to manufacturing productivity through mode three: commercial presence. To identify the impact of service openness on manufacturing productivity, this study examined the total factor productivity of a manufacturing firm with a specific service openness index weighted by the dependence of the manufacturing sector on inputs between services. This research used two types of data, namely FDI and STRI of the OECD. Contrary to Fernandes & Paunov's (2012) study measuring the openness of services that use FDI, this research employed foreign investment flows data coming into the service sector instead of foreign investment stock. This study obtained information about productivity firms from calculating TFP based on Annual Manufacturing Survey Data of Indonesia from the period of 2006 -2014. The study identified the service sector of construction, transportation, warehouse, and telecommunications, also electricity, gas, and water. As a contribution, we evaluated the causal impact of service liberalization on manufacturing firm productivity using TFP with an endogeneity problem.

2. RESEARCH METHODS

2.1. Data

The data for this paper came from the manufacturing census published by the Indonesian Bureau of Statistics (BPS). It provided some information such as output, the amount of labor, material, capital, firm's age, and percentage of import value. The total number of firms in the data set were 1.932 per year, covering thirty-two manufacturing industries according to their ISIC two-digit code. The datasets form an unbalanced panel from 2006–2014. The grouping of industries was by ISIC five-digit code for 2006–2014, and used the KBLI code for 2009.

Table 1. Descriptive Statistics

Descriptive	Obs.	Mean	Std. Dev	Min	Max
Y	12,861	736273.3	4905217	1.9069	2.43E+08
K	12,861	2.06E+10	5.75E+11	9645.931	5.51E+13
L	12,861	271.309	885.729	20	37750
M	12,861	1.22E+10	7.48E+10	89273	3.58E+12
Service open (FDI)	12,861	0.00027	0.000236	0.00008	0.00085
Service open (STRI OECD)	12,861	0.0050	0.0136	0.0001	0.0621
Tariff	12,861	7.236	2.7830	1.4	19.1
HHI	12,861	0.2226	.21287	0.02	1
Aged	12,861	18.860	11.858	1	102
Capital intensity	12,861	0.6296	1.8905	9.2858	10.203
Status exp. Yes=1	12,861	0.2791	0.4486	0	1
Percentage exp.	12,861	24.341	38.424	0	100
DDI	12,861	2.11E+07	2.17E+07	17692	6.41E+07

Source: Author calculation

Other data obtained from BPS publications were the wholesale price index (IHPB). IHPB data was required to deflate the values of output and input variables. This research used IHPB with a base value of the year 2000. This research estimated the TFP by following Arnold et al. (2011). As a measure of capital, this research used electricity consumption. The output variables' data were derived from the gross output value produced by company *i* in year *t.* The use of output as a productivity estimate included intermediate inputs. The labor variable was expressed in terms of

the total number of workers in a company *i* in year *t*. Then, the input of raw materials used local and import raw material costs incurred by the company in the production process. The nominal value of output, capital, and the material was deflate using the wholesale price index (the base year 2000). Then, the TFP was estimated as the residual of the three-factor Cobb-Douglas production function.

The data needed to measure the openness of trade in services were an input-output table from BPS and FDI inflows into the service sectors by BKPM. The input-output table provided information on the use of service products as intermediates input in the manufacturing sectors, where sectors map to the ISIC rev.3 classification and aggregate into the two-digit level. The investment coordinating board of the Republic of Indonesia (BKPM) provided information about the FDI service from 2006–2014. Besides, this research also used STRI OECD data to compare estimation results. The STRI OECD gave information about service openness in mode three.

In addition to the above data, some data were needed to control for other factors. Those might affect manufacturing productivity changes, such as output tariffs, a firm's age, capital intensity, status export, domestic investment, and export percentages. The output tariff data source from the WTO's publications. The data published by WTO used a two-digit HS level. To facilitate analysis, it is necessary to comply with HS 2012 and KBLI 2009. Capital intensity is the ratio of capital to the wage bill. For firm age obtained from the difference in years, the firm began commercial activities during the first year of observations. Domestic investment data obtained from BKPM and the percentage of exports was the output percentage exported by the company. The descriptive statistics for the sample are presented in Table 1.

