

BAGAIMANA DAYA SAING INDUSTRI *LIFE SCIENCES* DI INDONESIA: SEBUAH PEMBANDINGAN DENGAN NEGARA-NEGARA LAIN

HOW COMPETITIVE IS LIFE SCIENCES INDUSTRY IN INDONESIA: COMPARED TO OTHER WORLD COUNTRIES

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Abstrak

Indonesia adalah negara terbesar di Asia Tenggara dengan lebih dari 20 juta penduduknya adalah kelas menengah yang dewasa ini memiliki pengaruh penting dan semakin menginspirasi. Indonesia telah menjadi pasar yang menarik karena perkembangan pesat jumlah konsumen, khususnya dari kelompok penduduk berpendapatan menengah. Tingginya jumlah populasi juga mengindikasikan besarnya potensi sumber tenaga kerja. Industri Life Sciences (LS), secara luas mulai dikenal sebagai aliran baru ekonomi berbasis ilmu pengetahuan. Studi ini mengidentifikasi posisi relatif Indonesia dikaji dari investasi langsung luar negeri (foreign direct investment-FDI) pada industri LS, sekaligus dari sisi daya saing (*competitiveness*) dengan negara-negara lain di dunia Berdasarkan sektor LS, pesaing utama Indonesia adalah Portugal, Turki, Saudi Arabia, dan Nigeria, sedangkan berdasarkan aktivitas LS, Argentina dan Bulgaria adalah saingan utama. Studi ini juga mengungkapkan bahwa FDI yang masuk ke Indonesia dipengaruhi terutama oleh tingkat inflasi dan return on investment.

Kata kunci : Indonesia, *life sciences*, daya saing, investasi langsung luar negeri

Abstract

Indonesia is the South East Asia's largest economy and has a substantial and increasingly inspirational middle class of over 20 million. Indonesia has become an attractive market due to her strongly growing consumer market, especially the middle income segment. The high number of population also indicates the existing potential pool of labour. Life Sciences (LS) industry is widely recognised as the new wave of knowledge-based economy. This study identifies relative position of Indonesia in terms of foreign direct investment (FDI) in LS industry and competitiveness of the LS industry in Indonesia compared with other countries. Based on LS sector, Indonesia has to compete mainly with Portugal, Turkey, Saudi Arabia and Nigeria, while based on LS activities, Argentina and Bulgaria are the main competitors. It also reveals that FDI inflow to LS industry in Indonesia is influenced mainly by inflation and return on investment..

Keywords : Indonesia, *life sciences*, *competitiveness*, *foreign direct investment*

INTRODUCTION

Some countries in Asia and the Pacific, namely China, India, Indonesia, Thailand, and Vietnam have a large population with a growing middle class. These countries attract more market especially in terms of research location and manufacturing base of Life Sciences industry. Also, as a consequence of rising disposable incomes and shift in lifestyle, demands for medicine increase.

Indonesia, as South East Asia's largest economy, has a population of more than 250 million. It has affluent and increasing middle class households of over 20 million. As a reflection of rising disposable incomes, Indonesia's pharmaceutical market has registered double-digit growth since 2009 and by 2016 it is anticipated to rank as the sixth largest pharmaceutical market in the region (Jones Lang, 2012).

In 2011, four countries out of 10 members of the Association of Southeast Asian Nations (ASEAN) namely Brunei Darussalam, Indonesia, Malaysia, and Singapore saw a considerable rise in Foreign Direct Investment (FDI) inflows. As revealed by the United Nations Conference on Trade and Development (UNCTAD) (2012), Indonesia and Thailand are among the top priority host economies chosen by transnational corporations (TNCs). In addition, the possibility of further increase in FDI inflows to the two countries is growing.

The top five prospective host economies 2012-2014 are China, United States, India, Indonesia, and Brazil. This fact proves the importance of developing regions to transnational corporations (TNCs) as locations for international production (UNCTAD, 2012).

Indonesia has shown tremendous economic recovery after the 1997/1998 Asian financial crisis. The GDP (Gross Domestic Product) growth of Indonesia in 1998 was -13.33%. It settled above 4.5% since 2002. In the 2008 Global Financial Crisis, which was began in the US sub-prime mortgage markets, Indonesia had also affected. Depreciation of the rupiah (Indonesian currency) exchange rate by the end of 2008 was 30 percent. Still, Indonesia together with China and India are the only countries experienced with positive growth of GDP. In 2012, the growth of GDP stood at 6.2%. Even USA just acknowledge having better economy after almost 8 years (December 2015) by increasing their Federal rate. According to the World Economic Forum (2012) in Tan and Amri (2013), Indonesia has the 16th largest GDP in the world amounting to US\$846.8 billion in 2011. The stable growth of Indonesia's economy over the last decade, along with her progress in transition to democracy, has led to Indonesia as a prosperous and enabling environment for investment.

Despite all of those excellent records about Indonesia, statistics has shown that inward FDI to Indonesia is still relatively modest. Sjöholm dan Lipsey (2010) measure the role of inward FDI- in different East Asian countries by the

ratio of the inward stock to GDP, as can seen in Table 1 (Appendix 1).

