

The Structural and Macroeconomic Determinants of Manufacturing Export-Value Performance in ASEAN Countries

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ABSTRACT

This study aims to scrutinize the determinants of manufacturing exports in several ASEAN countries, specifically: Indonesia, Malaysia, Thailand, Philippines, and Vietnam. It adopts a panel data regression using the random effects model to predict manufacturing export value using structural (economic complexity and human capital) and macroeconomic (real effective exchange rate, foreign direct investment, and inflation) variables. The research finds that foreign direct investment, human capital, real effective exchange rate, and inflation are positive and statistically significant predictors of manufacturing exports in these ASEAN countries. However, the positive correlation between the real effective exchange rate and manufacturing exports is against previous literature arguing that a currency's depreciation drives export competitiveness. The findings suggest that currency appreciation can enhance a country's export performance as exports' input products are cheaper than before. Additionally, the positive influence of inflation on exports can be explained by the subsequent increase in consumption from foreign countries. Therefore, in addition to managing their exchange rates, countries must develop their human capital and attract more foreign investments to enhance their export performance.

ABSTRAK

Penelitian ini bertujuan untuk mengkaji faktor-faktor penentu ekspor manufaktur di beberapa negara ASEAN, khususnya: Indonesia, Malaysia, Thailand, Filipina, dan Vietnam, dengan mengadopsi regresi data panel menggunakan model efek acak untuk memprediksi nilai ekspor manufaktur menggunakan variabel struktural (kompleksitas ekonomi dan modal manusia) dan ekonomi makro (nilai tukar efektif riil, investasi asing langsung, dan inflasi). Penelitian menemukan bahwa investasi asing langsung, modal manusia, nilai tukar efektif riil, dan inflasi merupakan prediktor positif dan signifikan secara statistik terhadap ekspor manufaktur di negara-negara ASEAN ini. Namun, korelasi positif antara nilai tukar riil efektif dan ekspor manufaktur bertentangan dengan literatur sebelumnya yang berpendapat bahwa depresiasi mata uang mendorong daya saing ekspor. Temuan menunjukkan bahwa apresiasi mata uang dapat meningkatkan kinerja ekspor suatu negara karena produk input ekspor lebih murah dari sebelumnya. Selain itu, pengaruh positif inflasi terhadap ekspor dapat dijelaskan oleh peningkatan konsumsi dari luar negeri selanjutnya. Oleh karena itu, selain mengelola nilai tukarnya, negara harus mengembangkan sumber daya manusianya dan menarik lebih banyak investasi asing untuk meningkatkan kinerja eksportnya.

1. INTRODUCTION

Over the past few decades, the ASEAN manufacturing economy has proliferated in the global economic context. The driver for the vast manufacturing development is the global production network of multinational companies in the Southeast Asian region (Athukorala, 2021). During this development, an industrial transformation has produced different manufacturing components in different spatial locations

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(Athukorala, 2021). This globalized production network is evident as the Association of Southeast Asian Nations (ASEAN) region has diverse specializations in each member country – from producing simple consumable goods and apparel to advanced technology goods among them (Meyer et al., 2021).

In the global trade environment, ASEAN has extended its openness by having a more free trade agreement with China, Japan, South Korea, Australia, and New Zealand through the Regional Comprehensive Economic Partnership (RCEP), representing a significant market in which 30% of global output is generated within the trade region. With the diverse nature of manufacturing production in this area and an aim to eliminate trade barriers among the participating countries, the RCEP is said to enhance the manufacturing sector’s competitiveness through lowered costs of raw materials and freer exports. Meyer et al. (2021) observed that this would be attractive for multinational companies to leverage the competitive advantages of each country’s manufacturing sectors.

Given this structural shift in trade patterns, the conventional approach to analyzing export performance by products is rapidly losing relevance. In light of that, previous studies indicate that a growing global production network’s characteristics are the fundamental transformations of growing foreign direct investment and enhanced human capital development in the Southeast Asian region (Athukorala & Nguyen, 2022).

