

# Interlocking3

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## Does board interlock control high-tech performance? Evidence from ASEAN's Growth Countries

30

### Abstract

The aim of this study is to explain the board interlock association on high-tech firm performance in three growth ASEAN countries. The research samples were 109 high-tech listed manufacturing firms, consisting of 38 Indonesian firms, 37 Malaysian firms, and 34 Thai firms in the 2015-2018 period. The study used panel regression analysis. The research found that corporate governance through interlock directorates is a determinant of high-tech firm performance. The low human capital with high-tech capabilities in ASEAN countries can be overcome by interlocking and facilitating companies to access strategic information. This study also found a positive association between director woman interlock and corporate performance. On the other hand, an independent director who does interlocking actually has a negative effect on company performance. This research is the first research on board interlock in high-tech firms in ASEAN growth countries, Indonesia, Malaysia, and Thailand. There is still limited research involving more than one country, especially developing countries, in studying the interlock board relationship on the company performance. The highlight of this study is to compare the effects of the three interlocks, interlocking directorate, woman interlock, and independent interlock, and their associations on the profitability of high-tech firms. Investors can have an in-depth understanding of the role of the type of interlock that affects the profitability and make the right decision in investing.

**Keywords** ASEAN countries; Firm performance; High-tech firm; Woman interlock; Board interlock; Independent interlock.

### INTRODUCTION

ASEAN countries which had been originally carried out economic activities based on natural resource products began to shift towards economic activities based on high-tech firm manufacturing (Ho, 2019; Nimtrakoon, 2015; Yatim et al, 2014). Saeed et al (2019) in their research on the high-tech firm sector in developing countries of India stated that complex innovations and uncertainties arising from the demand from customers and technology which are experiencing rapid development are characteristics of high tech firms. In line with Kwon and Lee's research (2019) stated that high-tech firms that are in a dynamic competitive market environment need to adapt to unexpected demands and offer innovative products that are time-sensitive, to maximize the use of technological innovation. The high growth of the high-tech firm industry is one of the characteristics that distinguish it from other types of industry. In addition to high growth potential, high-tech firms are characterized by inherent uncertainty in the company regarding their firm value, where this value depends on unproven or uncharted future results (Kohers & Kohers, 2000). As a result of the combination of characteristics they have, risk-taking is needed by high-tech firms (Saeed et al, 2019).

In the corporate governance system, the executive board is a very important position, in which making company policies, making decisions and monitoring the majority of company activities is carried out by the executive board (Ramaswamy, 2019). It is not uncommon for companies to practice interlocking directorate considering the important role played by directors in influencing company performance. Research related to the practice of interlocking directorate

has developed rapidly over the last few decades. Lamb and Roundy (2016) stated that there are opportunities to develop research on interlocking directorate by paying attention to samples of different countries from the general researches. In several studies, the interlocking directorate has the same meaning as the words "dual director", "multiple directorships" and "shared director", which is a condition for someone who holds a position on the executive board is affiliated with a company, sits and also serves on the executive board of other companies that create relationships with companies, shareholders and individuals (Barosso et al, 2016). The relationship that has been formed brings together different directors on one board, thus forming relationships between different companies (Caiazza & Simoni, 2019).

In developed countries, there are best practices that determine the limit on the number of a board in interlocking. Whereas in developing countries, the number exceeds the existing limits in developed countries (Yatim et al, 2014; Sarkar & Sarkar, 2009). In developing countries, 3 executive board can interlock several companies and there are no rules that limit him or her. It is consistent with the findings of Tan et al (2019), that in Asia Pacific the proportion of councils that interlock in developing countries is greater than in developed. The high number of boards that interlock in developing countries can be caused by the limited number of directors available to companies (Sarkar & Sarkar, 2009) so that interlocking can be a valuable asset for companies in developing countries (Yatim et al, 2014). In addition, Arioglu (2020) stated that if the company wants to survive, it needs to overcome the existing uncertainties. Overcoming uncertainty can be done by practicing interlocking directorate, both general practice of interlocking directorate (Martin et al, 2013), woman interlock to see from the side of gender diversity (O'Hagan, 2017), and Independent interlock (Liao & Chen, 2020) to see if the independent director is doing the interlocking.