In 2009 the ratio of inward FDI to GDP for South East Asia was 46.34%, while for Indonesia the ratio was only 13.48%. As seen in table 1, there are only two countries which have ratio of inward FDI below Indonesia namely Taiwan and Korea. In addition, Indonesia also shows poor performance in competitiveness compared to other ASEAN economies. Based on the Global Competitiveness Index ranking, Indonesia ranked 50th (out of 144 countries) in 2012-2013, while Singapore is second and Malaysia is ranked 25th (table 2).

Table 2. Global Competitiveness Index (GCI) ranking

Country	2011-2012	2012-2013
Singapore	2	2
Malaysia	21	25
Brunei	28	28
Thailand	39	38
Indonesia	46	50
Philippines	75	65
Vietnam	65	75
Cambodia	97	85
Lao PDR*)	-	-
Myanmar*)	-	-

Source: The Global Competitiveness Report 2012-2013, *) data not available

The problem statement for this study basically to compare the weakness of Indonesia in term of competitiveness and some advantages which can be the factor to increase the competitiveness. Indonesia is an attractive market for FDI in LS industry due to its strongly growing consumer market, especially the middle income segment. The high population also indicates the potential pool of labor. Since FDI has a significant role in accelerating economic growth due its many benefits to receiving country, economies have been competing for attracting FDI.

This study identifies several location factors as the main determinants of LS industry. It also measuring the competitiveness of Indonesia's LS industry and investigating which country is the

main competitor, which are important to design a proper strategy to attract FDI.

LITERATURE REVIEW

Competitiveness

There are many concepts to measure competitiveness viewed from different perspective.

Wignaraja (2002) distinguished the competitiveness by macroeconomic, business strategy, as well as technology and innovation perspectives. He argued that macroeconomic perspective, which has been widely used to measure competitiveness in developed and developing countries, gives an incomplete framework for structuring public policies.

While Storper (1997) defines competitiveness as *“the ability of an (urban) economy to attract and maintain firms with stable or rising market shares while maintaining standards of living for those participating in it”* (Storper 1997, p.20). He also mentioned indicators of city ability to attract investments, such as investment climate, infrastructure availability, capacity of innovation and learning, the business environment, productivity, standard of living/quality of life and top down/sector and macro influences.

Competitiveness in term of national scale is explained by Onsel et al. (2008). It defines competitiveness as productivity of a country which produces goods and services under free and fair market. Those production are meet the international market standards and could increase the real income of its citizen. This concept also includes the set of institutions, policies, and factors that determine the level of productivity of a country.

Some scholars defend that competition among cities are exist in terms of investment. According to Alderson and Beckfield (2004), the level of cities is determined by the ability to attract investments and how they take control of the world economy.

Likewise, Gordon (1999) proposed that product markets, FDI, and hosting of high profile events are among various fields which cities could compete. Phillips and Ryan (2007) argued that the global life-science research has been significantly transformed. The main reasons behind this transformation are the complexity and specialization of this field which makes it difficult to isolate. The second reason is the extension of intellectual property (IP) rights into new subject areas and new jurisdictions.

Foreign Direct Investment (FDI)

Foreign private investment can be distinguished by FDI and portfolio investment. This research only discusses the FDI, which categorized into outward FDI and inward FDI. Outward FDI is direct investment abroad, whereas inward FDI is direct investment coming from abroad in to this country. UNCTAD (2007) defined FDI as *“an investment involving a long-term relationship and reflecting a lasting interest and control by a resident entity in one economy (foreign direct investor or parent enterprise) in an enterprise resident in an economy other than that of the foreign direct investor (FDI enterprise or affiliate enterprise or foreign affiliate)”*.

Why is it Important to Find Out The Determinants of FDI?

For many developing countries which do not have access to international capital market, attracting FDI is important. As mentioned by Chakrabarti (2001) and Asiedu (2002), most of the developing countries rely on two forms of foreign financing: FDI and official loans. The latter has been a problem for heavily indebted countries due to the ‘debt overhang’ in 1982-1983 (break down of normal financial relations). This led to the decline in official lending, foreign aid, investment, and growth rates in those countries. This backdrop revealed the

importance of FDI as provider of capital for investment.

Khondoker and Mottaleb (2007) argued that FDI has a significant role in rapid economic growth by bridging the gap between domestic savings and investment. It is also bringing the latest technology and management know-how from developed countries to developing and even to under-developed countries. Foreign investment offers many benefits to host country, such as enhancing its efficiency since the existence of foreign firms increase competition. Also, from the workers' side, it may support the increasing income by providing higher wage and salary in the host countries.

Crespo and Fontura (2007) mentioned other benefits of FDI to host country: providing capital foreign exchange, technology, competition, and raising access to foreign market. Azam and Lukman (2010) revealed FDI as an important factor for national economic development by transferring innovative technology, up to date management, and marketing techniques to the host countries.