2.2. Total Factor Productivity

Productivity is one indicator that can be used to view the performance of the manufacturing industry. To obtain the value of productivity then the proxy used is Total Factor Productivity (TFP). As a dependent variable, the TFP value is derived from the Cobb-Douglas production function by running fixed-effect regressions. The goal is to obtain the value of the coefficient of output elasticity to the input that describes the marginal productivity of the input.

$$Y_{it} = A_{it} K_{it}^{\alpha} L_{it}^{\beta} M_{it}^{\delta} \quad (1)$$

Where: Y_{it} is the output, K is capital, L is the amount of labor, and M is raw materials. A indicates other factors that affect the productivity of the firm in addition to capital, labor, and raw materials. Meanwhile the parameters α, β, δ are the output of elasticity for each input. In making the regression estimates, the above equation needs to be converted into the form of a natural logarithm. So equation (1) is as follows:

$$lnY_{it} = lnTFP_{it} + \alpha\ lnK_{it} + \beta\ lnL_{it} + \delta\ lnM_{it} \quad (2)$$

$$lnTFP_{it} = lnY_{it} - \alpha\ lnK_{it} - \beta\ lnL_{it} - \delta\ lnM_{it} \quad (3)$$

2.3. Specifics Service Liberalization Index

The measurement of trade openness in the service sector, this research was inspired by the measures used by Fernandes & Paunov (2012), Arnold et al., (2011), and Duggan (2013). They measure the openness of services by weighing the share of service inputs in manufacturing with the FDI share in the service sector. To obtain the input share of services in the manufacturing sector they use an input-output table for 2010. From that table, it is derived the value of service inputs (i.e., construction, transportation, warehouse and telecommunications, and electricity, gas and water) from each manufacturing sector ISIC's two digits. Then, the value of service input is divided by the total input of all sectors, it will obtain the share of input services in the manufacturing level's two digits. Furthermore, the FDI share destined for the service sector is calculated by dividing the total investment that service sector by the total investment in all sectors. Therefore, the specific

model to be estimated can be written as follows:

$$serv\ open_{jt} = \sum_k \alpha_k^j . FDIpen_{kt} \quad (4)$$

Where: $serv\_open_{jt}$ is a specific service openness index, $FDIpen_{kt}$, is the ratio of foreign investment in the construction services sector; transportation, warehouses, and telecommunication; as well as electricity, gas, and water. Inward FDI data is obtained from the BKPM publication. The calculation of the $FDIpen_{kt}$ the ratio is divided by the number of FDI injected into all three services sectors by the total of all FDI going to all sectors in year t. The purpose is to get FDI's share in the service sector. α_k^j is the ratio of service inputs used by manufacturing firms in the production process. Information on the use of service inputs is obtained from the Indonesia Input-Output Table of 2010. The calculation of the ratio of service inputs in the manufacturing industry is done by the number of service inputs from three service sectors divided by total inputs. Then, it will get the share of input services in manufacturing on two-digit ISIC. Subscript j is manufacturing industries and k is the service sector. To compare the result, this research used STRI OECD data instead of $FDIpen_{kt}$.

2.4. The Main Model

In the next stage, this study used a specific service openness index to observe the impact of service liberalization on manufacturing productivity. The analysis performed used panel data balanced with the dependent variable TFP with the independent variable being the *service liberalization index*. The model used stems from Arnold, et al., (2011) :

$$ln(TFP)_{it} = \beta_0 + \beta_1 service\ open_{jt} + \beta_{2,3,4,5}\, Z_{it} + \varepsilon_{it} \quad (5)$$

$$ln(TFP)_{it} = \beta_0 + \beta_1 service\ open_{jt} + \beta_2 Tariff_{it} + \beta_3 HHI_{it} + \beta_4 Aged_{it} + \beta_5\, Capital\ intensity_{it} + \beta_6 Status\ exp_{it} + \beta_7 Percentage\ exp_{it} + \beta_8\, DDI_{it} + \varepsilon_{it} \quad (6)$$

Where: TFP_{it} is firm productivity *i* in period *t* obtained from regression in equation (3); $serv\_open_{jt}$ is the main variable to measure service liberalization derived from the regression run to equation (4); Z_{it} is a control variable. In this study, variables are likely to affect the productivity of the firm, including a variable output tariff (Tariff); Herfindahl Index (HHI); the age of the firm (Aged); capital intensity, status export, percentage of exports, and domestic direct investment (DDI). The consideration of using the output tariff and Herfindahl Index is to control the level of competition between firms on a two-digit ISIC level. The older firms are considered to be more experienced, their TFP will be higher than younger firms. Exporting firms will face the terms and conditions of the country of destination and face competition from other countries that have differentiated products. Doing so will cause the productivity of the firm to be different from non-export firms. Therefore, to avoid the factors that cause different TFPs, these elements need to be controlled. ε_{it} is an error term. The above model will be estimated using the fixed-effect variety.