Most previous studies had conducted research on the board interlock phenomenon (Markoczy et al, 2020; Liao & Chen, 2020; Hernández-Lara & Gonzales-Bustos, 2019; O'Hagan, 2017; Zona et al, 2015; Martin et al, 2013). The increasing number of studies on the influence of board interlocks on the company has become evidence of the increasing interest in understanding the unique characteristics inherent in interlock boards. Markoczy et al (2020), for example, examined the effect of board interlocks on the re-appointment of female directors with samples from China. Liao & Chen (2020), conducted research on independent interlock directors on company earnings persistence with samples from China. Research conducted by Hernández-Lara & Gonzales-Bustos (2019) aimed to study the effect of business relations and social structure of interlocking on innovations with samples from the country of Spain. O'Hagan (2017) conducted research on board interlock in terms of gender by finding out the effect of woman interlock on company performance with samples from the USA. Zona et al (2015) studied the effect of board interlock on the firms' firm performance and combined the views of agency-resource dependence in explaining their findings with samples from Italy. Martin et al (2013) examined the role of uncertainty in the effect of the directorate interlock on firm performance with samples from the USA. From several studies related to board interlocks, not too many discussed the effect of more than one type of board interlocks on the firm performance of high-tech firms in developing countries, especially using samples of more than one country. Therefore, this study aims to fill the literature gap by analyzing the effect of board interlock type, namely interlocking directorate, woman interlock, and independent interlock on the firm performance of high-tech firms in developing countries in ASEAN using samples from Indonesia, Malaysia, and Thailand or which is better known as the ASEAN's Growth Triangle.

### Resource Dependence theory (RD Theory)

The literature review process begins by searching for combining the words "Interlock" and "High-tech" by limiting the scope of searches to business, management, and accounting published between 2012 – 2021 and cover only journal articles and conference papers. The searching for word combinations in articles and conference papers was based on abstracts, titles, and keywords. The leading bibliographic databases used in the search for relevant literature are Emerald Insight, Science Direct, and Scopus. The choice of this database is because it has a broad scope of interlocking topics. Researchers found 345 articles based on the keywords "Interlock" when combined with "High-tech" only an article were obtained from the three literature databases. This shows that previous studies on interlocking in high-tech firms are still limited.

The debate about interlocking directorates began way back in 1914, during the emerging debate period (1914-1970), basic concepts and interest in the causes of interlocking directorates emerged which led to the birth of RD theory (Caiazza & Simoni, 2019), where RD theory formulated by Pfeffer and Salancik (1978). Many studies currently use RD theory in explaining the phenomenon of the interlocking directorate (Hernández-Lara & Gonzales-Bustos, 2019; O'Hagan, 2017; Zona et al, 2015; Martin et al, 2013). RD theory describes an organization as an open system in which its performance depends on its ability to get resources from other companies through the reciprocal exchange (Pfeffer & Salancik, 1978). The executive board is a vital resource for the company because it can equip for a network of the company's external environment (Arioglu, 2020), sharing important knowledge for company managers (Kiliç & Kuzey, 2016). One of the ways the executive board provides a relationship for the external environment of the company is by the interlocking directorate. Zona et al (2015) argued that the relationship formed through an interlocking directorate can provide several benefits such as gaining access to resources, including tangible and intangible resources. Through this interlocking relationship, there is access to a variety of unique information and the ability to learn new organizational practices. Interlocking directorate can affect the performance of an organization by utilizing access to resources from the interlocking relationship for the needs of the organization's environment so that the organization gets greater performance benefits (Richardson, 1987).

Lamb and Roundy (2016) and Martin et al (2013) stated that resource search is one of the main reasons why board interlocks are formed, there are views from some executives that board interlocks can help companies form connections with other companies, helping executives in securing important resources needed by the company, so as to minimize environmental uncertainty. RD theory explains that a company in response to uncertainty will build a network such as an interlocking directorate to avoid the potential of negative effects of uncertainty in company performance (Martin et al, 2013). Burt (1980) showed that firms tend to interlock with firms in other sectors when they have a dependency relationship where efficient interlocking will increase profitability.

