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Abstract

This paper examines the applicability of the Dutch Disease hypothesis by using a vector auto-regression model, focusing on the five resource-rich and middle-income economies in the Association of Southeast Asian Nations (ASEAN): Malaysia and Indonesia as the forerunners, and Lao PDR, Myanmar and Vietnam as the latecomers at their development processes. The empirical study found that the latecomers of Lao PDR and Myanmar seemed to suffer from the Dutch Disease over the sample period; and the forerunners of Indonesia and Malaysia, on the other hand, appeared to have no Dutch Disease effect at least in the current period of 1995-2015, although Indonesia had experienced the Dutch Disease in the previous period of 1970-1995. The lessons from the forerunners' experiences in order for the latecomers to escape from the Ditch Disease are to establish some funding system of allocating resource revenues for investment projects; to diversify domestic industries through improving business environments; and to improve institutional quality to reinforce resource governance.

Key words: Dutch Disease, ASEAN, Vector auto-regression model, Natural resources, Resource fund, Diversification, Institutional quality
JEL Classification Codes: F43, L60, O53

1. Introduction

The economies of the Association of Southeast Asian Nations (ASEAN) have been a center of economic growth in Asia as well as in the world for the past decades. The annual growth rate of ASEAN economies recorded 5.6 percent on average during the period from 1990 to 2016, while those of Asian and the world economies showed 4.1 and 2.6 percent, respectively.[1] The ASEAN, at the same time, contains a variety of economies with different stages of development. According to the World Bank Analytical Classifications in 2016[2], Brunei and Singapore are classified into "High income"; Malaysia and Thailand into "Upper middle income"; Cambodia, Indonesia, Lao PDR, Myanmar, Philippines and Vietnam into "Lower middle income". Among the middle income economies, Malaysia, Thailand, Indonesia, and Philippines have become middle incomers earlier than Cambodia, Lao PDR, Myanmar and Vietnam, and so the former group is called "forerunners" while the latter is called "latecomers".

The heterogeneity in the ASEAN economies are found also from the perspectives of their abundance of natural resources and industrial structures. Figure 1 displayed the contribution of resource sector in each ASEAN economy by the GDP share of mining and utility sectors in 2015, and indicated much difference in the GDP share of resource sector from Brunei (43.5 %) to Singapore (1.4%). We now focus on the middle income economies that have the resource contribution to their GDP by around 10 to 20 percent: Lao PDR, Vietnam, Malaysia, Indonesia and Myanmar, and see their industrial structures in 2015 compared with those in 1980 by Table 1. The forerunners, Malaysia and Indonesia, reduced the GDP share of resource sector, and instead raised that of manufacturing sector. In particular, Indonesia now has the larger share in manufacturing than in resource sector, though she previously had a dominant share of resource sector as an oil-producing country. The latecomers, Lao PDR, Vietnam and Myanmar, on the other hand, raised their resource sector's shares as well as their manufacturing sector's shares. The critical question is, then, in what way the industrial structure should be designed in the future for the latecomers who are expected to sustain their economic growth, in other words, whether the latecomers should continue to depend heavily on the resource sector or transform their industrial structures towards manufacturing-oriented ones just like the cases of forerunners of Malaysia and Indonesia.

From a theoretical perspective, this issue could be discussed in the context of the

[1] The growth rates are calculated by Gross Domestic Products at constant prices (2005), retrieved from UNCTAD STAT: http://unctadstat.unctad.org/EN/.

[2] See the website: https://datahelpdesk.worldbank.org/knowledgebase/articles/378834-how-does-the-world-bank-classify-countries

"resource curse" hypothesis initially proposed by Auty (1993): resource-rich countries tend to grow more slowly than resource-poor countries. The logic of this hypothesis is a crowding-out if we follow Sachs and Warner (2001): natural resources crow-out activity *x*; activity *x* drives growth; therefore natural resources harm growth. This crowding-out logic could be applied typically to the "Dutch Disease" hypothesis by arguing that natural resources crowd-out manufacturing activities. The Dutch Disease was originally named by the *Economist* magazine on November 26, 1977 by being inspired by repercussions of natural gas discoveries by the Netherlands in the late 1950s. The theoretical framework for the hypothesis was established by the Salter-Swan-Corden-Dornbusch model. Corden and Neary (1982) described this model as the resource reallocation from tradable sector to non-tradable sector caused by positive wealth shocks from natural resource sector through a real exchange rate appreciation.

This paper aims to examine the applicability of the Dutch Disease hypothesis focusing on the selected resource-rich ASEAN economies by using a vector auto-regression (VAR) model as an analytical method. For the analytical samples, we target the five middle income economies in which the GDP share of resource sector accounts for around 10 to 20 percent in 2015: Malaysia and Indonesia as the forerunners, and Lao PDR, Myanmar and Vietnam as the latecomers. As we observed, there is a contrast in the trends in their industrial structures for 1980-2015: the forerunners experienced the decline in resource sector and the increase in manufacturing sector instead, and the latecomers showed the expansion in resource sector. If the Dutch Disease effect is found in the latecomers but not in the forerunners through the VAR model estimation, some lessons from the forerunners could be extracted to apply to the latecomers on the future design of the industrial strategies.

The rest of the paper is structured as follows. Section 2 represents literature review and clarifies the contribution of this study. Section 3 conducts empirics with a VAR model estimation. Section 4 discusses the policy implications derived from the estimation outcomes. The last section summarizes and concludes.

2. Literature Review and Contribution

This section reviews the literature with a focus on the Dutch Disease hypothesis, and demonstrates this study's contributions. From the theoretical perspective, as we stated in the introduction, the Salter-Swan-Corden-Dornbusch model clarified the mechanism in which the development of natural resources deteriorates manufacturing activities. Corden and Neary (1982) originally described this mechanism in the following way: positive wealth shocks from natural resource sector, through raising higher disposal income and aggregate demand, trigger higher relative prices of non-tradable goods (spending effect) that correspond to a real exchange rate appreciation; this causes further movement of resources toward non-tradable sector away from tradable sector (resource movement effect).