This research investigates the structural and macroeconomic determinants of manufacturing export value in ASEAN manufacturing centers in Indonesia, Vietnam, Thailand, Malaysia, and the Philippines. It is essential to investigate the manufacturing export of ASEAN countries as it is increasingly contributing to and changing the configuration of their manufacturing development to the Southeast Asian region. For instance, more than twenty publicly-listed companies in China have decided to move out or expand their manufacturing to Vietnam and other countries in ASEAN (Aba, 2021). It shows that there has been an uneven manufacturing export development among those five countries, as shown in Figure 1.

Over the previous years, Vietnam has consistently and significantly increased its manufacturing exports, far outpacing the other four countries in the analysis. To explain this, there have been structural transformations that occurred in Vietnam. For instance, Vietnam’s currency has outstandingly appreciated since 2010 and remains stable as opposed to the dollar. In addition, Vietnam also experienced a significant increase in its comprehensive trade balance, mainly due to China’s growing labor cost and the ongoing trade war between USA and China. The enactment of US tariffs on China’s exports has positively affected Vietnam’s exports as most Foreign Direct Investment (FDI) was immediately diverted to Vietnam (Dapice, 2021).

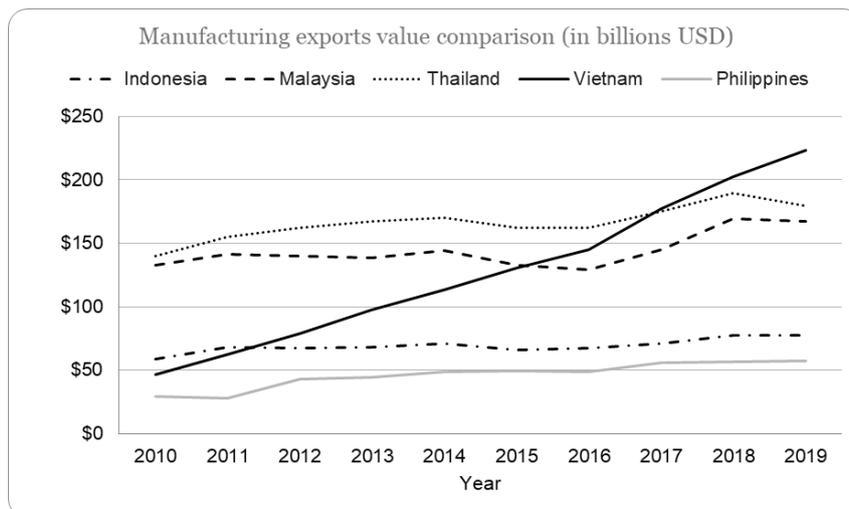


Figure 1. Manufacturing export values in selected ASEAN countries
 Source: Processed data (The World Bank, 2021a)

Conversely, Indonesia and the Philippines have been at the bottom of that manufacturing export development. Manufacturing exports require significant productivity from the quality of human development (Sheridan et al., 2020). Unfortunately, based on HDI from 2010 to 2015, Indonesia and the Philippines have among the lowest HDI levels (HDI data: <https://hdr.undp.org/data-center/human-development-index#/indicies/HDI>). In that perspective, the countries with the lowest HDI do not have adequate ability to add more value to exports, which can dampen their manufacturing export performance (Balland et al., 2021). In recent debates about product costs and human capital, economic development will become increasingly complex as economies transform from becoming agricultural-oriented into manufacturing, requiring more complex skills. Unfortunately, due to the lack of progress in human development, premature deindustrialization occurs where unskilled labor cannot participate; hence, idle manufacturing capital is apparent in multiple developing countries (Aiginger & Rodrik, 2020).