Furthermore, to evaluate endogenous issues, this research used a variable instrumental approach. Service liberalization in Indonesia is likely due to the endogenous effects of trade agreements. Indonesia has trade agreements with countries in the ASEAN region as well as outside it. Therefore, the possibility of service liberalization in Indonesia is also due to the commitment of the agreements between ASEAN countries, one of which is with Malaysia. So, the existence of this trade agreement causes Indonesia to open its trade in the service sector.

The services trade in Malaysia represents a proxy that bilateral trade agreements can affect the openness of services in Indonesia. Following the approach adopted by Arnold, et al. (2011) in determining the variable instrument that is likely to be a factor that influences the service liberalization index variable, we estimated the following model:

$$serv\ open\_IV_{jt}^{malaysia} = \sum_k \alpha_{jk}^{Idn} \,.\, STRI\ OECD_{kt}^{malaysia} \quad (7)$$

Where: $serv\ open\_IV_{jt}^{malaysia}$ is the Malaysia service liberalization index; $STRI\ OECD_{kt}^{malaysia}$ is the *STRI* of the OECD for Malaysia; α is the ratio of service inputs used by manufacturing firms in the production process in Indonesia; Subscript j is the two-digit ISIC code for manufacturing industries; k is service sector (construction, transportation, warehouse, and telecommunication, electricity, gas, and water), and t is during 2006–2014.

To obtain an index of service openness in Malaysia is almost the same as the index calculation of the opening of specific services for Indonesia. By using Malaysia's OECD STRI data in 2006–2014, which was then weighted by sharing service inputs for the Indonesian manufacturing sector based on the Input-Output table 2010, Malaysia's service openness index can be obtained. The calculation of the sharing of service inputs by counting them through equation (4).

3. RESULTS AND DISCUSSION

3.1. Diagnostic test

The heteroscedasticity test is used to examine a violation of the classical assumption in the linear regression model. Heteroscedasticity occurs when the residual value of the model does not have a constant variance. In statistics, if the variance of the residuals in the regression model is a constant called homoscedasticity. However, if the variants are different, it is known as heteroscedasticity. A good regression model does not occur heteroscedasticity. In the fixed-effect model, the study performs a modified Wald test for GroupWise heteroscedasticity. The results showed that the null hypothesis is rejected (p-value < 0.05). It means that the model was heteroskedastic. Despite heteroscedasticity, the estimator is still unbiased and consistent but inefficient. The researcher used robust standard errors to address the heteroscedasticity problem. Although it does not change coefficient estimates, the p-value will be more accurate. If comparing with the previous results, the coefficient estimates did not change, but standard errors and t value are a little different.

One of the classical assumptions is that there is no correlation between observations in one period. The existence of autocorrelation problems will result in inefficient estimates. The inefficient variance of parameter estimation due to the t value tends to be small and the test results to accept the null hypothesis (H0). A good regression model is one that does not have autocorrelation problems. Autocorrelation in the data panel can be detected using the Wooldridge test. Wooldridge's method uses the first-differences serial correlation of residuals, where the null hypothesis is no first-order autocorrelation.

The Wooldridge test results showed that the probability is 0.0020 (P < 0.005). H0 was rejected, which means that there was autocorrelation in this model. Hence, this study has found two problems with the model: serial correlation and heteroscedasticity. Driscoll & Kraay (1998) suggest estimating the standard error of the coefficient estimates. Because assumed the error structure be heteroskedastic, autocorrelation up to some lag, and possibly correlated between the groups (panels). Furthermore, Driscoll–Kraay standard errors are almost invariant to changes in the level of cross-sectional and temporal correlation.