64

RD theory recognizes women's participation in the composition of the executive board as an important resource in the board of a company Adeabah et al (2018). Their participation can increase profits for company performance. This theory stated that the council as a vital resource can provide external resources by including gender diversity to support the management of environmental uncertainty (Arioglu, 2020). There are still a few female directors who do interlocking in Indonesia, Malaysia, and Thailand, around 8.4% of the 63.6% interlocking



directorate (table II), because of the patriarchal culture that is still strong in ASEAN countries. It can be said that it is discrimination if the participation of women on a executive board is minimal (Kiliç & Kuzey, 2016).

### Stewardship theories

Stewardship theory stated that this theory provides greater authority and power to the board to act as a steward who is responsible for managing the company. This theory suggests that the council will work hard to achieve the goals of the owners (Boyd et al, 2011). The executive board seeks to achieve shareholder's goals to maximize shareholder's wealth regardless of how much ownership the board has (Subramanian, 2018). In addition, the council is able to unite various interests and is willing to act to protect the owners' long-term interests and welfare (Kallamu & Saat, 2015;).

Essentially, the board can do satisfactory work and become a good steward of assets for the company, so that the executive board who are dominated by inside directors can work to maximize shareholders' wealth (Donaldson, 1990). This theory also stated that inside directors can perform as stewards who have interests that are aligned with shareholders (Davis et al, 1997). Inside directors have more knowledge and information about the company than outside directors or independent directors, where this can support the right decision making (Donaldson & Davis, 1991). Regarding firm performance, stewardship theory stated that inside directors have a greater influence on board decision making because of their expertise, experience, and knowledge of the company (Kallamu & Saat, 2015).

### Hypotheses

Reducing environmental uncertainty as well as external interdependence is generally carried out by companies that have limited resources and their efforts in managing dependency (Zona et al, 2015) by creating a network of relationships or bringing dependence into the organization is the focus of RD theory. With the interlocking directorate, it can be used as a mechanism to reduce environmental uncertainty in a company (O'Hagan, 2017; Martin et al, 2013). It is in line with the statement of Ramaswamy (2019), that interlock acts as a medium of information so that habits in other companies will be carried, shared, and implemented in the original company through social relationships that are formed.

When directors occupy several positions on the executive board of other companies, they can create relationships with other companies and influence each other (Caiazza & Simoni, 2019) in the form of access to strategic information resources (Barosso-Cast et al, 2016), minimizing the uncertainty of the business environment, access to unavailable information to the public, combining the strategies and practices of the two companies. When an interlock director is affiliated with another company that has a positive reputation, it will have a positive impact on the performance of the original company (Lamb and Roundy, 2016). The board relationship that is formed can be a mechanism for exchanging information between companies by bringing together directors who have specific knowledge and sharing that knowledge, thus potentially increasing firm value through additional resources for companies involved in the interlock (Ramaswamy, 2019). Especially in companies that have limited resources, the interlock relationship that is

formed will reduce these limitations and improve the performance of the company (Zona et al, 2015). Through this explanation, the proposed hypothesis is:

H1: There is positive influences between the interlocking directorate and the firm performance of the company

Several studies have shown that women have characteristics that make them more valuable than men. First, women tend not to have problems attending board meeting, they are considered more responsible (Arioglu, 2020). Second, in terms of monitoring, women tend to be more diligent when compared to men (Adams & Ferreira, 2009). Third, gender diversity further increases firm risk-taking (Saeed, 2019). Critical resources related to connections (networks) for both customers and competitors, understanding related to the industry, and access to financing can increase the presence of female directors, so that company performance can increase (Reguera-Alvarado et al, 2015). In addition, the human capital they bring to the board tends to increase the pool of knowledge so that it can create advantages in decision making (Post & Byron, 2015). Because of these characteristics, O'Hagan (2017) stated that companies that fail to recruit female directors have the potential to harm the company's firm performance.