Studies on Determinants of FDI

As explained earlier, the importance thing to analyze the determinants of FDI in terms of economic growth has led scholars to do a lot of empirical studies. They concentrate more on location factors rather than the capital propriety advantages (Nonnemberg and Mendonca, 2004). This is because the capital propriety advantages as *push factor* are more difficult to analyze as it heavily involves firms in its survey. Several empirical studies on different determinants and observed effect on FDI are presented in table 3 (Appendix 2).

Life Sciences Industry

Stremersch and Van Dyck (2009) defined LS industry as an industry that comprises companies in pharmaceuticals, biotechnology, and therapeutic medical devices, and it forms the innovative

producer side of the health care industry. Two basic dimensions that underlie the LS industry are science-based knowledge (“know-why”) and quality of life.

Gertler and Vinodrai (2009) noted that activity related with life science is expected to produce employment and to raise income for regions and nations, contributing to their economic competitiveness and prosperity, and to generate highly skilled and well-paying jobs. Therefore, academics and policymakers have paid more concerns to understanding the enabling conditions, institutional forces and policy mechanisms that have nurtured and developed the innovative capacity and economic success of LS industry activities in particular regions and nations, as argued by Gertler and Vinodrai (2009).

FDI and Competitiveness in Indonesia

In Indonesia, study and analyses related to competitiveness have also been conducted. The ranking of Investment Climate for 33 Indonesian provinces was provided by Regional Autonomy Watch (*Komite Pemantauan Pelaksanaan Otonomi Daerah-KPPOD*) and Indonesia Investment Coordinating Board (BKPM) in 2008 (KPPOD, 2008a). This ranking was based on six indicators: investment services, investment promotion, commitment of provincial government to the private sector, infrastructure, labor, and accessibility to land. KPPOD (2008b, 2011) also measured rankings in the city and district level based on surveys to business operators in more than 240 cities and districts through the Local Economic Governance.

METHODOLOGY

The Purpose of The Study

The purpose of this research is to identify the relative position of LS industry in Indonesia in terms of FDI and competitiveness, by using descriptive and explanatory analysis. Both of those

analyses are quantitative approach by processing the existing raw data using software: UCINET, SPSS version 20, and EViews version 5.1.

The World Data Set

This study comprises all the firms, cities, and countries across the world in the database of 'FDI Markets', particularly in the cluster of LS industry. Combined with the location factors data set from Global Competitiveness Report, 117 countries from seven regions (Africa, Asia and Pacific, Middle East, West Europe, Rest of Europe, North America, and Latin America) are being analysed.

FDI in this study is based on green field data, because it is a kind of investments where parent companies start an entirely new venture in a foreign country by constructing new operational facilities from the ground up. Therefore it indicates traceable developments between firms and are beneficial in studying their impact on regional development (Wall and Burger, 2012). Another constraint with the purchased data is that roughly 60% of the investment values are not known and have therefore been estimated by FDI Markets. By using a high degree of estimated data in the analyses, the results could possibly be misleading. The solution is using the number of investments instead of the value of investment as a proxy.

Indonesian Data Set

Previous study about determinants of inward FDI in India, Indonesia and Pakistan was written by Azam and Lukman (2010). They found out that determinants of inward FDI in Indonesia do not match with those of Pakistan and India. Almost all of the results of determinants of inward FDI in Indonesia are statistically insignificant. This study assessed the similar variables used by Azam and Lukman to analyze the determinants of inward FDI in LS industry in Indonesia. All variables are compiled for each Indonesian province, including

variables that were not processed in the previous study (government consumption, infrastructure, tax, and return on investment). Variable of external debt is the only one excluded due to the difficulty of finding external debt data in the provincial level.

The panel data methodology was used, which combines information on the variation of the Indonesian provinces. It comprises 29 provinces out of 33 provinces and covers period from 2003 to 2011. Four provinces namely Riau Archipelago, West Sulawesi, North Maluku, and West Papua were dropped because they do not have data on FDI in LS industry.

The selected explanatory variables were trade openness (TO), market size (MS), domestic investment (DI), infrastructure expenditure (IE), government consumption (GC), tax (TAX), inflation (INF), and return on investment (RI). The dependent variable (Y variable) was data of inward FDI value which were collected from the Indonesia Investment Coordinating Board (BKPM).

This study utilised panel (longitudinal) data which is defined as data set that follows a given sample of individuals over time, and thus provide multiple observations on each individual in the sample (Hsiao, 2003, p.2). Panel data were distinguished between balanced and unbalanced data. In panel data, variables of the same cross-sectional subject are observed over time. Let $i = 1, 2, \dots, N$ be an index of the cross-sectional subject and $t = 1, 2, \dots, T_i$ be an index of time for subject i .