This test detected whether there is a correlation among two or more independent variables in the regression model. One of the assumptions in the linear regression model is the absence of multicollinearity. The multicollinearity test used the variance inflation factor (VIF). Multicollinearity occurs when the VIF value is above 10, or the tolerance value (1/VIF) is below 0.1. From table 2. The results showed that all variables had a VIF value below 10. It means that the model is free from multicollinearity.

3.2. Service Liberalization on Manufacturing Productivity

The regression results were seen in equation (6) show the impact of services liberalization on manufacturing productivity in Indonesia. Table 2 shows the two types of data used in measuring the index of specific service openness in equation (4). The purpose of using two different types of data in the index openness measurement of services was to compare the results obtained. First, FDI inflow data were lumpy data in that foreign investment entering the service sector can experience fluctuations every year so that it does not describe the openness of services. Second, OECD STRI data was based on expert judgment, where the value of the index was quite subjective. Therefore, researchers presented two types of data to reinforce the results of the estimates obtained.

Table 2. The Empirical Result of Fixed Effect Model Estimation

Dependent Variable: *ln* TFP			
Variable	**Liberalization Proxy using FDI Inflow**	**Liberalization Proxy using STRI OECD**	**1/VIF**
Service open	7.937***	2.332***	0.370
	(2.052)	(0.272)	
Tariff	0.000103	-0.000678	0.223
	(0.009)	(0.001)	
HHI	0.049***	0.050**	0.538
	(0.019)	(0.017)	
Aged	-0.007***	-0.017***	0.319
	(0.002)	(0.005)	
Capital intensity	-0.051***	-0.050***	0.854
	(0.002)	(0.003)	
Status exp	-0.032*	-0.024	0.372
	(0.018)	(0.019)	
Percentage exp	0.000299***	0.000192**	0.369
	(0.000109)	(9.23e-05)	
DDI	2.19e-09***	8.78e-10*	0.419
	(3.79e-10)	(4.69e-10)	
Constant	0.088**	-0.609***	-
	(0.040)	(0.132)	
Observations	12,861	12,861	
Number of id	1,932	1,932	
R-squared	0.035	0.037	

Note: * is significance level at 10%; ** is significance level at 5%; *** is significance level at 1%
Source: Authors calculations

Table 2 shows the results of the estimation of the dependent variable, which was regressed together with the specific service openness index and several control variables by the fixed-effect method. In column (1), the coefficient of the service openness index for FDI inflow data used for calculating the specific service openness index shown, and they were positive and significant at the 1% level. Our estimation confirmed that increasing the openness in the service sector will increase the productivity of the firm since manufacturing firms used service inputs to support their production activities. Thus, the more open the service sector is, the cheaper service products, the greater the selection of products, and the better quality product will be. These advantages will encourage manufacturing firms to be more efficient and productive. Firms that depend on the use of services will impact more. In line with the previous study, the more competitive market will increases firm TFP (Aghion & Braun, 2008; Nickell, 1997). Column (2), on the use of data on STRI OECD, shows similar results with column (1). This result supported our hypothesis that an increase in the openness of services will increase firm productivity.

HHI variable representing the level of market concentration showed positive and significant results. It means that the higher market concentration will increase productivity. According to Aghion & Braun (2008), the company's productivity will increase when they are in a high-competition market. Also, Nickell (1997) finds that there is a positive relationship between market competition and TFP. A more competitive market will increase a firm's TFP because firms demand innovation and efficiency to compete with other companies. Although, aged and capital intensity show a negative and significance, which is means that the younger firm and the less capital intensity, the higher productivity of the firm (Hill & Kalirajan, 1993; Pitt & Lee, 1981).Young firms tend to be able to increase firm productivity with service openness. Young firms have more modern and more sophisticated machines that boost firm productivity.

Furthermore, this research includes percentage export and domestic direct investment (DDI) as variable control. The coefficient on the percentage export and DDI remains positive and significant. This result supports the research from Tzelepis et al. (2006). It showed that export firms are more efficient than non-exporting companies because exporters had high-quality products to enter the international competition (Kasahara & Rodrigue, 2008).