Interlocking can be a way that can help women to gain ease in becoming a member of the executive board (Hernández-Lara & Gonzales-Bustos, 2019). Several studies have found a positive influence between women in board positions on the company's firm performance (Arioglu, 2020; Kiliç & Kuzey, 2016; Post & Byron, 2015; Reguera-Alvarado et al, 2015), in addition, there is also a finding by O'Hagan (2017) that companies have experienced an increase in company performance when the level of participation of female directors in the interlock is high. Because of these findings, the hypothesis put forward for the woman interlock phenomenon is:

H2. There is a positive influence between woman interlock on the company's firm performance

A director who has added value related to human capital can be appointed to an interlocking position so that one of the motivations for involving the director in interlocking activities is to access the ability, experience, and individual expertise of the director (Lamb & Roundy, 2016). According to Hernández-Lara and Gonzales-Bustos (2019), the difference in the influence of the type of director (inside director and outside director) shall constitute a change of the role of interlock directors. Outside directors who hold positions on board members and have no special or personal relationship with the company either as employees or former employees are called independent directors (Adams & Ferreira, 2009). Independent directors have an important role in supervising the board, exerting influence over the choice of company accounting policies and methods (Liao & Chen, 2020) and monitoring board activity, and controlling decision making by the board (Merendino & Melville, 2019). Independent interlocks play an important role in bridging the network consisting of interlocks of companies. However, there is literature that claims that independent interlocks can reduce a company performance because independent interlocks networks can form small groups that have the opportunity to collude with each other to thwart shareholders' interests (Liao & Chen, 2020). Unlike the inside director, an independent director who has concurrent positions at several companies at the same time will fail to devote all his abilities to one company (Liao & Chen, 2020). Based on the stewardship theory, basically, an inside director is an individual who can be trusted and can be called a good steward who will work based on the interests of shareholders (Davis et al, 1997). This theory argued that the majority of boards must consist of inside directors because inside directors have better information and knowledge in making effective decisions than independent directors (Donaldson & Davis, 1991).

Consistent with Arora and Sharma (2016) and Sanan et al (2019) found that there is a negative influence between independent directors and the company's firm performance. Because of this research, the proposed hypothesis is:

H3. There is a negative influence between independent interlocks on the company's firm performance

## RESEARCH METHOD

### Sample and data collection

The samples used were high-tech firms in Indonesia, Malaysia, and Thailand. These three countries are three of the five largest developing countries in ASEAN and have the title of the founding countries of ASEAN (Nimtrakoon, 2015). The three countries are growth ASEAN countries that are members of the Indonesia-Malaysia-Thailand Growth Triangle (IMT-GT). This study uses a balanced panel. Samples were companies listed on the Indonesia Stock Exchange (IDX), the Bursa Malaysia (BM), and the Stock Exchange of Thailand (SET), and data were obtained from the annual report and Bloomberg database. Nimtrakoon (2015) stated that in the last two decades trade activities between countries in ASEAN have shifted from natural resource-intensive products to high-tech manufactures. The high-tech firm sector classification uses Cowling (2017) consists of manufacturing companies engaged in computers, electronic and optical equipment, chemicals and pharmaceuticals, electrical equipment, mechanical machinery, and transportation equipment. The list of companies in Indonesia can be seen on the website [www.idx.co.id](http://www.idx.co.id). Factbook lists all sectors and companies listed in IDX. Annual reports of Indonesian companies were obtained through the IDX website or the company's official website. Annual reports of companies in Malaysia can be downloaded via the website [www.bursamalaysia.com](http://www.bursamalaysia.com). Meanwhile, the list of companies in Thailand was obtained through [www.set.or.th](http://www.set.or.th). Meanwhile, the companies' financial data were obtained from the Bloomberg database.

The balanced panel data used for this study was from 2015-2018. Ho (2019) and Nimtrakoon (2015) stated that 2015 is an important moment in the regional economic integration agenda for countries that are members of the Association of Nations.

### Measures

Data on the financial information of companies that originally used their respective currencies was changed based on the year-end exchange rate for the IDR currency in order to facilitate this research.

#### Dependent Variabel (Firm performance)

Return on Assets (ROA) based on previous studies ROA is often used in measuring profitability ratios (Zona et al, 2015; Martin et al, 2013) ROA is an indicator used to measure a company's ability to generate relative profits to the total amount of assets owned by the company. ROA provides facilities for comparison with previous studies, where this ratio is commonly used as a reference for company performance index (Zona et al, 2015). ROA can be calculated by dividing net income by the company's total assets. Margin Ratio (Margin) an indicator that measures the company's ability to generate profits from sales, it shows the company's ability to generate net income from total sales (Nimtrakoon, 2015). The margin ratio can be obtained by dividing net income by total net sales.