A panel is called balanced if each cross-section subject has the same number of observations. That is, if $T_i = T$ for $i = 1, 2, \dots, N$ and the total number of observations is

$$n = NT$$

If each individual subject has a different number of observations over time, that is $T_i \neq T_j$, then we have an unbalanced panel. The total number of observations for unbalanced panel is

$$n = \sum_{i=1}^N T_i.$$

Also if $N > T$, it is called a short panel and if $N < T$, then it is called a long panel. Generally panel data regression model is written as

$$Y_{it} = \alpha_{it} + \beta' X_{it} + \mu_{it}, \\ i = 1, 2, \dots, N, \quad t = 1, 2, \dots, T$$

Where Y_{it} is the dependent variable of the individual i at time t , intercept α_{it} is an effect of individual i at time t , variable β' is constant vector $K \times 1$, X_{it} is a $K \times 1$ vector of explanatory variables, and μ denotes error regression of individual i at time t . Panel data analysis has three approach methods namely Pooled Least Square (PLS), Fixed Effect (FE) and Random Effect (RE).

How to Measure Relative Position and Competitiveness

The ranking of countries is developed by processing number of FDI in LS industry using excel software. It is also classified by types of investments (outward and inward), each of them has been analysed based on region and country.

The main competitors of Indonesia in LS industry are answered with the results of Manhattan Distance analysis. This analysis measuring the distance between two points which is calculated by summing the absolute differences of their coordinates, using UCINET software by processing matrix of number of FDI in LS industry and name of countries.

RESEARCH FINDINGS

In terms of three main sectors in the LS industry, Indonesia had only two outward FDI which were only in pharmaceutical sectors comparing with other ASEAN member, after Malaysia, Singapore, and Thailand. Table 4 shows that Indonesia has 56th position among 66 countries worldwide, classified by number of outward FDI in three main sectors. Table 5 shows that as destination country, Indonesia came with better result, rank 35 out of 117 countries with inward FDI in three main sectors. (Appendix 3 and 4).

As seen in Table 6 and Table 7 (Appendix 5 and 6), by three main activities, Indonesia ranked 54 out of 66 as source country (outward FDI). As a destination country by activities, Indonesia stood at rank 36 out of 117.

The Main Competitors of Indonesia

Table 8 below illustrates the 20 competitor countries of Indonesia (by sectors). As can be seen, viewed from outward FDI, Indonesia has two competitors from Asia and the Pacific region: Australia and Philippines. From Africa region the competitors are Algeria, Nigeria, Egypt, and South Africa. From the region of Latin America there are two competitors of Indonesia, namely: Argentina and Colombia. Israel and Saudi Arabia are the competitors from Middle East region. From West Europe, Indonesia has Portugal, Finland, and Denmark as competitors. Several countries from the Rest of Europe also become the competitors of outward FDI, with the top namely Romania, Turkey, and Serbia.

Table 8. Competitors of Indonesia by Sectors in LS industry

No.	Sectors	
	Outward FDI	Inward FDI
1	Argentina	Bulgaria
2	Romania	Portugal
3	Portugal	Nigeria
4	Turkey	Turkey
5	Serbia	Finland
6	Slovakia	Israel
7	Australia	Chile
8	Algeria	Saudi Arabia
9	Bulgaria	Serbia
10	Saudi Arabia	Algeria
11	Nigeria	Egypt
12	Slovenia	Ukraine
13	Colombia	Philippines
14	Ukraine	Qatar
15	Egypt	Malaysia
16	Finland	Taiwan
17	Philippines	Slovenia
18	Denmark	Croatia
19	South Africa	Tunisia
20	Israel	Malta

As the destination countries, Indonesia has several competitors from various regions. Philippines, Malaysia, and Taiwan become competitors from Asia and the Pacific. From Africa, Nigeria and Egypt also become competitors in terms of outward FDI. The main competitors of Indonesia are Portugal, Turkey, Saudi Arabia, and Nigeria.

Table 9 describes the competitors of Indonesia by activities. Argentina as can be seen clearly is the main competitor, both as source and destination country of FDI. In terms of outward FDI, only Vietnam and Sri Lanka are the competitors of Indonesia from Asia and the Pacific region. While in terms of inward FDI in the same region; Philippines, Australia, and Taiwan are the main competitors of Indonesia. It can be concluded that the main competitors of Indonesia by activities in LS industry are Argentina and Bulgaria.

Table 9. Competitors of Indonesia by Activities in LS Industry

No.	Sectors	
	Outward FDI	Inward FDI
1	Argentina	Argentina
2	Bulgaria	Portugal
3	Vietnam	Nigeria
4	Jordan	Philippines
5	Lithuania	Saudi Arabia
6	Chile	Serbia
7	Ghana	Algeria
8	Malta	Slovakia
9	Puerto Rico	Australia
10	Sri Lanka	Bulgaria
11	Macedonia FYR	Egypt
12	Mexico	Slovenia
13	Norway	Ukraine
14	Portugal	South Africa
15	Serbia	Turkey
16	Ukraine	Colombia
17	Colombia	Croatia
18	Egypt	Dominican Rep.
19	Kenya	Finland
20	Liechtenstein	Taiwan

Panel Regression Analysis

This section presents the econometric results of the determinants for inward FDI in LS industry in Indonesia.