3.3. The Endogeneity Issues

Regarding the issue of endogeneity on the openness of services in Indonesia, the estimation results will be presented in Table 4 with the variable instrument method. Trade openness in the service sector in Indonesia is likely due to the endogenous effect of trade agreements carried out by Indonesia and other countries. The use of instrumental variables can reduce the possibility of a correlations between trade openness in the service sector and other factors such as trade agreements. However, it did not eliminate the correlation. This study used OECD STRI data for Malaysian countries that were weighed by sharing input services used by manufacturing industries in Indonesia. This calculation followed Arnold, et al. (2011) in determining instrument variables in the Czech Republic.

Table 3. The Impact of Service Liberalization on Firm TFP-IV: Estimation Result

Dependent variable: *ln* TFP	
Variable	Liberalization Proxy using STRI OECD
Service open	1.443***
	(0.423)
Tariff	0.003
	(0.002)
HHI	0.065***
	(0.022)
Aged	-0.002
	(0.004)
Capital intensity	-0.032***
	(0.003)
Status exp.	0.080***
	(0.015)
Percentage exp.	-0.006***
	(0.001)
DDI	2.07e-09***
	(4.00e-10)
Constant	-0.233***
	(0.0574)
Observations	12,861
R-squared	0.020

Note: * is significance level at 10%; ** is significance level at 5%; *** is significance level at 1%
Source: Authors calculations

Table 3 shows the results for the Instrument variable using the dependent variable logarithm of TFP firms and STRI OECD data from Malaysia. The estimation results with variable instruments for the Malaysian state showed that increasing service openness will increase the productivity of manufacturing firms. This result is similar to Table 2 when using FDI and STRI OECD Indonesian data. The service openness variable coefficients were positive and significant levels, it means that increasing service openness will encourage an increase in firm productivity positive link between service openness and productivity may be due to the causality. It was such as bilateral-multilateral trade agreements or encouragement from manufacturing companies. The larger and more productive firm will require higher quality service inputs. The possibility of service openness in Indonesia was also due to the commitment of agreements between ASEAN countries, one of which is Malaysia. Hence the trade agreement will cause the Indonesian state to open trade in the service sector.

Furthermore, HHI variables represent the level of market concentration, showed positive and significant at 1% level. It means that higher market concentration will increase the productivity of the firm. According to Demsetz (1973), The firms in a highly concentrated industry will have advantages in cost efficiency and higher profits than in competitive industries. The percentage of exports showed negative and significant results on the dependent variable. It means that an increase in exports will reduce the productivity of the firm. It showed that manufacturing firms in Indonesia were less able to compete in the export market.

3.4. The Impact of Each Service on Firm TFP

In this section, this study explores the impact of each service liberalization on firm productivity. By using two types of data, several services had shown that liberalization on service positively correlated with productivity. This result presented a similar to the previous section in aggregate services. This outcome means that openness in the service sector cannot be done only for a few sectors. All sectors complement each other and thus encourage increased productivity of the firm. For example, if openness only occurs in transportation, warehouse, and telecommunication services but the price of electricity, gas, and water services are costly because of the lack of openness in that sector, the firm will allocate high costs to the consumption of electricity, gas, and water to encourage production. In the end, the firm will have difficulty in performing efficiently and thereby increase productivity.

Indonesia has experienced deregulation of the services sector during the period 2006-2014, researcher expected that service input cost reduction leads to an increase in firms' production. Table 4 shows the estimation result for equation (6) with a particular service. First, this research regressed TFP on electricity, gas and water services. This research observed from column 1 that the coefficients on electricity, gas and water were both positive and significant. It means that services openness on electricity, gas, and water will improve the productivity firm. Electricity is one of the essential services for firms' input (Allcott et al., 2016). Most firms cannot produce anything without electricity. Lack of power provision will affect a decline in output. Moreover, the entry of foreign investment into the electrical power sector will encourage the development of electric power plants. Consequently, they can adequately supply power consumption needs and increase company productivity.

Second, construction services had the highest coefficient value compared to other services by using STRI OECD. It means that the more increase in service openness that occurs in construction services, the more increases in manufacturing productivity. According to Giandrea, Cahill, & Quinn (2008) the openness in the construction services sector will accelerate infrastructure development such as highways and bridges. Those infrastructures will accelerate and facilitate the distribution of products to consumers, thereby increasing demand that leads to increase productivity. Also, with the ease of roadway access, producers more easily reach raw materials providers.