From the empirical perspective, the Dutch Disease hypothesis has been intensively examined in a variety of aspects containing the effect of resource booms on a real currency appreciation. Edwards (1986), for instance, verified the causality from a commodity export boom to a real exchange rate through money-inflation link. Sachs and Warner (2001) found that resource-rich economies tended to have higher price levels after controlling for the income effect, and demonstrated further that the subsequent loss of price competitiveness in manufacturing sectors impeded their export-led growth. More recent macroeconomic studies have also provided evidence directly to support the Dutch Disease effect. Harding and Venables (2010) indicated that the response to a resource windfall is to decrease non-resource exports by 35-70 percent, and Ismail (2010) revealed that a 10 percent oil windfall is on average associated with a 3.4 percent fall in value added across manufacturing sector.

When we focus on the studies on ASEAN economies, however, there have been limited evidence on the Dutch Disease effect in such selected individual economies as Indonesia, Malaysia and Lao PDR. On the repercussions of the oil bonanza in Indonesia during the late 1970s, Usui (1996 and 1997) argued that the Dutch Disease could be avoided due to such policy adjustments as the currency devaluation in 1978 and the subsequent accumulation of budget surpluses. Pangestu (1990), on the other hand, still emphasized the existence of the Dutch Disease in Indonesia during that period by demonstrating that the currency devaluation in 1978 only provided temporary relief to the nonoil-traded-goods sector. As for the current status of Indonesia and Malaysia, Rosser (2007) and Noh (2013) argued that they succeeded in escaping the resource curse by utilizing external political and economic conditions and by diversifying economic structure, respectively.

Regarding the case of Lao PDR with resource sectors still growing, Kyophilavong and Toyoda (2009) and Kyophilavong et al. (2013), by using a macro-econometric model and a computable general equilibrium model respectively, investigated the impacts of capital inflows in resource sectors on Lao macro-economy. They found two-side effects: positive impacts in the short run, and negative effects in the long run, i.e., the Dutch Disease effect through appreciation of real exchange rate. Insisienmay et al. (2015) searched for evidence of the Dutch Disease on Lao economy by investigating the causal link from natural resource exports to real exchange rate, through estimating multiple regression equations. They found some symptoms of the disease and proposed policy options such as the investments of resource revenues for infrastructure and education.

This study aims to contribute to the literature above as follows. First, the analysis of this study addresses not an individual economy but a group of resource-abundant economies in the ASEAN by applying a common analytical methodology to the investigation of the Dutch Disease effect. It enables us to compare the applicability of the Dutch Disease among a variety of economies with different stages of development. If the Dutch Disease effect is found in the latecomers but not in the forerunners among the ASEAN, some lessons from the forerunners could be extracted to apply to the latecomers for escaping from the Dutch Disease.

Second, on an analytical method, this study adopts a VAR model estimation with Granger causality and impulse response tests. The VAR makes it possible to trace directly the causality and dynamic responsive effect from resource abundance to manufacturing activities. The causality issue would, in particular, be critical, since manufacturing activities might also affect the share of resource sector relative to GDP. Suppose that manufacturing sectors in an economy boosts its economic growth for a while and makes the economy reach a high income stage. The economy would eventually appear to have a low share of resource sector to GDP. Similarly, the lack of manufacturing activities in an economy might make the economy stay at a resource-rich status. The variables of resource sector and manufacturing sector as a percentage of GDP, therefore, have an endogenous relationship. In that case, a single-equation regression causes a estimation bias. A VAR model, instead, allows for potential endogeneity between the variables of concerns: the model lets the data determine the causality between the variables, and makes it possible to trace out the dynamic responses of variables to exogenous shocks overtime. The VAR model estimation, thus, makes it possible to strictly examine the existence of the Dutch Disease effect, i.e., whether resource abundance crowds out manufacturing sectors or not.

In sum, the contributions of this study are to deal with a group of resource-abundant economies in the ASEAN by applying a common analytical methodology for the comparison of the applicability of the Dutch Disease effect, and to analyze directly the causality and dynamic responsive effect from resource abundance to manufacturing activities in the Dutch Disease mechanism by using a VAR model as an analytical method.

3. Empirics

This section turns to the empirics for examining the Dutch Disease effect on the selected resource-rich ASEAN economies by utilizing a VAR estimation method. In this section we clarify the key variables and methodology for the estimation and the estimation outcomes.

We sample the five middle income economies among ASEAN in which the GDP share of resource sector accounts for around 10 to 20 percent in 2015: Malaysia and Indonesia as the forerunners and Lao PDR, Myanmar and Vietnam as the latecomers, for the purposes of making their comparisons and extracting some lessons from the forerunners to apply to the latecomers. All the data are retrieved from UNCTAD STAT.[3] In accordance with the data availability of the dataset, the sample period is the one from 1970 to 2015.[4]

3.1 Key Variables

We herein identify the following three key variables for a VAR model estimation to examine the existence of the Dutch Disease effect in which resource abundance crowds out manufacturing activities: mining and utility production (*mau*), manufacturing-services ratio (*mos*) and real GDP per capita (*ypc*). The reason why we focus only on these limited variables is to maximize the degree of freedom in the estimation within the short-range of annual data from 1970 to 2015.

The first variable of mining and utility production (*mau*) represents natural resource abundance in an economy. The UNCTAT STAT database has the series of "Mining, manufacturing, utilities" and "Manufacturing" as GDP (value added) by kind of economic activity in terms of US dollars at constant prices (2005) in millions. The mining and utility production is calculated by subtracting "Manufacturing" from "Mining, manufacturing, utilities" in this series.

The second variable of manufacturing-services ratio (*mos*) is introduced for examining directly the crowding-out effect on manufacturing activities, i.e., the ultimate effect of the Dutch Disease. In the context of the theoretical framework of the Salter-Swan-Corden-Dornbusch model, the manufacturing sector is assumed to be a proxy of tradables, while the service sector is that of non-tradables. The manufacturing-services ratio is derived by dividing "manufacturing in value added" by "services and construction in value added" in terms of US dollars at current prices in millions in the category of GDP

[3] See the website: http://unctadstat.unctad.org/EN/.