The data used are unbalanced panel data comprising time series data from 2003-2011 (trade openness, market size, domestic investment, inflation, return of investment) and three variables which are only available from 2003-2008 (infrastructure, government consumption, indirect tax). The cross-section data only used 29 provinces in Indonesia which had FDI in LS industry

Regression model for inward FDI by province in Indonesia year 2003-2011 is

$$y_{it} = \alpha_{0i} + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \beta_5 X_{5it} + \beta_6 X_{6it} + \beta_7 X_{7it} + \beta_8 X_{8it}$$

$i = 1, 2, \dots, 29$ (number of province as individual sample unit)

$t = 1, 2, \dots, 9$ (number of year observation) with

y_{it} = value of inward FDI in LS industry

X_{1it} = trade openness (TO)

X_{2it} = market size (MS)

X_{3it} = domestic investment (DI)

X_{4it} = infrastructure expenditure (IE)

X_{5it} = government consumption (GC)

X_{6it} = taxes (TAX)

X_{7it} = inflation (INF)

X_{8it} = return on investment (RI)

Determine the Estimation Method

1). Pooled Least Squares (PLS) method will be used to develop the regression model for FDI inward

$$FDI = -2143.37 - 16.98 TO - 35.93 MS + 0.53 DI + 3.30 IE - 2.01 GC + 4.80 TAX + 55.58 INF + 4248.56 RI$$

$$(0.00) (0.05) \quad (0.88) \quad (0.01) \quad (0.10) \\ (0.24) \quad (0.00) \quad (0.44)$$

*) The value between brackets represent the t sig

As can be seen from individual test (t-test probability) there are four variables found significant. MS (market size), IE (infrastructure expenditure), and TAX are significant at 5% level of significance, while GC (government consumption) is significant at 10% level of significance. Two variables are insignificant, which are TO (trade openness) and INF (inflation) The empirical results obtained are acceptable and significant on the basis of R-squared (R^2) 0.67. The Durbin-Watson

statistics is 1.84 (close to 2), shows no autocorrelation problem.

2). Fixed Effects Method (FEM) has been assessed to calculate for possible unobserved heterogeneity across provinces. The regression model is:

$$FDI = -346.63 + 11.07 TO - 24.33 MS + 0.04 DI + 0.44 IE - 0.33 GC + 0.84 TAX + 5.76 INF + 650.86 RI$$

$$(0.23) \quad (0.15) \quad (0.64) \quad (0.25) \quad (0.62) \\ (0.18) \quad (0.00) \quad (0.00)$$

*) The value between bracket represent the t sig

INF (inflation) and RI (return of investment) are significant at 5% level of significance. Here the value of R-squared (R^2) is 0.76 and it is higher than result of R^2 from PLS method. Similar with PLS method, FEM also highly significance which shown by F-stat value (0.00000). The Durbin-Watson statistics is 2.45.

3). Since the results from those two approaches are somewhat significant, restricted F-test should be implemented to determine which method will be better to use. The F-test hypothesis is as follows

H_0 : Pooled Least Squares Model (restricted)

H_1 : Fixed Effect Model (unrestricted)

Table 10. Redundant Fixed Effects Test

Pool: FEM

Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	5.202851	(28,125)	0.0000

The p-values associated to the F-statistic is 0.0000, which provides strong evidence against the null hypothesis meaning FEM should be used to estimate panel regression model.

4). Random Effect Method (REM) takes the residual error into account using least square method.

$$FDI = -2129.77 + 9.76 TO - 36.61 MS + 0.13 DI + 3.95 IE - 2.62 GC + 5.37 TAX + 52.89 INF + 3264.12 RI$$

$$(0.00) \quad (0.16) \quad (0.94) \quad (0.23) \quad (0.74) \\ (0.48) \quad (0.03) \quad (0.50)$$

*) The value between bracket represent the t sig

The result obtained is only two variables are significant at 5% level of significance, IE (infrastructure expenditure) and TAX. The value of R-squared is 0.44, REM is also highly significance which shown by F-stat value (0.00000). The Durbin-Watson statistics is 1.99 which indicated no autocorrelation.

5). The REM assumes that random effects are uncorrelated with the explanatory variables. Hausman test should be used to determine whether FEM or REM more suitable to estimate the model. The hypothesis of Hausman Test is:

H_0 : Random effect (RE)

H_1 : Fixed effect (FE)

Table 11. Hausman Test

Correlated Random Effects - Hausman Test

Pool: FEM

Test cross-section fixed effects

Summary	Chi-Sq. Statistic	Chi-Sq. d.f	Prob.
Cross-section F	4.468903	8	0.8125

As can be seen on the Table 11 above, the test fails to reject the null hypothesis at 5% level of significance. Meaning that the assumption that the random effects should be uncorrelated to the explanatory variables is true for this dataset. Therefore the panel regression model should be estimated by using the REM method.

6) At last, this research should compare the statistical results between FEM and REM to determine which one is the most suitable model.

Table 12. Comparison of Statistical Result between FEM and REM

Model	Fixed Effects Method (FEM)	Random Effects Method (REM)
R- Squared	0.76	0.44
Adjusted R-Squared	0.68	0.41
Prob (F-Statistic)	0.00	0.00

Based on Table 12, Statistical result for FEM shows that this model is the best to be used as estimator tool for panel regression. It also beneficial using this model since the different characteristic of each individual sample and time series are taken into account.