### Independent Variable

Each country has policies related to the structure of the council that is applied to each country. There are countries that implement One-tier boards and there are also those that apply Two-tier boards. In Indonesia, the board structure adheres to the two-tier board, while Malaysia and Thailand adhere to the one-tier board (OECD,2017). Thus, for this study, the total executive board 56 Indonesia is obtained by adding up the Executive board and the Board of 24 mmissioners. Interlocking Directorates (interl) can be calculated using the total number of meml33s of the executive board who also serve as members of the executive board of other companies divided by the number of members of the executive board of the company (Hernández-L32 & Gonzales-Bustos, 2019; Barosso-Castro et al, 2016). Woman Interlocks (woman) can be measured by the proportion of female directors who interlock the total board members of the company (Hernández-Lara & Gonzales-Bustos, 2019). Independent Interlocks (Indep) are used to see the dimensions of the level of independence (Hernández-Lara & Gonzales-Bustos, 2019). In which the independent director is an outside director who has be38 selected for his professional experience and good reputation. Independent interlocks can be measured by the proportion between the number of independent directors who interlock the total board members of the company

### Variable Control

Variable Firm Size (Size) can be 21 measured by the natural loga2thm of total assets at the end of the year (Herná55z-Lara & Gonzales-Bustos, 2019). Leverage calculated by dividing total debt by total assets (Hernández-Lara & Gonzales-Bustos, 2019; Yatim et al, 2014). When a company has a high level of leverage, it becomes a risky company and needs to be monitored more so tha8 it can avoid business and financial risks (Yatim et al, 2014). Sales Growth Rate (Growth) can be measured by subtract28 last year's sales from last year's sales then dividing it by last year's sales (Nimtrakoon, 2015). Board size (Bsize) measured as the number of members of the executive board, in which the board size is used to control the structure of the board (Arioglu, 2020). Increasing the number of directors can lead to an increase in the talent pool and connections to the outside environment so that it can positively affect the performance and value of the company.

### Empirical model

$$\begin{aligned} ROA_{i,t} &= \alpha + \beta_0 Interl_{i,t} + \beta_1 womani_{i,t} + \beta_2 Indep_{i,t} + \beta_3 Size_{i,t} + \beta_4 Lev_{i,t} + \beta_5 Growth_{i,t} + \beta_6 Bsize_{i,t} + \varepsilon_{i,t} \\ Margin_{i,t} &= \alpha + \beta_0 Interl_{i,t} + \beta_1 womani_{i,t} + \beta_2 Indep_{i,t} + \beta_3 Size_{i,t} + \beta_4 Lev_{i,t} + \beta_5 Growth_{i,t} + \beta_6 Bsize_{i,t} + \varepsilon_{i,t} \end{aligned}$$

## RESULTS AND DISCUSSION

Table 1 shows a summary of the samples observed in this study. Initially, 171 companies were included in the high-tech firm sector in Indonesia, Malaysia, and Thailand. However, during the process of searching for data, there were 52 companies that did not have complete annual reports from 2015-2018. Several companies have just conducted an initial public offering in the period 2015-2018, and there are also companies that do not publish a complete annual report every year. In addition, there were 10 companies that published complete annual reports for 4 years, but the annual reports did not use the international language, namely English. Thus, in the end, there are 109 companies that can be used as the population in this study.

**Table 1.** Sampling criteria

Sampling criteria	Full sample	Indonesia	Malaysia	Thailand
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High-tech firm	171	49	55	67
Companies which annual reports are incomplete	(52)	(9)	(18)	(25)
Companies which annual reports do not use English	(10)	(2)	0	(8)
Total company	109	38	37	34
Total period	4	4	4	4
The total sample used in this study	436	152	148	136