This study adds to the academic substance by investigating how structural and macroeconomic drivers (e.g., human development and FDI), in light of a more globally engaged production network, can affect the ASEAN manufacturing region's export performance. Some past studies have not sufficiently explained how macroeconomic and structural factors affect manufacturing export in ASEAN trade contexts. Some studies only partially investigate structural factors on manufacturing export value. For instance, Sheridan et al. (2020) argued that even with advanced machinery and technology in manufacturing industries, it requires capable human resources to operate that technology. In addition, Aiginger & Rodrik (2020) underscored the importance of manufacturers' complex economic formation, which can impact the value added to manufacturing export. Furthermore, a more sophisticated ability to produce diversified exports will substantially enhance manufacturing export value. Given several ASEAN countries' complex institutional trade arrangements, those studies do not provide substantial analysis for ASEAN case studies.

On the contrary, some ASEAN studies intensively shed light on some ASEAN countries' responsiveness to the importance of real effective exchange rates and inflation. This can be seen as an economic consideration to purchase capital input and be competitive in global markets in the context of developing markets (Nguyen et al., 2019; Mauliana et al., 2020). Nonetheless, those studies overlook the importance of human capital and economic complexity, which can determine export performance in the context of ASEAN countries.

Our study argues the importance and relevance of investigating ASEAN exports, as the post-Washington consensus enacted significant structural change of export-oriented industrialization in some ASEAN countries. With more interested multinational companies acquiring foreign capital in some ASEAN countries, their strategies have changed to shape some of their manufacturing in some ASEAN countries as a center for economic export to the global market (Neilson et al., 2020). This economic shift becomes a salient justification for scrutinizing selected ASEAN countries' export performance.

2. THEORETICAL FRAMEWORK AND HYPOTHESES

This literature review explores the structural and macroeconomic drivers of manufacturing export value from international trade scholars. Structural factors in this study consist of human capital and economic complexity. On the other hand, the macroeconomic factors are real effective exchange rate, FDI, and inflation.

To establish a fundamental understanding, Krugman et al. (2018) stated that a basic theory of comparative advantage relies on a country's productivity advantage to produce over other countries with the slightest opportunity costs. Deliberating economic exchange to purchase from the most efficient producer and selling products that producers are good at will lead to a better and more efficient outcome among different parties (Krugman et al., 2018). Under this basis, inter-country trade would generally make trading countries better off. Based on their proposition, specialization among different countries will boost exports and indirectly influence economic growth (Krugman et al. 2018).

The global production network has diversified significantly when extending the comparative advantage concept of international trade. For Southeast Asian countries, this evolving global production network has introduced a new dynamic with different specializations of manufacturing products across countries. During this development, there has been a post-Washington consensus phenomenon where advanced industrial countries outsource part of their manufacturing assemblies to countries such as Vietnam, Indonesia, and

other Southeast Asian nations (Neilson et al., 2014). In particular, many agricultural products in Indonesia have been exported as raw materials, e.g., coffee or cocoa, and some have also been processed into manufacturing products for export (Neilson et al., 2014). Hence, Southeast Asia's increasingly global production network has established these countries as clusters of manufacturing assemblies besides China, where these countries' production is exported elsewhere.

In the growing global production network, the impact of FDI on manufactured exports has been investigated. FDI is one foreign investment channel, which could be in the form of acquisition, joint venture, or the establishment of a new company in which investor countries invest in a host country (Fernandez et al., 2020). Owusu-Nantwi & Erickson (2019) argued that FDI could drive the host country's economic growth through four factors: direct technology transfer, demonstration effects, competition effect, and labor movement between the firms. Specifically, FDI can have different forms, from mergers and acquisitions to greenfield FDI. Mergers and acquisitions include purchasing domestic firms, while greenfield investment is more oriented toward building the firm on the investment country from scratch (Harms & Méon, 2018). In this stance, more significant investments under greenfield FDI have contributed to a more long-lasting development impact on economic growth (Harms & Méon, 2018). FDI tends to invest more in the manufacturing production segment than other segments in the manufacturing sector, such as marketing and sales, which have no production plant (Amighini et al., 2017). FDI on the production segment within the manufacturing sector also gives more benefits to the host countries than the other segments (Amighini et al., 2017). In a panel analysis of ASEAN-5 countries from 1970 to 2015, FDI is a significant and positive determinant of exports, as foreign investment companies lean towards manufacturing export here (Asirvatham et al., 2017). Thus, the proposed first hypothesis is:

H₁: FDI has a positive impact on manufacturing export values.