Lastly, the transportation, warehouse & telecommunications showed the positive and significant. Telecommunications services promoted the creation of new knowledge and more efficient information processing. Faster information processing allowed manufacturing companies

to communicate with suppliers directly without going through agents to regulate product distribution systems (Kretschmer, 2012). The smooth communication process can cut off the distribution process and reduce coordination costs. Timely delivery of information also facilitated better decision-making and reduced supervision costs (Arvanitis & Loukis, 2009; Atrostic et al., 2004). With communication technology, it will reduce fixed costs to obtain information and diminish the variable costs needed to participate in the market.

Based on the results of Bernard et al. (2006), a decrease in transportation costs leads to an increase in manufacturing productivity. This decrease lets firms allocate costs to increase production. Besides that, the ease of logistics services to distribute raw materials to the firms also increases productivity. If the transportation provided varies according to need, it will increasingly facilitate manufacturers to distribute products to consumers. This ease of distribution will increase the demand for products, thereby increasing manufacturing productivity.

Furthermore, for the control variables, each data type showed different results. The percentage of exports, Herfindahl index, company aged, and domestic investment services showed positive and significant results. This result was not much different from the estimation of the impact of service openness on company productivity in the aggregate (Table 2).

Jurnal Ekonomi Pembangunan
Volume 19 (1): 1-16, June 2021
P-ISSN: 1829-5843; E-ISSN: 2685-0788

Table 4. The Impact of Each Service on Firm TFP

Fixed Effect						
Sectors	**FDI inflow**			**STRI OECD**		
	1	2	3	1	2	3
Electricity, Gas and Water	633.2***			2,307		
	(108.6)			(1,440)		
Construction		1,993***			785.2***	
		(473.2)			(86.50)	
Transportation, Warehouse & Telecommunications			60.31**			249.3***
			(24.12)			(27.69)
Tariff	0.000113	0.000235	0.000308	-9.31e-05	-0.000699	-0.000602
	(0.000949)	(0.000983)	(0.00100)	(0.00119)	(0.00101)	(0.00102)
HHI	0.0526***	0.0454**	0.0500***	0.0578***	0.0500***	0.0415**
	(0.0191)	(0.0190)	(0.0193)	(0.0185)	(0.0175)	(0.0198)
Aged	-0.0139***	-0.00132	-0.00661**	0.00417	0.0187***	0.0209***
	(0.00284)	(0.00257)	(0.00330)	(0.0115)	(0.00551)	(0.00619)
Capital intensity	-0.0505***	-0.0518***	-0.0502***	-0.0486***	-0.0509***	-0.0522***
	(0.00274)	(0.00299)	(0.00211)	(0.00312)	(0.00378)	(0.00391)
Status export	-0.0328	-0.0293	-0.0315	-0.0230	-0.0247	-0.0292
	(0.0205)	(0.0184)	(0.0200)	(0.0208)	(0.0190)	(0.0179)
Percentage exp	0.000405***	0.000199**	0.000238*	0.000161	0.000195**	0.000209***
	(0.000116)	(9.39e-05)	(0.000138)	(0.000113)	(9.09e-05)	(7.72e-05)
DDI	2.73e-09***	1.57e-09***	1.99e-09***	2.11e-09***	7.44e-10*	-3.82e-10
	(4.71e-10)	(2.59e-10)	(4.92e-10)	(4.30e-10)	(4.49e-10)	(5.74e-10)
Observations	12,861	12,861	12,861	12,861	12,861	12,861
Number of id	1,932	1,932	1,932	1,932	1,932	1,932
R-squared	0.037	0.036	0.035	0.035	0.038	0.038

Note: * is significance level at 10%; ** is significance level at 5%; *** is significance level at 1%
Source: Authors calculations

4. CONCLUSIONS

This study explored the impact of service openness in manufacturing productivity by using two types of data (FDI and STRI OECD). By using micro-level data, it allowed us to analyze the relationship between services openness and manufacturing performance. Our result was trade openness in the service sector had increased the productivity of manufacturing firms. It was because the firm relies on the service sector in the production process to distribute its products. Furthermore, the openness that occurs in the service sector will further encourage the increase in productivity of manufacturing firms.