Estimation Model Panel Regression for FDI

Based on the several test in the previous section, FEM has been found more efficient than REM. Then the estimated model panel regression for FDI is:

$$\text{Inward FDI} = -346.63 + 11.07 \text{ TO} - 24.33 \text{ MS} + 0.04 \text{ DI} + 0.44 \text{ IE} - 0.33 \text{ GC} + 0.84 \text{ TAX} + 5.76 \text{ INF} + 650.86 \text{ RI}$$

FEM allows us to explore the relationship between predictor variable (X variables) and outcome variables within province. When using FEM we assume that something within the province may impact or bias the predictor or outcome variables and we need to control it. FEM removes the effect of those time-invariant characteristics from the predictor variables so that we can assess the predictors' net effect. The fixed-effects model controls for all time-invariant differences between the individuals, so the estimated coefficients of the fixed-effects models cannot be biased because of omitted time-invariant characteristics (i.e culture, environment)

Another significant assumption of the FEM is that those time-invariant characteristics are unique to the province and should not be correlated with other province characteristics. Each province is different therefore the entity's error term and the intercept represent as a constant (which captures provincial characteristics) should not be correlated with the others.

From eight variables, only two variables are found significant, they are Inflation (INF) and Return on investment (RI) The other variables are not significant when to be tested partially, meaning that if they stand alone as a determinant of FDI,

they are insignificant. Those variables had been statistically significant as the determinant of LS industry when they are assessed simultaneously, and represents by the R-square of FEM (0.67) and F stat-value (0.00).

Inflation is found as significant with expected positive sign. Azam & Lukman (2010) also found a positive relationship between inflation rates and inward FDI. Return on investment, with proxy 1/GDRP, is found significant with positive expected sign. Tsai (1994) and Azam & Lukman (2010) also found positive significant relationship.

Trade openness is find insignificant with expected positive sign. Schmitz & Bieri (1972), Wheeler & Moody (1992) also found insignificant relationship between trade openness and FDI.

Market size had been found insignificant with expected positive sign. The previous study that also found positive relationship between market size and FDI are from Chakrabarti (2001, 003), Ioannatos (2003), Banga (2003), and Eli et al., (2006). Domestic investment had been found insignificant with expected positive sign. The similar findings are from Razin (2003) and Yasmin et al.,(2003).

Infrastructure Expenditure and Government consumption had been found insignificant with expected positive sign. Tax had been found insignificant with unexpected positive sign. Only Wheeler & Mody (1992), Jackson & Markowski (1995), Yulin & Reed (1995) and Porcano & Price (1996) which had similar result. Meanwhile as can be seen in table 3 above, many researches found out taxes has negative effect on FDI.

Table 13. Intercept estimation ($\hat{\alpha}_{0i}$) of each province for FEM with cross section weight

No	Province	$\hat{\alpha}_{0i}$
1	NAD	-1178.32
2	Sumatera Utara	-2686.48
3	Sumatera Barat	-741.17
4	Riau	1486.37
5	Jambi	-244.46
6	Sumatera Selatan	-1166.80

7	Bengkulu	-44.72
8	Lampung	-439.64
9	Bangka Belitung	-57.62
10	DKI Jakarta	15756.52
11	Jawa Barat	2281.28
12	Jawa Tengah	-3990.92
13	DI Yogyakarta	-253.60
14	Jawa Timur	-3891.21
15	Banten	1657.82
16	Bali	-683.47
27	Nusa Tenggara Barat	-363.54
18	Nusa Tenggara Timur	-115.74
19	Kalimantan Barat	-491.15
20	Kalimantan Tengah	-197.80
21	Kalimantan Selatan	-692.93
22	Kalimantan Timur	-1846.50
23	Sulawesi Utara	-86.25
24	Sulawesi Tengah	-126.87
25	Sulawesi Selatan	-852.92
26	Sulawesi Tenggara	-114.06
27	Gorontalo	-8.05
28	Maluku	-21.59
29	Papua	-509.24

The fixed-effects parameters, α_i , capture the net effects of all variables, both observable and unobservable, that vary across provinces but are constant over time. Constant intercept for this model is -346,6247, therefore we have to sum up this intercept with the province's intercept as presented in table 13 to develops model for each province.

Indonesia has 33 provinces; unfortunately only 29 provinces could be examined. Kepulauan Riau, Papua Barat, Sulawesi Barat, and Maluku Utara are excluded. This panel regression analysis requires time series data of the dependent variable (Y). Since those four provinces in certain year within period 2003 to 2012 did not receive FDI, so they were excluded from analysis.

The constant value ($\hat{\alpha}_{0i}$) of intercept for each of Indonesian province ranged from 15409,9 (DKI Jakarta) and -4337.5 (Jawa Tengah). Only four out of 29 provinces that have positive intercept, namely: DKI Jakarta (15409.9), Jawa Barat (1934.66), Banten (1311.2), and Riau (1139.75). DKI Jakarta, Jawa Barat, and Banten are also having highly

competitiveness ranking compared to other provinces.