Another macroeconomic factor to consider is the real effective exchange rate. In this stance, we cited the real effective exchange rate from manufacturing trade partners (Bruegel, 2021). The real effective exchange rate is a measurement of the exchange rate of a particular country against its trading partners, reflecting the relative price difference among them. In this case, currency appreciation is represented by a higher value in the real effective exchange rate and vice versa.

There are different advocates regarding real effective exchange rates: some scholars conclude negative relationships through cheaper output, while others argue a positive one through cheaper input value. For the negative one, in the case of China, its export competitiveness in the global market can be severely affected by its domestic currency appreciation. Otherwise, its currency devaluation will improve export performance in the long run (Thorbecke & Zhang, 2009). A similar result was found where currency depreciation is a beneficial driver for the export performance of the United States. Another study also reveals that depreciation is favorable for a country to boost their export (Semuel & Nurina, 2015). Considering Vietnam's position as a country-oriented in manufacturing export, its exports' competitiveness in the global market can be severely affected by its domestic currency appreciation in the short run; otherwise, its currency devaluation will improve export in the long run (Nguyen et al., 2019). Thorbecke & Zhang (2009) similarly argued that the depreciation of ASEAN countries' currencies can enhance export performance, as it reflects cost competitiveness against competing countries. Using the real exchange rate weighted by countries' export volume, his research found that ASEAN countries' bilateral exchange rate with importing countries has an adverse effect of reducing about 2% of export value for every percentage increase in the exchange rate.

Other studies found that exchange rate appreciation drives cheaper inputs and causes a higher export value. For instance, Dhasmana (2013) highlighted that overvalued exchange rates drive more input channels for manufacturing and enhance manufacturing export. With a stable exchange rate, the appreciation signals businesses to import more input for their production. However, this cannot work in a volatile movement, creating uncertainty (Dhasmana et al., 2013). Hence, this statement applies in a stable exchange rate condition. Another study in China found that the currency's appreciation drives more product imports and enables manufacturing innovation (Dai et al., 2018). Firms engaging in the export market produced more than those non-exported firms in China. In Vietnam, the appreciation of the domestic exchange rate is seen

by some firms to drop their production costs; hence they use the strategy to lower the export price. The industry is not overreacting but tends to improve export performance in that context (Dapice, 2021). Sato et al. (2013) also argued that firms can access domestic inputs at a lower price during exchange rate appreciations, which translates into lower production costs. The second hypothesis is as follows:

H₂: The real effective exchange rate positively affects manufacturing export value.

In addition, another macroeconomic factor to highlight is the inflation rate. Inflation itself refers to the general increase in prices of goods within a particular country. Inflation directly affects the money supply, subsequently and indirectly impacting a country's international trade. Investors will deposit their money in banks when the interest rate increases, and conversely, people tend to hold cash when the interest rate falls, which causes an increase in the money supply in the market; thus, it will increase the price of goods (Darman, 2016). India's inflation, export, and import data series shows that high inflation severely affects its international trade because goods and services become more expensive in the international market, thus decreasing the demand for domestic goods and services in the international market (Sahoo & Sethi, 2018). In 5 ASEAN countries from 2000 to 2015, another study found a negative correlation between inflation and exports, where they argue that rising inflation favors imports and increases the cost of production (Purusa & Istiqomah, 2018). On the other hand, another research shows that in the long run, the exporting country's inflation rate will be followed by an increase in neighboring countries' consumption (Mauliana et al., 2020); hence more exports will flow to neighboring countries. The third hypothesis proposes that:

H₃: Inflation has a negative impact on manufacturing export value.