[4] For Myanmar, the sample period is the one from 1986 to 2015, since the values of the mining and utility production before 1985 are negligible, namely, less than 10 million US dollars at constant prices (2005).

by kind of economic activity of the UNCTAD STAT dataset. When the estimation tries further to decompose the Dutch Disease effect into “spending effect” and “resource movement effect” by following the Salter-Swan-Corden-Dornbusch model, a real exchange rate needs to be added as an intermediate variable to link resource abundance with manufacturing activities. It would, however, be difficult to estimate real exchange rates by a common formula for the five sample ASEAN economies, since they differs in the currency regimes.[5] Frankel (2010) argued, for instance, in the context of Dutch Disease, that the real appreciation in the currency takes the form of nominal currency appreciation if the country has a floating exchange rate, whereas taking the form of money inflows and inflation if the country has a fixed exchange rate. We thus omit this variable and focus only on the ultimate Dutch Disease effect.

The third variable, i.e., real GDP per capita (*ypc*) is included as a control variable in the estimation, since the manufacturing-services ratio might also be affected by development stage of an economy, for example, according to the Petty-Clark’s Law (Clark, 1940). The data for real GDP per capita is retrieved from the series of “US Dollars at constant prices (2005) per capita” in the UNCTAD STAT dataset.

Figure 2 displays the three key variables above. From simple observation, we cannot judge any clear relationships on the causality and dynamic impacts between mining and utility production (*mau*) and manufacturing-services ratio (*mos*), since both variables would be also affected by real GDP per capita (*ypc*). There comes the necessity to conduct a VAR model estimation in the next sub-section.

3.2 Methodology for a VAR Model Estimation

We now turn to the methodological issue for a VAR model estimation. Before specifying a VAR model, we investigate the property of each variable’s data, by employing a unit root test, and if needed, a co-integration test for a set of variables’ data. The unit root test is conducted on the null hypothesis that a level and/or a first difference of the individual data have a unit root. In case that the test tells us that each variable’ data has a unit root in the level, but not in the first-difference, a set of variables’ data corresponds to the case of $I(1)$, and then can be further examined by a co-integration test

[5] According to Ilzetzki et al. (2011), the recent currency regimes are described as follows. Indonesia: Managed floating/crawling band around US dollar (April 1999–December 2010); Lao PDR: De facto crawling band around US dollar (January 2007—December 2009); Malaysia: De facto band around US dollar (July 2005-December 2010); Myanmar: Dual Market/freely falling/freely floating (February 1999–December 2010); Vietnam: De facto crawling peg to US dollar/Dual Market (January 1990—March 2010).

for the "level" data. If a set of variables' data are identified to have a co-integration, the use of the "level" data is justified for a VAR model estimation. For a unit root test, we adopt the augmented Dickey-Fuller (ADF) test (see Said & Dickey, 1984), and for a co-integration test, we employ the Johansen test (see Johansen, 1995).

Table 2 reports the result of both unit root and co-integration tests. For the data of all three variables in each sample economy, the unit root test identified a unit root in their levels, but rejected it in their first differences at the conventional level of significance, thereby a set of the variables' data following the case of $I(1)$. The co-integration test was, thus, conducted further on the combination of variables, and both the trace test and the Maximum-eigenvalue test implied that the level series of a set of variables' data were co-integrated. We thus utilize the level data for a VAR model estimation on all sample economies.

We now specify a VAR model equation for estimation in the following way.

$$y_t = \mu + V_1 y_{t-1} + V_2 z_t + \varepsilon_t \qquad (1)$$

where y_t is a column vector of the variables with year t, i.e., $y_t = (mau_t \; mos_t)'$; μ is a constant vector; V_1 and V_2 are coefficient matrix; y_{t-1} is a vector of the lagged variables; z_t is a vector of the control variable of real GDP per capita (*ypc*); and ε_{it} is a vector of the random error terms in the system. The lag length (-1) is selected by the Schwarz Information Criterion with maximum lag equal to (-2) under the limited number of observations. The value data for mining and utility production (*mau*) and real GDP per capita (*ypc*) are converted into natural logarithm form for the estimation to avoid the heteroskedastic in the error terms.

Based on the estimation of a VAR model (1), we examine the Granger causality between mining and utility production (*mau*) and manufacturing-services ratio (*mos*) by controlling real GDP per capita (*ypc*). When the negative causality from *mau* to *mos* is identified at a conventionally significant level, we then investigate further the impulse response of *mos* to the *mau* shock so that we can trace the dynamic effect. If the negative impulse response is confirmed beyond a reasonable error band, we could then argue that the targeted economy has suffered from the Dutch Disease.

3.3 Estimation Outcomes

Table 3, Table 4 and Figure 3 respectively report the estimation outcomes of the VAR model, the Granger causalities and the impulse responses for the five ASEAN economies.

When we look at the result of the Granger causality test in Table 4, it was in Lao PDR and Myanmar that the causality from mining and utility production (*mau*) to manufacturing-services ratio (*mos*) was identified at the conventionally significant level. Considering the estimated VAR model in Table 3, the causality in both economies is supposed to be in a negative direction, thereby implying the crowding-out effect of resource production on manufacturing activity. We then step into the test of impulse response of manufacturing-services ratio (*mos*) to the shock of mining and utility production (*mau*) focusing on Lao PDR and Myanmar. Figure 3 reported that *mos* negatively responded to the *mau* shock beyond a 95 percent error band during six- or seven-year interval.

Regarding the other economies, namely, Indonesia, Malaysia and Vietnam, the causality from mining and utility production (*mau*) to manufacturing-services ratio (*mos*) was not found at the significant level. We then examine further the causality on three economies by dividing sample period for 1970-2015 by the midpoint of 1995 after checking a structural change on that point (see Table 5, 6 and 7). The structural change could be examined by Chow's breakpoint test to diagnose a breakpoint by the F-statistics with probabilities for the hypothesis of parameter stability over different periods for the combination of variables, i.e., mining and utility production (*mau*) and manufacturing-services ratio (*mos*). Table 5, 6 and 7 verified the existence of a breakpoint in 1995 in Indonesia, Malaysia and Vietnam. We thus conduct a VAR model estimation of (1) and the Granger causality test again for the different periods of 1970-1995 and 1995-2015 on three economies.