Table 2 shows that an average of 63.6% of the companies in the study sample conducted an interlocking directorate with a standard deviation of 29.3%. In which, there are companies that all members of the board perform interlocking directorate in other companies. For the woman interlock, the average value obtained is small, namely 8.4%. There is a maximum value of 50% in a company, which means that half of the members of the executive board who perform interlocking directorate are women. As for the Independent Interlock, the average value obtained is 25.1%, having a maximum value of 75% in a company where members of the executive board who perform the interlocking directorate are members of independent directors. Of the 63.6% boards that perform interlock directorate, it is found that 25.1% are independent interlocks, this represents that companies tend to prefer inside directors to outside directors. For the interlocking directorate, the woman interlock and the independent interlock both have a minimum value of 0. This means that there are companies where the executive board does not perform the interlocking directorates, woman interlocks, or independent interlocks at all. A standard deviation that has a value of less than 1 (ROA, Margin, Interl, Woman, Indep, Lev, and Growth) means that the data used has a small data value distribution. For profitability ratio, Margin is the ratio that has the largest value as well as the smallest value when compared to ROA.

**Table 2. Descriptive Statistics**

Variable	Mean	Median	Min	Max	SD
ROA	0.048	0.045	-0.308	0.921	0.08
Margin	0.052	0.054	-5.778	1.901	0.37
Interl	0.636	0.7	0	1	0.293
Woman	0.084	0	0	0.5	0.11
Indep	0.251	0.25	0	0.75	0.187
Size	28.407	28.147	25.749	33.474	1.592
Lev	0.196	0.166	0	0.811	0.163
Growth	0.067	0.048	-0.888	5.415	0.404
Bsize	8.736	8	4	26	3.112

In assessing panel data, determining model estimates is important. The first thing to do had been to test the panel data using the OLS model, then the results obtained would be assessed to determine the appropriate model to be used in this study. In conducting this assessment, there are

three types of tests to determine which model is appropriate. First, an F-test was conducted to determine a better model between Pooled and Fixed. After that, there was a test Breusch-Pagan where the results determine the better model between pooled and random. Finally, there was the Hausman test that shows between fixed and random models, which one is more appropriate in the study. The results of these tests can be seen in Table 3.

When in the regression model stage, the classic assumption test is important. The classic assumption test used in this study consists of a heteroscedasticity test and a multicollinearity test. Wooldridge (2013) explained that heteroscedasticity is a condition that arises when the variance of the error is not the same for all observations made. Researchers need to perform a heteroscedasticity test to test the variability of the data they have. When the heteroscedasticity test results show a *p-value* less than 0.05, it means that the model used has heteroscedasticity. Apart from the heteroscedasticity test, another classic assumption test that was carried out was the multicollinearity test. Wooldridge (2013) stated that in determining multicollinearity, sometimes the value of 10 is selected in determining the cut off value for VIF (Variance Inflation Factor), this means that VIF must be at a value below 10. The VIF value of all variables in this study has a value below 2.5 with the highest value for VIF is 2.471 which is owned by the Interl variable (interlocking directorates). It can be concluded there is no problem of multicollinearity in this model.

Table 3 shows the results of the panel model test where based on the Hausman test the random effect model is more suitable for ROA while the Fixed effect model is more suitable for Margin ratio. However, in the Fixed effect model, the assumption of homogeneity must be fulfilled and this is not fulfilled in this research model. This study has a greater between effects variation than the within effects variation, so it is more appropriate to use random effect model. Fixed effect models make homogeneity assumptions while random effect models will allow heterogeneity modeling between units.

**Table 3.** Summary of panel effect tests

Dependent variables	ROA (p-value)	Margin (p-value)
The Fixed effect estimator	4,43872 e-029	8,76502 e-015
Result	Fixed	Fixed
Random effect estimator		
Breusch-Pagan test statistic	8,71696 e-035	3,52442 e-013
Result	Random	Random
Hausman test statistic	0.096698	1,16906 e-008
Result	Random	Fixed

Table 4 shows the final model in the form of the weighted least square used in this study. H1 states that there is a positive association between the interlock directorate and the company's firm performance. The results of the analysis in table 4 show that the interlocking directorate has a significant positive relationship with company performance, it is concluded that H1 is accepted. This finding has similarities with the findings of Barosso-Castro (2016), Zor et al (2015), Martin et al (2013), in which their research found that the interlocking directorate has a positive impact on a company's firm performance.