The essence of the human capital factor is to nourish skill upgrading and indirectly enhance the value-added of exports in developing markets. According to Sheridan (2014), it is only beneficial for a country to transition from primary to manufacturing exports once a certain amount of human capital is reached, benefiting from higher rates of return. Essentially, at lower levels of human capital, the trade-off between relying on primary and manufacturing goods is large, and a shift too early would be disadvantageous for the country's export performance. By having well-developed human capital, a country can more effectively benefit from technological learning, resulting in increased productivity. Human capital accumulation is much simpler in the manufacturing sector as industrial activities tend to cluster, in contrast to the scattered nature of agricultural sectors (Szirmai, 2012). In addition to benefiting from learning through open trade with foreign countries, manufacturing also has a knowledge spillover effect on other economic sectors (Su & Yao, 2016). Nonetheless, the manufacturing development in emerging Asian countries has not formed evenly, as some countries are delayed in focusing on the manufacturing sector, which previously persisted in the agricultural sector (Rodrik, 2016). Human capital levels are also a key consideration for foreign investors before investing in host countries, given competition from countries with comparable human capital. FDI is linked to manufacturing export values (Zafar et al., 2019). Human capital development thus becomes a recent international economic concern in determining manufacturing export value.

There has been recent research that shows the importance of human capital to ASEAN manufacturing export, but perhaps those literature require observations from a macroeconomic perspective. For instance, Sarmidi (2011) agreed that human capital plays an essential role in exports from 4 ASEAN countries: Indonesia, Malaysia, Singapore, and Thailand. An increase in human capital, or a reduction in the illiteracy rate, can boost the aggregate export of goods and services such as manufactured goods, electronics, and the rubber sector (Sarmidi, 2011). Implementing the Herfindahl Index on time-series data export diversification, including manufacturing export, an international economic study concluded that human capital positively influences the export diversifications of both ASEAN and SAARC regions (Noureen & Mahmood, 2021). Their research claimed a 0.5 percent and significant increase in export diversification following increased human capital development. Thus, the advancement of human capital plays a role in promoting export diversification as part of a structural reconstruction to facilitate capacity building. Therefore, the fourth hypothesis is:

H₄: The human development index has a positive impact on manufacturing export value.

Furthermore, we adopt economic complexity that international economic scholars previously scrutinized as a structural driver for exports. As discussed above, it is valuable to acknowledge the diversity of economic complexity across countries in the widespread global production network phenomenon. Economic complexity refers to the overall composition of a country's scope of export products and the nature of those products being unique (i.e., hard to imitate) (Doğan et al., 2021) Schetter (2017) defines complexity as the extent of concurrent tasks being done to produce a product, and that countries with higher skill levels have an edge in producing more complex products. It also implies that as products become more complex, more skill is required to refine them (Schetter, 2017).

Besides, the literature indicates that complexity is associated with higher manufacturing export performance. Export complexity is associated with export competitiveness, where higher complexity reflects a higher degree of technology within the products and vice versa (Wang et al., 2021). It is thus unsurprising that countries with a high degree of complexity (e.g., Japan, Switzerland, and Germany) are associated with high-income levels (Erkan & Yildirimci, 2015). With more complex and diversified manufacturing products, Rodrik (2016) found both prospective and critical aspects. In countries lacking technological spillover and low human skills, export complexity has caused uneven consequences to labor. The labor shortage for more sophisticated industrial products has worsened manufacturing productivity which signals premature deindustrialization. Apart from that, he saw that in countries such as South Korea, Malaysia, and Taiwan, there is more even labor and technological spillover taking place. Hence their growing product diversification has been associated with better economic performance (Rodrik, 2016). Moreover, Schetter (2016) argues that economic complexity originating from a firm's comparative advantage will generate more export value and overall economic growth.