In Indonesia, Table 5 identified the causality from mining and utility production (*mau*) to manufacturing-services ratio (*mos*) in 1970-1995, but not in 1955-2015. The causality in 1970-1995 was negative in its direction judging from the estimated VAR model jointly. As for Malaysia, the causality was not found in either periods at the significant level as shown in Table 6. It should, however, be noted that the sign of the coefficient of the lagged *mau* explaining *mos* turned from negative one in 1970-1995 to positive one in 1995-2015 in the estimated VAR model. Vietnam has another picture on the causality in Table 7. The causality was confirmed not in 1970-1995 but in 1995-2015 and the causality in 1995-2015 was positive in its direction in the estimated VAR model.

We interpret the estimation outcomes above as follows. First, the latecomers of Lao PDR and Myanmar with the rising trends in resource sector share have suffered the Dutch Disease over the sample period judging from the crowding-out effect of resource production on manufacturing activity. Second, the forerunners of Indonesia and Malaysia have no Dutch Disease effect at least in the current period of 1995-2015, although

Indonesia had experienced the Dutch Disease in the previous period of 1970-1995. Third, Vietnam may have a different story from the other sample economies. The current positive causality from mining and utility production to manufacturing activity may come from the expansion in utility production. In fact, the utility production as a percentage of GDP went up from 3.26 in 2005 to 3.99 in 2015, whereas the mining production share dropped from 9.73 in 2005 to 9.61 in 2015.[6] This may suggest that not mining sector but availability of electricity has promoted manufacturing activity, which has little to do with the Dutch Disease issue. We thus exclude Vietnam in the discussions in the later section.

4. Discussions on Policy Implications

This section discusses the policy implications derived from the estimation outcomes in the previous section. To be specific, the questions are why the forerunners of Indonesia and Malaysia have currently no Dutch Disease effect, and in particular why Indonesia has been able to escape from the Dutch Disease; and what kinds of lessons from the forerunners could be extracted to apply to the latecomers of Lao PDR and Myanmar who are currently suffering from the Dutch Disease. We herein pick up the following three perspectives on this issue.

The first perspective is whether an economy is mobilizing its resource revenues for a productive use, namely, investments necessary for its future development. From the theoretical viewpoint, Sachs (2007) proposed an economic model to explain that the Dutch Disease could be reversed if natural resource earnings were used not for consumption but for public investment. In reality, Demachi and Kinkyo (2014) introduced the following advanced practices of Indonesia and Malaysia: Indonesia directed its oil revenues to rural infrastructure, in particular, to implementing large-scale projects for school construction; and Malaysia achieved resource-based industrialization by directly allocating natural resource revenues to investments in heavy industries. Regarding institutional system, Indonesia has set up the "Revenue Sharing Fund" since 2005[7], and Malaysia has managed the "National Trust Fund" since 1988[8], respectively, for the purpose of setting aside natural resource revenues and of using them for specific development projects, whereas the latecomers, Lao PDR and Myanmar, have no specific funds yet. The revenue management can also be evaluated by the Resource Governance

[6] The data are retrieved from General Statistics Office Of Vietnam.
See the website: http://www.gso.gov.vn/default_en.aspx?tabid=775.

[7] See EITI Indonesia Report 2014: https://eiti.org/document/2014-indonesia-eiti-report.

[8] See the website of Natural Resource Governance Institute: https://resourcegovernance.org/natural-resource-funds.

Index. The latest index in 2017 in Table 8 indicated that Lao PDR and Myanmar are far behind Indonesia and Malaysia in the rankings of "revenue management" as well as composite index and the other items. From these points, some funding system of allocating resource revenues for investment and development projects should be urgently established in Lao PDR and Myanmar, who have a rising share of resource sector and also get the Dutch Disease effect.

The second perspective is whether an economy is promoting strategic policies to diversify its industries without depending heavily on resource sector. As we observed in Table 1, the forerunners of Indonesia and Malaysia depend no more on resource sector by getting a dominant GDP share of manufacturing sector in 2015. As we mentioned in the literature review, Rosser (2007) and Noh (2013) argued that Indonesia and Malaysia succeeded in escaping from the resource curse by diversifying economic structure, respectively. In order to diversify domestic industries, the most effective way would be to invite foreign direct investment (FDI), when the economy is lacking in technological capability and entrepreneurship. Kimura (2006) argued that the ASEAN forerunners had started applying the "accept everybody" policy for incoming FDI in the latter half of the 1980s or the early 1990s, and had enhanced locational advantages through various measures to compete over hosting FDI. As a consequence, the business environments in Indonesia and Malaysia are far better than those in Lao PDR and Myanmar as shown in the rankings of the "Doing Business 2017" in Table 9. The diversification of industries by improving business environments should, therefore, be facilitated for the latecomers of Lao PDR and Myanmar.

The last perspective is whether an economy is improving its institutional quality to transform its economic structure from "resource curse" to "resource blessing". Van der Ploeg (2011) argued that "good institution" made it possible to turn the resource effect from a curse to a blessing. A typical example was found in the case of Indonesia. Asanuma (2008) argued that the "Pertamina", the largest state-owned enterprise in Indonesia, fell into a crisis in 1975 due to its mismanagement in the resource-curse era; and since then it had been the "Technocrats" that had taken over the control of oil and gas revenues and had carried out a series of reforms for reducing the country's dependence on oil and gas and for diversifying the economy. The institutional quality could be represented by the Worldwide Governance Indicators in Table 10. The indicator takes the value of -2.5 in the worst quality and of 2.5 in the best one, and the value of around zero in the world average. We observed that during the past two decades, the indicator of Indonesia improved and that of Malaysia kept high scores, while those of Lao PDR and Myanmar stayed still behind those of Indonesia and Malaysia. The latecomers of Lao PDR and Myanmar who suffer from resource curse in terms of the Dutch Disease could turn out to enjoy resource blessing with the improvement of their institutional qualities.

5. Concluding Remarks

This paper examined the applicability of the Dutch Disease hypothesis focusing on the selected resource-rich ASEAN economies by using a VAR model as an analytical method. For the analytical samples, we targeted the five middle income economies in which the GDP share of resource sector accounts for around 10 to 20 percent in 2015: Malaysia and Indonesia as the forerunners, and Lao PDR, Myanmar and Vietnam as the latecomers. Comparing industrial structures in 2015 and 1980, the forerunners experienced the decline in resource sector and the increase in manufacturing sector instead, and the latecomers showed the expansion in resource sector.