H2 states that woman interlock has a positive association when it comes to the company's firm performance. The results of the analysis in table 4 show that the woman interlock has a positive association with ROA and Margin, it is concluded that the proposed H2 is acceptable. The

results of these findings are in line with research conducted by O'Hagan (2017) which found that woman interlock has a positive effect on the company's firm performance.

H3 states that the existence of independent interlocks has a negative effect on the company's firm performance. Table 4 shows the results that are consistent with the hypotheses formulated in this study, thus H3 can be accepted. The results of this study are consistent with the findings of previous studies, among others (Sanan, 2019; Arora & Sharma, 2016) which found that board independence has a negative effect on the company's firm performance.

**Table 4.** Final regression model for board interlock and firm performance with Random Effect

Variable	ROA			Margin		
	Coeff	Std. error	p-value	Coeff	Std. error	p-value
Const	0.0099	0.108	0.927	-0.243	0.4275	0.570
Interl	0.065	0.024	0.007***	0.228	0.1067	0.033**
Woman	0.084	0.049	0.085*	0.181	0.2126	0.395
Indep	-0.088	0.036	0.015**	-0.151	0.1581	0.341
Size	0.0008	0.004	0.847	0.009	0.0165	0.606
Lev	-0.097	0.030	0.001***	-0.523	0.1282	0.000***
Growth	0.027	0.007	0.000 ***	0.107	0.0378	0.005***
Bsize	0.0007	0.002	0.719	0.003	0.0084	0.725
Adjusted R <sup>2</sup>	0.142926			0.119254		
p-value (F)	1,44906 e-006			1,30262 e-005		

Note: \* p < 0.10; \*\* p < 0.005; \*\*\* p < 0.01

## Discussion

First, the results of our research related to the corporate governance mechanism through the interlocking directorate have a positive and significant effect on the company's firm performance. This indicates that in developing countries in ASEAN, the practice of interlocking directorate can improve the firm performance of companies. Apart from being an indication of improving the company's firm performance, this finding also implies that in developing countries in ASEAN there are limited people who have the expertise for companies (Sarkar & Sarkar, 2009), so that the presence of an interlocking directorate on the executive board can be a method of addressing the limitations of experts, given that high tech firms are companies that have complex innovation characteristics (Saeed et al, 2019), are in a dynamic competitive environment (Kwon & Lee, 2019), have high growth potential and there is inherent uncertainty (Kohers & Kohers 2000). Martin et al (2013) found that there is a strong positive effect between the company's firm performance and the interlocking directorate, especially when the company's environmental uncertainty is very high. Thus according to the RD theory, when there are uncertainties or limitations, the company will build a relationship with companies that have the resources so that it can reduce these problems (Caiazza & Simoni, 2019)

The interlocking directorate practice carried out by the company will increase and restructure resource dependence so that it can improve company performance, this can happen when the



original company which has limited resources interlocking directorate with companies that have higher resources (Zona et al, 2015). The interlocking relationship that is formed can facilitate access to strategic information (Barosso-Castro, 2016), resources that cannot be created by internal companies (O'Hagan 2017), a forum for information exchange between companies (Ramaswamy, 2019; O'Hagan, 2017). Thus we agree with the opinion of Yatim et al (2014) that the interlocking directorate can be a valuable corporate asset in developing countries. In addition, these results can explain the findings of Tan et al (2019) who conducted cross-country research, that the proportion of those who conduct interlocking directorates in developing countries is more than in developed countries in the Asia Pacific region. These results are also consistent with the RD theory, the formation of networking between companies to reduce environmental uncertainty and dependence.

We found that the participation of female directors in the woman interlock shows a positive and significant effect on firm performance in high-tech firms in Indonesia, Malaysia, and Thailand. This finding implies that woman interlock is one of the important practices in the executive board that can support the firm performance of high-tech firms in developing countries in ASEAN. When viewed from the characteristics of high-tech firms, namely having complex innovation (Saeed et al, 2019), fast growth, and the inherent uncertainty in the company (Kohers & Kohers, 2000). Women who occupy board positions in developing countries, especially in the high-tech firm sector, tend to have risk-taker characteristics (Saeed et al, 2019) so that the presence of women on the executive board can increase a company's risk-taking. Wiley and Monllor-Tormos (2018) stated that the strong pressure arising from competition causes high-tech firms need to take investment strategies that have a high risk. Therefore, we suggest the practice of woman interlock in high-tech firms in developing countries in ASEAN.