With the growing economic complexity of the manufacturing industry, other scholars underscore the importance of human capital development to support export-oriented manufacturing industries. Several multinational companies have provided human development training to their employees in developing countries to enhance their productivity (Cavusgil et al., 2020). It is driven by the company's need to outsource its operations, incentivized by cost savings and a better organization of its business activities (Mostafa & Roorda, 2017). With this motivation in mind, it would subsequently influence the dynamics of exports in developing countries, specifically for manufactured products. In fact, these multinational companies have worried that global outsourcing will dampen their product quality if the human capital quality is not sustained in their decentralized production assemblies. Hence human capital investments have particularly intensified in several manufacturing-based countries (Meyer et al., 2021). From the discussion above, the proposed hypothesis is:

H₅: The rank of economic complexity has a positive impact on manufacturing export value.

The conceptual framework presented in Figure 1 is based on the discussions above regarding the factors influencing manufacturing export value. Inter-country trade analysis scholars have done extensive investigations in some developed markets like the United States and others like China and other East Asian countries. Nonetheless, the application of inter-country trade analysis in the Southeast Asian context remains poor. This paper will extend the recent empirical evidence on the influence of structural and macroeconomic determinants of manufacturing export in the Southeast Asia region, specifically to the member countries of ASEAN (The Association of Southeast Asian Nations).

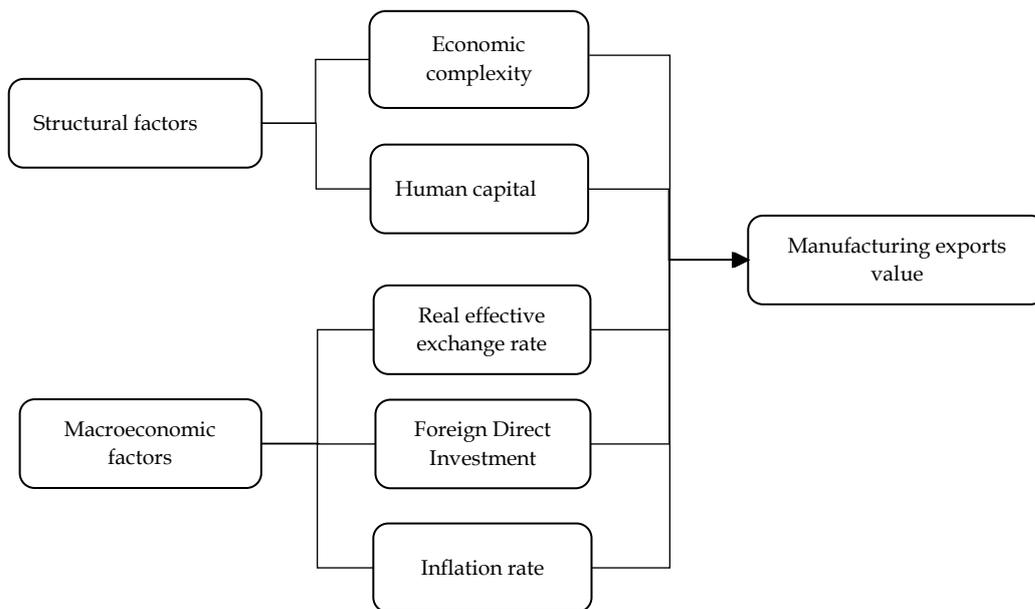


Figure 2. Inter-Country Trade Determinants of Manufacturing Export Value
 Source: Elaborated from Krugman et al. (2018), Schetter (2016), Sheridan (2014)

3. RESEARCH METHOD

The model will follow previous inter-country analyses, which apply macroeconomic and structural factors as drivers for manufacturing export value. However, where some studies aimed to explore long-term relationships, this study aims to explore the correlations between the manufacturing export value and the predictor variables. Additionally, variables such as the human development index and economic complexity are incorporated as additional controls in explaining intercountry differences in export values, as supported by the literature review. The data is gathered from multiple sources, as shown in Table 1. Furthermore, all the data are numerical types with distinct measurement units. The following table summarizes the model’s variables and the expected signs as determined by the literature. The research utilizes STATA as the software for the panel data regression analysis.