The contribution of this paper to the literature is to show that liberalization in the service sector might also improve manufacturing productivity. The effect of service openness has a direct impact on the firm's productivity performance by reducing input cost and support distribution and marketing. This case was reinforced by evidence after the liberalization of services (Electricity, gas and water; Construction; Transportation, warehouse, and telecommunications) in Indonesia in the early 2000s. Firms have increased their productivity after the reform of the service sector was implemented.

According to these results, this research recommends some policies. First is removing market barriers that still limit competition in the various service sub-sectors. It is such as, reducing restrictions on the product in service market regulations will greatly benefit the service sector. Second is removing discrimination in the service market will attract foreign companies and stimulate FDI to enter Indonesia. Also, it leads to increase market competition, improve the quality of services provided as well as improve technology and will further contribute to manufacturing productivity.

REFERENCES

Aghion, P., & Braun, M. (2008). Competition and Productivity Growth in South Africa. *Economics of Transition*, *16*(4), 741–768. https://doi.org/10.1111/j.1468-0351.2008.00336.x

Allcott, H., Collard-Wexler, A., & O`Connell, S. D. (2016). How Do Electricity Shortages Affect Productivity ? Evidence from India. *American Economic Review*, *106*(3), 587–624. DOI: 10.1257/aer.20140389

Amiti, M., & Konings, J. (2007). Trade liberalization, intermedicate inputs, and productivity: evidence from indonesia. *American Economic Review*, *97*(2003), 1611–1638. DOI: 10.1257/aer.97.5.1611

Amiti, M., & Wei, S. J. (2009). Service offshoring and productivity: Evidence from the US. *World Economy*, *32*(2), 203–220. https://doi.org/10.1111/j.1467-9701.2008.01149.x

Arnold, J., Javorcik, B., Lipscomb, M., & Mattoo, A. (2012). Services Reform and Manufacturing Performance: Evidence from India. *World Bank Policy Research Working Paper*, *January*. https://doi.org/10.1111/ecoj.12206

Arnold, Jens M., Javorcik, B. S., & Mattoo, A. (2011). Does services liberalization benefit manufacturing firms?. Evidence from the Czech Republic. *Journal of International Economics*, *85*(1), 136–146. https://doi.org/10.1016/j.jinteco.2011.05.002

Arnold, Jens Matthias, Mattoo, A., & Narciso, G. (2008). Services inputs and firm productivity in Sub-Saharan Africa: Evidence from firm-level data. *Journal of African Economies*, *17*(4), 578–599.

Arvanitis, S., & Loukis, E. N. (2009). Information and communication technologies, human capital, workplace organization and labour productivity : A comparative study based on firm-level data for Greece and Switzerland. *Information Economics and Policy*, *21*, 43–61. https://doi.org/10.1016/j.infoecopol.2008.09.002

Atrostic, B. K., Bureau, U. S. C., & Motohashi, K. (2004). IT, Productivity and Growth in Enterprises : Evidence from new international micro data. *OECD Workshop on ICT and Business Performance*, *January*.

Bas, M. (2014). Does services liberalization affect manufacturing firms ' export performance ? Evidence from India q. *Journal of Comparative Economics*, *42*(3), 569–589. https://doi.org/10.1016/j.jce.2013.06.005

Baumol, B. W. J., Anne, S. U. E., Blackman, B., & Wolff, E. N. (1985). Unbalanced Growth Revisited : Asymptotic Stagnancy and New Evidence. *The American Economic Review*, *75*(4), 806–817.

Bell, D. (1976). The coming of Post-Industrial Society. *The Educational Forum*, *40*(4), 574–579. https://doi.org/10.1177/089692057400400303

Bernard, A. B., Jensen, J. B., & Schott, P. K. (2006). Trade costs, firms and productivity. *Journal of Monetary Economics*, *53*(5), 917–937. https://doi.org/10.1016/j.jmoneco.2006.05.001

Beverelli, C., Fiorini, M., & Hoekman, B. (2017). *Services trade policy and manufacturing productivity : The role of institutions*. *104*, 166–182. https://doi.org/10.1016/j.jinteco.2016.11.001

Borchert, I., Gootiiz, B., & Mattoo, A. (2014). Policy barriers to international trade in services: Evidence from a new database. *World Bank Economic Review*, *28*(1), 162–188.