An important finding in this study is that the number of female directors who interlocked in Indonesia, Malaysia, and Thailand was very minimal, only around 8.4% of 63.6% of the total number of directors who interlocked. This is very much influenced by the patriarchal culture in ASEAN countries which is still strong. The view that women have a lower long-term commitment to companies than men, women who are more closely related to family relationships, can hinder women's career development and lead to fewer women being selected in important positions in some industries (Arena et al, 2015). Another finding is that the increase in interlocking female directors is positively related to the profitability of high-tech firms. There has been an increase in the quality of decision making with the participation of women on the board, from the view of RD theory (Adeabah et al, 2018). Women can provide added value by sharing ideas and new perspectives on the board (Adam & Ferreira, 2009), building a positive image also increasing the competitive advantage (Kiliç & Kuzey, 2016). In addition, female directors who participate in the Interlock can be a potential in a unique knowledge transfer mechanism, reducing uncertainty in the environment outside the company, so as to increase profitability for the company is greater than male directors (O'Hagan, 2017). This finding is supported by Post and Byron (2015) who found that female directors have a cognitive framework that positively influences decision-making, including the experiences, knowledge, and values that female directors bring to the board where all three will add important information that is considered in decision making, thus increasing the ability of the company to create profits from investments and assets owned by the company.

The presence of independent interlock directors has a significant negative effect on the performance of high-tech companies in ASEAN. When the number of independent interlocks on the executive board increases, the company's firm performance will be lower. There are several reasons for this result. First, it is consistent with the stewardship theory, wherein principle the

inside director can act as a good steward who can support and protect the interests of shareholders (Davis et al, 1997) compared to independent directors. Second, if a problem occurs, perhaps the independent director can act faster than the inside director, but they may make mistakes if their judgment is not influenced by the information held by the inside director. On the other hand, inside directors have better expertise, knowledge, and experience about the company when compared to independent directors, so they have a greater influence in board decision making (Kallamu & Saat, 2015). Third, the factor of independence of outside directors in ASEAN countries is often questioned. In developing countries, it is common to find the same board serving as an independent interlock (outside director) simultaneously at several companies. This can occur due to the limited number of independent directors who have good competence in developing countries Arora and Sharma (2016), especially in high-tech firms where there are few human capital with high-tech capabilities. Given that high-tech firms are complex and dynamic companies that are always growing and developing, special competencies are needed in this field. Each high-tech firm has unique characteristics and is different from one another. The presence of an independent interlock in several high-tech firms in developing countries may have a low level of independence so that monitoring and supervision functions do not run optimally. According to Merend and Melville (2019) the lack of independence of the board from outside directors can cause a decline in the company's firm performance. Therefore, the increasing number of independent interlocks can result in a decrease in the company's firm performance.

## CONCLUSION

The purpose of this study is to explain the board interlock association with high-tech firm performance in three growth ASEAN countries (Indonesia, Malaysia, and Thailand). This study found that the number of female directors who interlocked in Indonesia, Malaysia, and Thailand was very small, around 8.4% of 63.6% of the total number of directors who interlocked. Another finding is that an increase in the number of female directors who perform interlocking is positively related to the profitability of high-tech firms. There is an increase in the quality of decision making with the participation of women on the board, from the point of view of RD theory (Adeabah et al, 2018). In addition, this study found that the presence of an independent interlock director has a significant negative effect on the firm performance of high-tech companies in ASEAN. When the number of independent interlocks on the executive board increases, the company's firm performance will be lower. The test results did not change after performing the robustness test.

This study has some limitations. This study only focuses on internal mechanism corporate governance as independent variables, especially board interlocking, woman interlocking, and independent interlocking. In addition, the samples of ASEAN countries used are only three countries, namely Indonesia, Malaysia, Thailand, so it has weaknesses in generalizing the results for the ASEAN region. The samples of companies in the study are also limited to high-tech manufactures in the three countries in the 2015-2018 period. Future research can try to research other industrial sectors and update the observation period to obtain new evidence regarding the relationship between board interlocking and company performance.

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