The main findings of the empirical study were summarized as follows. The latecomers of Lao PDR and Myanmar seemed to suffer from the Dutch Disease over the sample period judging from the crowding-out effect of resource production on manufacturing activity. The forerunners of Indonesia and Malaysia, on the other hand, appeared to have no Dutch Disease effect at least in the current period of 1995-2015, although Indonesia had experienced the Dutch Disease in the previous period of 1970-1995.

The study extracted the lessons from the forerunners' experiences in order for the latecomers to escape from the Ditch Disease as follows. The latecomers are to establish some funding system of allocating resource revenues for investment projects; to diversify domestic industries through improving business environments for attracting FDI; and to improve institutional quality to reinforce resource governance.

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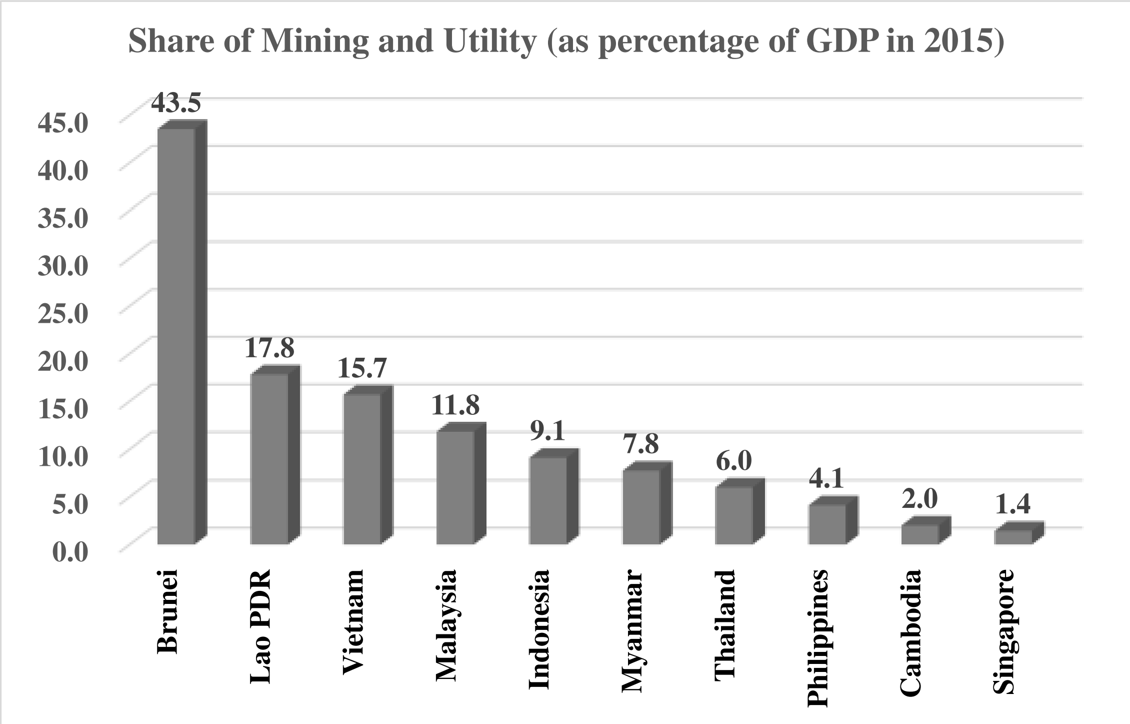
Figure 1 Comparison in Resource Abundance among ASEAN in 2015