Boylaud, O., & Nicoletti, G. (2003). Regulation, market structure and performance in telecommunications. *OECD Economic Studies*, *2001/1*(237), 99–142. https://doi.org/10.1787/18151973

Crozet, M., Milet, E., & Mirza, D. (2016). The impact of domestic regulations on international trade in services: Evidence from firm-level data. *Journal of Comparative Economics*, *44*(3), 585–607. https://doi.org/10.1016/j.jce.2015.11.004

Demsetz, H. (1973). Industry structure, Market Rivalry, and public Policy. *Law and Economics*, *16*(1), 1–9. https://doi.org/10.1086/466752

Driscoll, J. C., & Kraay, A. C. (1998). Consistent covariance matrix estimation with spatially dependent panel data. *Review of Economics and Statistics*, *80*(4), 549–559. https://doi.org/10.1162/003465398557825

Duggan, V. (2016). Service Sector Reform and Manufacturing Productivity Evidence from Indonesia. World Bank Policy Research Working Paper No. 6349.

Ethier, W. (1982). National and International Returns to Scale. *The American Economic Review*, *72*(3), 389–405.

Fernandes, A. M., & Paunov, C. (2012). Foreign direct investment in services and manufacturing productivity : Evidence for Chile ☆ *Journal of Development Economics*, *97*(2), 305–321. https://doi.org/10.1016/j.jdeveco.2011.02.004

Francois, J. F. (1990). Producer Services,Scale, and the Division of Labor. *Oxford Economic Papers*, *42*(4), 715–729.

Francois, J., & Hoekman, B. (2010). Services Trade and Policy. *Economic Literature*, *48*(3), 642–692. DOI:10.2307/20778764

Gershuny, J. (1978). *After Industrial Society: The Emerging Self-Service Economy*. The MACMILLAN PRESS LTD London and Basingstoke.

Giandrea, M. D., Cahill, K. E., Quinn, J. F. (2008). Self-Employment Transitions among Older American Workers with Career Jobs. *Bls Working Papers*, *April*, 38.

Greenhalgh, C., & Gregory, M. (2001). Structural change and the emergence of the new service economy. *Oxford Bulletin of Economics and Statistics*, *63*(SUPPL.), 629–646. https://doi.org/10.1111/1468-0084.63.spe1.2

Hill, H., & Kalirajan, K. P. (1993). Small enterprise and firm-level technical efficiency in the Indonesian garment industry. *Applied Economics*, *25*(9), 1137–1144. https://doi.org/10.1080/00036849300000174

Javorcik, B. S., & Narciso, G. (2008). Differentiated products and evasion of import tariffs. *Journal of International Economics*, *76*(2), 208–222. https://doi.org/10.1016/j.jinteco.2008.07.002

Kasahara, H., & Rodrigue, J. (2008). Does the use of imported intermediates increase productivity ? *87*, 106–118. https://doi.org/10.1016/j.jdeveco.2007.12.008

Kox, H., & Rubalcaba, L. (2007). The contribution of business services to European economic growth. In *Business Services in European Economic Growth* (Issue February, pp. 74–94). https://doi.org/10.1057/9780230228795

Kretschmer, T. (2012). Information and Communication Technologies and Productivity Growth: A Survey of the literature. *OECD Digital Economy Papers*, *195*.

Lanaspa, L., Sanz-Gracia, F., & Vera-Cabello, M. (2016). The (strong) interdependence between intermediate producer services' attributes and manufacturing location. *Economic Modelling*, *57*, 1–12. https://doi.org/10.1016/j.econmod.2016.04.010

Markusen, J. R. (1989). Trade in producer services and in other specialized intermediate inputs. *American Economic Review*, *79*(1), 85–95.

Nickell, S. (1997). Unemployment and Labor Market Rigidities: Europe versus North America. *Journal of Economic Perspectives*, *11*(3), 55–74.

Pitt, M. M., & Lee, L. F. (1981). The measurement and sources of technical inefficiency in the Indonesian weaving industry. *Journal of Development Economics*, *9*(1), 43–64.

Tzelepis, D., Tsekouras, K., Skuras, D., & Dimara, E. (2006). The effects of ISO 9001 on firms' productive efficiency. *International Journal of Operations and Production Management*, *26*(10), 1146–1165. https://doi.org/10.1108/01443570610691111