Three of those provinces are located in Java, and only Riau is located in Sumatra Island. As reported in Life Sciences Cluster Report 2012, Indonesia has 55 industrial park firms but unfortunately none of them are dedicated fully to the LS industry. Java, which is seen as a destination option for industry, has about 75 percent of Indonesian's industrial estate. 50 percent of them are located in Jawa Barat province. The biggest pharmaceutical company also located in Greater Jakarta Industrial estate, covers Tangerang, Bogor, Bekasi, and Karawang.

Riau has a relatively higher intercept because of their positions in Sumatra which is near Singapore as one of the biggest receiver of FDI, and also becomes province in Indonesia which has the free tax policy. This policy has been a factor that enhances inward FDI to Riau Province.

Surprisingly, Jawa Timur and Jawa Tengah -ranked 2nd and 3rd in competitiveness- had the lowest intercept compared to other provinces. This results need further research to find out whether this condition only exist in LS industry or else.

CONCLUSIONS AND RECOMMENDATION

Conclusions

This research aimed to find the most competitors of Indonesia in the LS industry. As the source country of FDI, Indonesia has two competitors from Asia and the Pacific region, namely: Australia and Philippines. From Africa region the competitors are Algeria, Nigeria, Egypt, and South Africa. Latin America also becomes the competitors of Indonesia, with Argentina and Colombia as the countries. Israel and Saudi Arabia are the competitors from Middle East region. From West Europe, Indonesia has Portugal, Finland, and Denmark as

competitors. Several countries from Rest of Europe also become the competitors of outward FDI, namely Romania, Turkey, and Serbia.

As the destination country, Indonesia has Philippines, Malaysia and Taiwan as the competitors. Overall, based on LS sectors Indonesia has Portugal, Turkey, Saudi Arabia and Nigeria as the main competitors. Based on activities, Indonesia has Argentina and Bulgaria as the main competitors. Whilst in terms of outward FDI, the competitors of Indonesia are Argentina, Bulgaria, Vietnam, Jordan, and Lithuania. By inward FDI, there are Argentina, Portugal, Nigeria, Philippines, and Saudi Arabia as the competitors. This study revealed that FDI inward in LS industry in Indonesia influenced mainly by inflation (INF) and return on investment (RI). It clearly shows that for Indonesia macroeconomic variables (inflation) and return on investment have significant relationship with inward FDI.

The dynamics of price of primary goods in Indonesia -which is reflected on inflation rates-tends to be viewed as an opportunity for inward FDI. Return on investment (RI) also significantly positive affected inward FDI. The different result is: GDP is found positive affected inward FDI in the world model but as likely negative determinants for Indonesia, since it is used as a proxy for return on investment variable (1/GDRP). In Indonesia, the increase of inward FDI will be gained coherent with increasing price of primary goods.

This study had also found that provinces with higher ranking of competitiveness, such as Jawa Timur and Jawa Tengah had the lowest intercept of estimates model compared to other provinces. This results need further research to find out whether this condition only exist in LS industry or anything else.

Recommendation

The disparity in economic and social sector between province in Java and other islands is the main issue for

attracting FDI. The empirical study resulted that only four provinces has a positive intercept as the host of FDI, three of them are located in Java, since Java provides better infrastructure, higher skilled labor, better facilities of science, etc.

As argued by Sethi et al. (2003) FDI brings several benefits for the host country, such as the inflow of capital, the creation of job opportunities, transfer of technological knowledge—which is translated into the development of skilled workers—, higher productivity, and higher value-added activities. These advantages will enhanced the income distribution among Indonesian provinces will be diatributed evenly.

The economic structure of Indonesia is now primarily focused on agriculture and industries which extract and utilize natural resources. Industries which is focused on products with significant added value are still limited. There is no other way to attract more FDI in LS industry in Indonesia, but improvement on infrastructure and human capital resources. The Masterplan for Acceleration and Expansion of Indonesia's Economic Development (abbreviated MP3EI)¹ is expected to be the solution to accelerate and expand economic development among regions.

¹ The Masterplan for Acceleration and Expansion of Indonesia's Economic Development (abbreviated MP3EI) is an ambitious plan by the Indonesian government to accelerate the realization of becoming a developed country. It aims to established Indonesia as one of the world's developed countries by 2025.

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APPENDIX

Appendix 1

Table 1. The Stock of inward FDI as percent of GDP, year 1980-2009

	1980	1985	1990	1995	2000	2005	2009
China/HK	53.37	55.01	46.33	36.47	47.44	32.95	27.06
Taiwan	5.69	4.62	5.91	5.75	6.08	12.13	12.75
Indonesia	5.73	5.98	6.95	9.32	15.2	14.41	13.48
Korea	1.78	1.87	1.97	1.84	7.45	13.25	13.31
Malaysia	20.33	22.8	22.57	31.15	56.24	32.23	39.01
Philippines	2.82	5.98	10.22	13.69	23.92	15.17	14.63
Singapore	45.66	60.03	82.57	78.21	119.26	162.44	193.98
Thailand	3.03	5.14	9.66	10.53	24.38	34.24	37.52
Vietnam	59.1	30.25	25.49	34.48	66.07	58.93	51.93
Northeast Asia	41.85	38.91	25.9	20.96	32.11	26.01	25.35
Southeast Asia	9.44	12.54	18.09	22.46	44.47	44.8	46.34