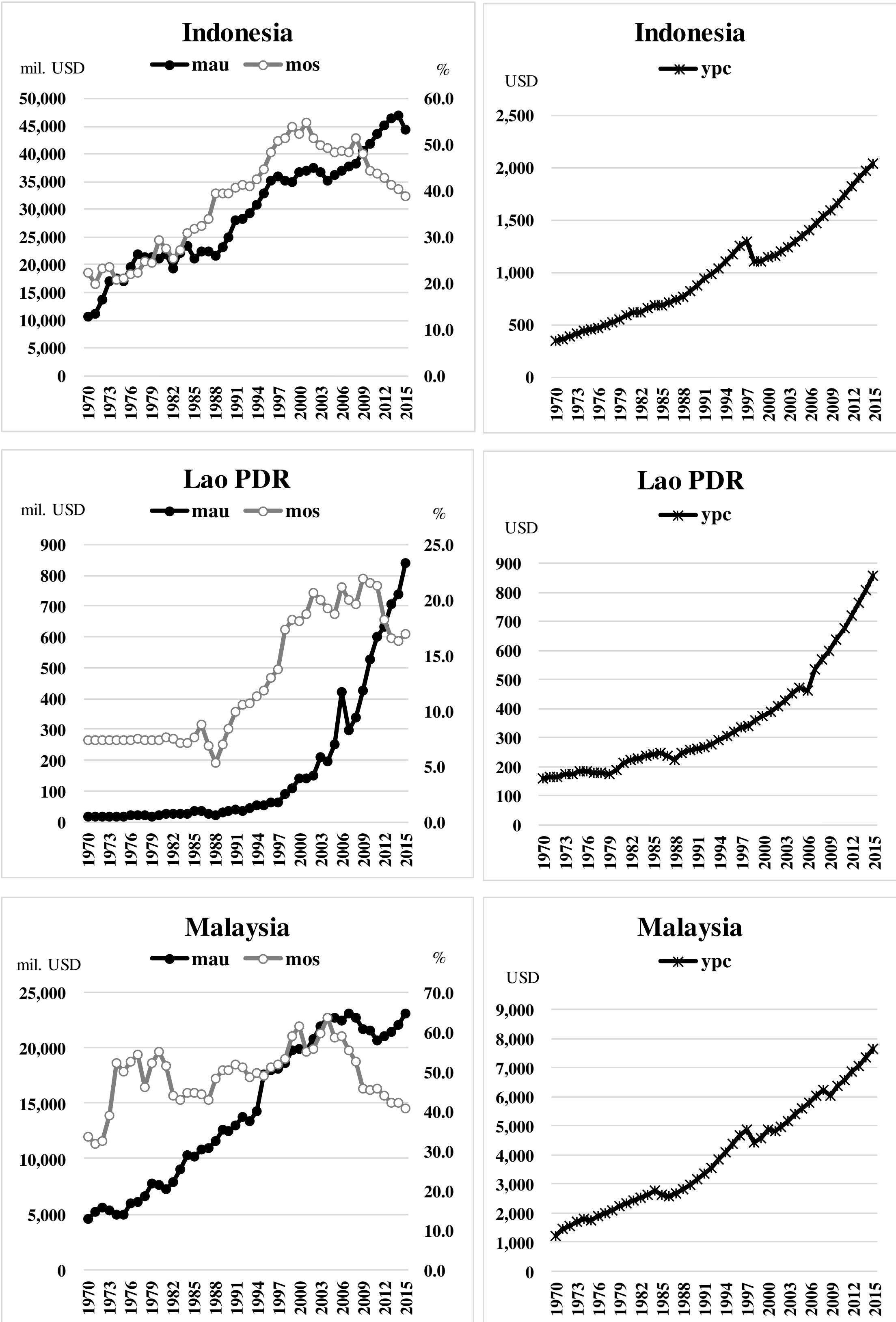
Source: UNCTAD STAT

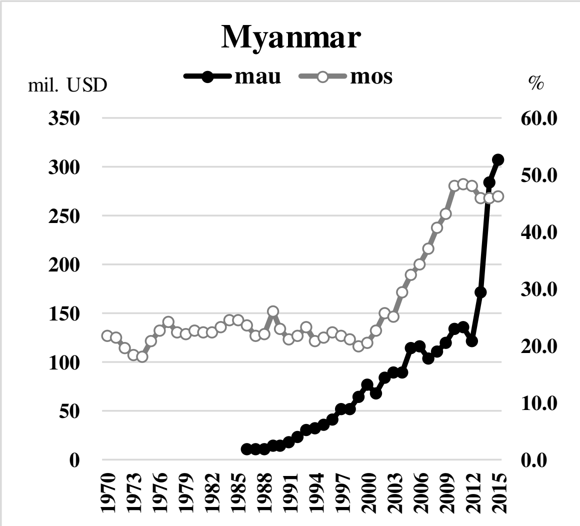
Table 1 Industrial Structure in Selected ASEAN Economies

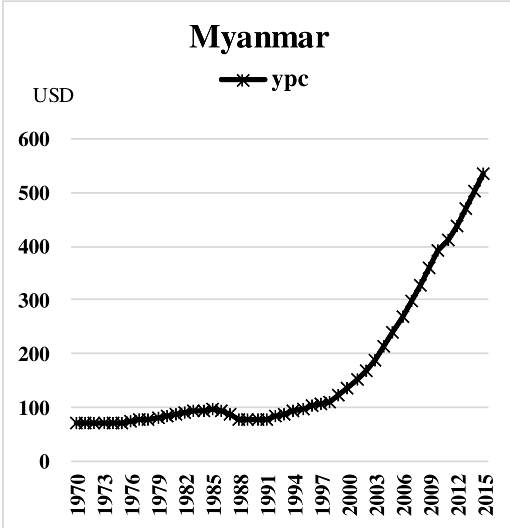
GDP Ratio %	2015		1980	
	Mining & Utility	Manufacturing	Mining & Utility	Manufacturing
Lao PDR	17.8	8.5	5.6	3.8
Vietnam	15.7	15.2	3.9	11.5
Malaysia	11.8	23.1	15.2	21.9
Indonesia	9.1	21.5	23.0	12.4
Myanmar	7.8	20.7	1.5	9.5

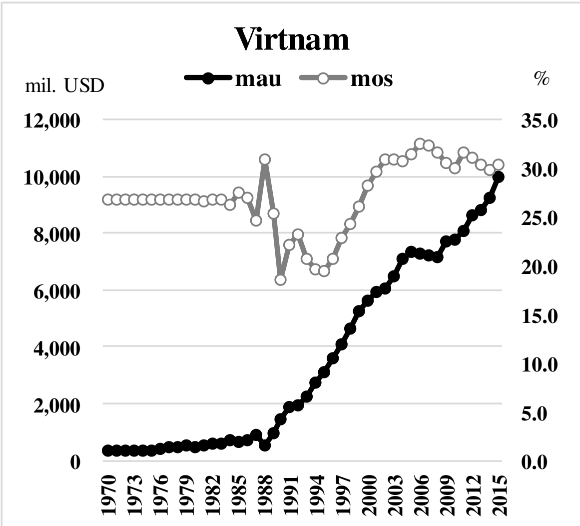
Source: UNCTAD STAT

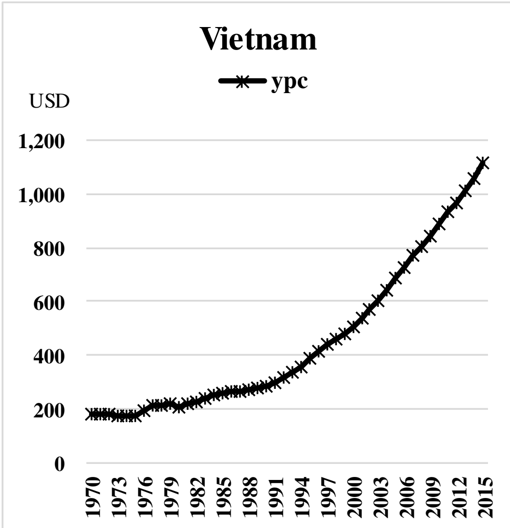
Figure 2 Overviews of Key Variables











Source: UNCTAD STAT

Table 2 ADF Unit Root Test and Johansen Co-integration Test

	Unit Root Test (ADF Test)		Cointegration Test (Johansen Test)	
	Level	First Difference	Trace	Max-eigen
[Indonesia]				
mau	-1.12	-5.62 ***		
mos	-1.42	-6.06 ***	31.23 ***	24.22 ***
ypc	2.30	-4.44 ***		
[Lao PDR]				
mau	4.18	-3.87 ***		
mos	-0.76	-5.25 ***	18.48 **	15.38 **
ypc	2.60	-6.41 ***		
[Malaysia]				
mau	-0.69	-5.37 ***		
mos	-2.39	-5.94 ***	12.25 *	11.84 **
ypc	1.54	-5.97 ***		
[Myanmar]				
mau	-0.07	-3.92 **		
mos	0.48	-3.95 ***	33.78 ***	23.77 **
ypc	-1.17	-3.71 **		
[Vietnam]				
mau	3.10	-3.72 ***		
mos	-1.72	-3.26 **	33.07 ***	25.29 ***
ypc	1.13	-4.03 **		

Note: ***, **, * denote rejection of null hypothesis at the 99%, 95% and 90% level of significance, respectively.

Table 3 Estimated VAR Model

Indonesia	*mau*	*mos*
mau-1	0.630 *** [7.391]	-0.088 [-0.025]
mos-1	0.001 [0.700]	0.977 *** [16.150]
C	2.290 *** [4.547]	5.073 [0.244]
ypc	0.215 *** [3.268]	-0.430 [-0.158]
adj. R^2	0.976	0.959
Lao PDR	*mau*	*mos*
mau-1	0.512 *** [3.809]	-2.703 ** [-2.474]
mos-1	0.026 ** [2.558]	1.097 *** [13.255]
C	-4.201 *** [-3.487]	-22.311 ** [-2.281]
ypc	1.045 *** [3.553]	5.678 ** [2.378]
adj. R^2	0.988	0.961
Malaysia	*mau*	*mos*
mau-1	0.890 *** [11.716]	7.459 [1.584]
mos-1	0.000 [0.097]	0.788 *** [8.682]
C	0.349 ** [2.191]	10.943 [1.109]
ypc	0.086 [1.047]	-8.644 [-1.691]
adj. R^2	0.986	0.711
Myanmar	*mau*	*mos*
mau-1	0.965 *** [9.150]	-2.507 ** [-2.064]
mos-1	0.000 [0.061]	0.591 *** [5.086]
C	0.083 [0.118]	-27.934 *** [-3.455]
ypc	0.029 [0.111]	9.829 *** [3.250]
adj. R^2	0.976	0.972
Vietnam	*mau*	*mos*
mau-1	0.911 *** [9.581]	1.688 [1.427]
mos-1	-0.010 [-1.129]	0.900 *** [7.941]
C	-0.137 [-0.310]	7.270 [1.319]
ypc	0.194 [0.911]	-2.883 [-1.089]
adj. R^2	0.985	0.738

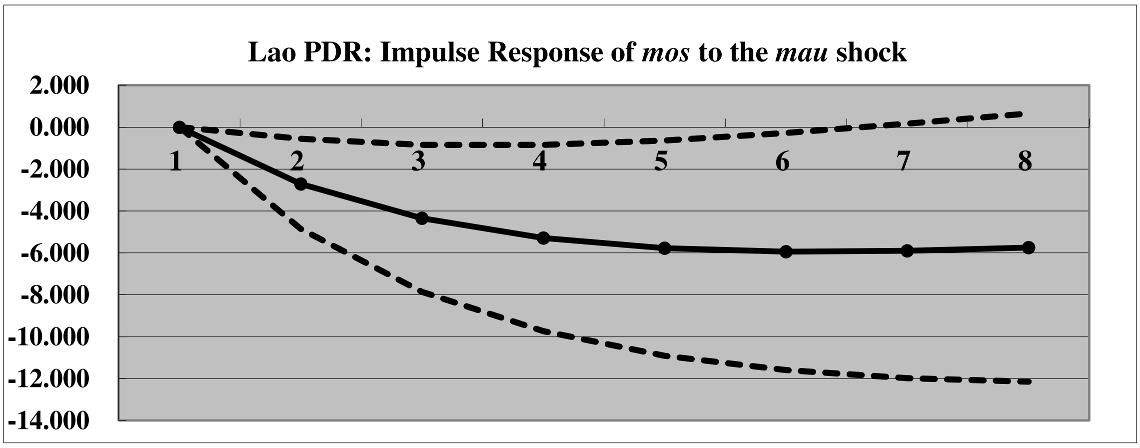
Note: ***, ** denote rejection of null hypothesis at the 99% and 95% level of significance, respectively. The figure in [ ] are t-value.

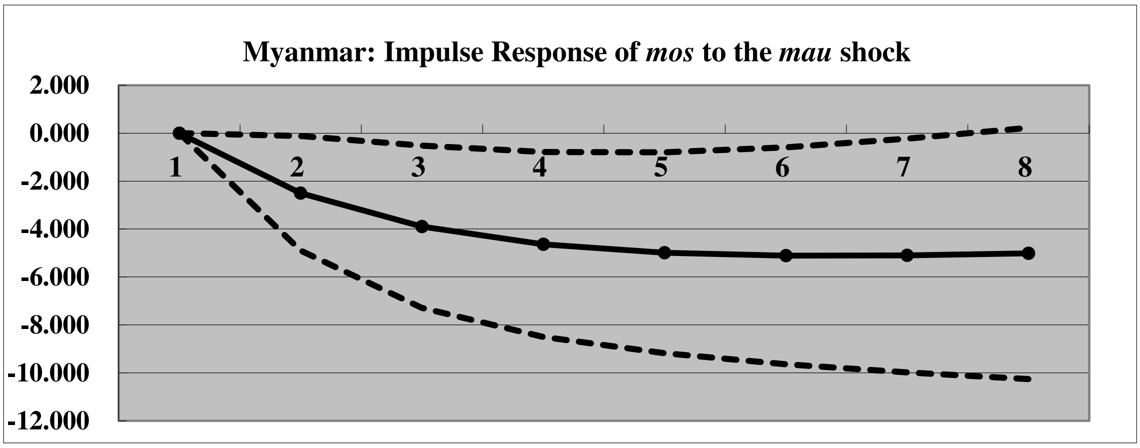
Table 4 Granger Causality Test

	Null Hypothesis	Lags	Chi-sq
Indonesia	*mau* does not Granger Cause *mos*	1	0.000
Lao PDR	*mau* does not Granger Cause *mos*	1	6.122 **
Malaysia	*mau* does not Granger Cause *mos*	1	2.510
Myanmar	*mau* does not Granger Cause *mos*	1	4.263 **
Vietnam	*mau* does not Granger Cause *mos*	1	2.038

Note: ** denotes rejection of null hypothesis at the 95% level of significance.