Source: Lipsey and Sjöholm, 2010

Appendix 2

Table 2. Determinants of FDI and observed effect on FDI

Determinants of FDI	Positive effect	Negative effect	Insignificant
1. Market size	Bandera & White (1968) Schmitz & Bieri (1975) Swedenborg (1979) Lunn (1980) Dunning (1980) Root & Ahmed (1979) Kravis & Lipsey (1982) Nigh (1985) Schneider & Frey (1985) Culem (1988) Papanastassiou & Pearce (1990) Wheeler & Mody (1992) Sader (1993) Tsai (1994) Shamsuddin (1994) Billington (1999) Pistoresi (2000)		
2. Inflation rate		Garibaldi et al (2001) Naeem, Ijaz & Azam (2005) Azam & Lukman (2010)	
3. Domestic investment	Razin (2003) Yasmin <i>et al.</i> (2003) Naeem, Ijaz & Azam (2005) Azam & Lukman (2010)		
4. Trade openness	Kravis & Lipsey (1982) Culem (1988) Edwards (1990) Gastanaga <i>et al.</i> (1998) Pistoresi (2000) Hausmann & Fernandez-Arias (2000) Aseidu (2002) Ioannatos (2003) Azam & Lukman (2010)		Schmitz & Bieri (1972) Wheeler & Mody (1992)
5. Government consumption			Azam & Lukman (2010)
6. Infrastructure	Wheeler & Mody (1992) Kumar (1994) Loree and Guisinger (1995) Aseidu (2002) Ioannatos (2003) Azam & Lukman (2010)		

7. Taxes and tariffs	Swenson (1994)	Hartman (1984) Grubert & Mutti (1991) Hines & Rice (1994) Loree & Guisinger (1995) Guisinger (1995) Cassou (1997) Kemsley (1998) Barrel & Pain (1998) Gastanaga <i>et al.</i> (1998) Billington (1999) Wei (2000)	Wheeler & Mody (1992) Jackson & Markowski(1995) Yulin & Reed (1995) Porcano & Price (1996)
8. Return on investment	Tsai (1994) Azam & Lukman (2010)		

Source: Compiled from Chakrabarti (2001), Asiedu (2002), Azam & Lukman (2010)

Appendix 3

Table 4. Rank of ASEAN Countries by Outward FDI in Three Main Sectors period 2003-2012

World Ranking	Source Countries	Number of FDI			Total
		Pharmaceuticals	Medical Devices	Healthcare	
18	Malaysia	2	10	26	38
20	Singapore	2	11	16	29
47	Thailand	0	0	5	5
56	Indonesia	2	0	0	2
60	Philippines	0	0	1	1
62	Vietnam	1	0	0	1
*)	Cambodia	0	0	0	0
*)	Myanmar	0	0	0	0
*)	Laos	0	0	0	0
*)	Brunei	0	0	0	0

*) not having outward FDI

Appendix 4

Table 5. Rank of ASEAN Countries by Inward FDI in Three Main Sectors period 2003-2012

World Ranking	Destination Countries	Number of FDI			Total
		Pharmaceuticals	Medical Devices	Healthcare	
8	Singapore	71	27	11	109
26	Vietnam	16	12	5	33
30	Thailand	9	16	3	28
31	Malaysia	10	10	5	25
35	Indonesia	9	3	8	20
50	Philippines	4	3	2	9
69	Cambodia	1	1	2	4
106	Laos	0	0	1	1
108	Myanmar	1	0	0	1
*)	Brunei Darussalam	0	0	0	0

*) not having inward FDI

Appendix 5

Table 6. Rank of ASEAN Countries by Outward FDI in Three Main Activities period 2003-2012

World Ranking	Source Countries	Number of FDI			Total
		Manufacturing	Sales, Marketing & Support	Research & Development	
21	Singapore	9	8	0	17
22	Malaysia	9	6	1	16
54	Indonesia	1	0	1	2
55	Thailand	0	1	0	1
56	Philippines	0	1	0	1
62	Vietnam	1	0	0	1
*)	Cambodia	0	0	0	0
*)	Myanmar	0	0	0	0
*)	Laos	0	0	0	0
*)	Brunei Darussalam	0	0	0	0

*) not having outward FDI

Appendix 6

Table 7. Rank of ASEAN Countries by Inward FDI in Three Main Activities period 2003-2012

World Ranking	Destination Countries	Number of FDI			Total
		Manufacturing	Sales, Marketing & Support	Research & Development	
8	Singapore	40	28	52	120
27	Thailand	20	5	4	29
28	Vietnam	15	14	0	29
32	Malaysia	15	4	6	25
36	Indonesia	10	7	1	18
54	Philippines	2	6	0	8
96	Myanmar	1	0	0	1
*)	Laos	0	0	0	0
*)	Cambodia	0	0	0	0
*)	Brunei Darussalam	0	0	0	0

*) not having inward FDI