Figure 3 Impulse Responses





Note: The dotted lines represent a 95 percent error band over 8-year horizons.

Table 5 Structural Change in Indonesia

[Chow Test]

	Breakpoint	F-statistic	Probability
mau & mos	1995	101.977	0.000

[Estimated VAR Model]

1970-1995	*mau*	*mos*
mau-1	0.456 *** [2.963]	-8.314 ** [-2.051]
mos-1	-0.009 [-1.387]	0.388 ** [2.144]
C	2.187 *** [2.910]	-31.698 [-1.601]
ypc	0.547 ** [2.307]	20.605 *** [3.300]
adj. R^2	0.923	0.953
1995-2015	*mau*	*mos*
mau-1	0.557 *** [4.328]	-2.948 [-0.365]
mos-1	0.001 [0.787]	0.584 *** [4.192]
C	2.869 *** [3.361]	117.621 ** [2.198]
ypc	0.238 *** [2.725]	-9.200 * [-1.677]
adj. R^2	0.934	0.861

Note: ***, **, * denote rejection of null hypothesis at the 99%, 95% and 90% level of significance, respectively. The figure in [ ] are t-value.

[Granger Causality Test]

	Null Hypothesis	Lags	Chi-sq
1970-1995	*mau* does not Granger Cause *mos*	1	4.207 **
1995-2015	*mau* does not Granger Cause *mos*	1	0.133

Note: ** denotes rejection of null hypothesis at the 95% level of significance.

Table 6 Structural Change in Malaysia

[Chow Test]

	Breakpoint	F-statistic	Probability
mau & mos	1995	9.735	0.000

[Estimated VAR Model]

1970-1995	*mau*	*mos*
mau-1	0.606 *** [4.296]	-1.960 [-0.223]
mos-1	-0.005 * [-1.841]	0.660 *** [3.840]
C	-0.534 [-1.390]	7.206 [0.301]
ypc	0.559 *** [2.910]	3.438 [0.287]
adj. R^2	0.969	0.526
1995-2015	*mau*	*mos*
mau-1	0.302 * [1.917]	21.640 [1.488]
mos-1	0.005 ** [2.276]	0.521 ** [2.366]
C	3.904 *** [5.882]	34.066 [0.557]
ypc	0.318 ** [2.568]	-25.974 ** [-2.272]
adj. R^2	0.861	0.819

Note: ***, **, * denote rejection of null hypothesis at the 99%, 95% and 90% level of significance, respectively. The figure in [ ] are t-value.

[Granger Causality Test]

	Null Hypothesis	Lags	Chi-sq
1970-1995	*mau* does not Granger Cause *mos*	1	0.049
1995-2015	*mau* does not Granger Cause *mos*	1	2.216

Table 7 Structural Change in Vietnam

[Chow Test]

	Breakpoint	F-statistic	Probability
mau & mos	1995	44.510	0.000

[Estimated VAR Model]

1970-1995	*mau*	*mos*
mau-1	0.733 *	-5.967
	[1.932]	[-1.423]
mos-1	0.006	-0.155
	[0.165]	[-0.369]
C	-3.604 **	39.491 **
	[-2.211]	[2.194]
ypc	0.959	5.228
	[1.282]	[0.632]
adj. R^2	0.925	0.522
1995-2015	*mau*	*mos*
mau-1	0.997 ***	10.385 ***
	[9.088]	[5.239]
mos-1	-0.010 **	0.550 ***
	[-1.999]	[6.011]
C	0.265	-29.631 ***
	[0.578]	[-3.575]
ypc	0.016	-7.311 ***
	[0.224]	[-5.608]
adj. R^2	0.990	0.979

Note: ***, **, * denote rejection of null hypothesis at the 99%, 95% and 90% level of significance, respectively. The figure in [ ] are t-value.

[Granger Causality Test]

	Null Hypothesis	Lags	Chi-sq
1970-1995	*mau* does not Granger Cause *mos*	1	2.027
1995-2015	*mau* does not Granger Cause *mos*	1	27.447 ***

Note: *** denotes rejection of null hypothesis at the 99% level of significance.

Table 8 Resource Governance Index 2017 (Rankings among 89 countries)

	Indonesia	Malaysia	Lao PDR	Myanmar
Composite Index	11 (mining) 12 (oil & gas)	27 (oil & gas)	64 (mining)	77 (oil & gas) 83 (mining)
Value Realization	14 (mining) 15 (oil & gas)	51 (oil & gas)	65 (mining)	60 (oil & gas) 76 (mining)
Revenue Management	6 (mining) 6 (oil & gas)	46 (oil & gas)	65 (mining)	65 (oil & gas) 65 (mining)
Enabling Environment	27 (mining) 27 (oil & gas)	10 (oil & gas)	57 (mining)	76 (oil & gas) 76 (mining)

Source: Natural Resource Governance Institute: http://resourcegovernanceindex.org/

Table 9 Doing Business 2017 (Rankings among 190 countries)

	Indonesia	Malaysia	Lao PDR	Myanmar
Total Rank	91	23	139	170
Starting a Business	151	112	160	146
Dealing with Construction Permits	116	13	47	66
Getting Electricity	49	8	155	149
Registering Property	118	40	65	143
Getting Credit	62	20	75	175
Protecting Minority Investors	70	3	165	179
Paying Taxes	104	61	146	119
Trading across Borders	108	60	120	159
Enforcing Contracts	166	42	88	188
Resolving Insolvency	76	46	169	164

Source: The World Bank: http://www.doingbusiness.org/rankings

Table 10 Worldwide Governance Indicators in 2015

	Indonesia	Malaysia	Lao PDR	Myanmar
Control of Corruption	-0.45	0.28	-0.84	-0.89
Government Effectiveness	-0.22	0.96	-0.50	-1.24
Political Stability	-0.60	0.19	0.48	-1.17
Regulatory Quality	-0.21	0.77	-0.80	-1.26
Rule of Law	-0.41	0.57	-0.75	-1.22
Voice and Accountability	0.14	-0.35	-1.67	-1.30
Average	-0.29	0.41	-0.68	-1.18
Average in 1996	-0.52	0.49	-0.68	-1.53

Source: The World Bank: http://data.worldbank.org/