As seen in Table 1, this paper hypothesizes that the FDI and HDI of a country would positively influence its manufacturing export value, which is expected due to the factors’ inherently beneficial nature in supporting/reflecting a country’s productivity and labor quality. On the other hand, a country’s inflation rate and economic complexity rank is predicted to weaken the manufacturing export value since a higher inflation rate would reflect a cut in consumers’ purchasing powers, and a less complex economy generally indicates lower value-added within the exports. Finally, this study argues that effective exchange appreciation will improve export performance. Exchange rate appreciation would make raw materials cheaper and cut down production costs within the particular country, thus increasing its export competitiveness.

Table 1. The impact of independent variables & expected sign

Variable	Expected sign	Data source
Foreign Direct Investment (FDI)	+	The World Bank (2021b)
Real Effective Exchange Rate	+	Bruegel (2021)
Inflation Rate	-	The World Bank (2021c)
Human Development Index (HDI)	+	UNDP (2019)
Economic Complexity Rank	-	The Atlas of Economic Complexity

To reflect recent development trends, the analysis timeframe will be from 2010 to 2019, with a total sample size of 48 observations. The timeframe of this research from 2010 to 2019 reflected the latest data when the research was conducted. The observations are derived from 5 countries: Indonesia, Thailand, Malaysia, Vietnam, and the Philippines. The countries are chosen considering their proximity and similar economic conditions, especially in terms of export.

There are three model options in panel data regression analysis: pooled ordinary least squares (OLS), fixed effects, or random effects. The appropriate model selection is contingent on a fixed effect or a heterogeneity term among observations, where the heterogeneity term captures individual differences not accounted for by the independent variables. The pooled OLS model can be used if it is constant among countries and uncorrelated to the independent variables. Otherwise, the other panel estimation methodologies would be used instead (Gujarati, 2022). It can subsequently be assessed using the Hausman test for choosing between fixed and random effects. The following model specification will be used in this research:

$$\ln_mfg_{it} = \beta_1 + \beta_2 \ln_FDI_{it} + \beta_3 \ln_REER_{it} + \beta_4 \ln_inf_{it} + \beta_5 \ln_HDI_{it} + \beta_6 \ln_rank_{it} + \alpha_i + u_{it} \quad (1)$$

All dependent and independent variables are normalized using natural logarithms, where \ln_mfg is the logged value of manufacturing export in the current USD. It should be noted that The World Bank does not explicitly give the value of manufacturing export. Thus, the value is calculated by multiplying each country's merchandise export value (in current USD) with the manufacturing export proportion as a percentage of merchandise exports. This data is taken from the World Bank (The World Bank, 2022; The World Bank, 2021a, 2021b, 2021c).

From the equation above, \ln_FDI is each country's net foreign direct investment inflow, \ln_REER is the real effective exchange rate, \ln_inf is the inflation rate, \ln_int is a country's average annual interest rate, \ln_HDI is the human development index, and \ln_rank is each country's ranking of economic complexity in a given year. The term α_i captures country-specific fixed effects, and u_{it} is the residual error term. Several tests will be conducted from the model specification to derive a robust statistical result. Firstly, a descriptive analysis explains the mean, median, standard deviation, and the values' range (maximum and minimum range).

Further, the analysis must determine the panel data regression's random and fixed effect models. To execute this, a Hausman test was conducted (Gujarati, 2022). If the result shows that the p-value of the statistical test is less than 0.05; thus, the best model will be a fixed effect. If the p-value is above 0.05, the suitable model will be the random effect, as shown in the heterogeneity of the error term among individuals in the time-series dataset.

Following the Hausman test, several tests will be carried out: the Chow and the LM tests (Baltagi, 2021). The Chow test determines whether the best model will be pooled panel regression (PLS) or Fixed Effect. If the p-value is less than 0.05, hence fixed effects should be used (Baltagi, 2021). After that, the Lagrange multiplier test is conducted to determine the best model between PLS and the random effect model. If the p-value is less than 0.05, it will be concluded that the best model will be the random effects model (Baltagi, 2021).

4. DATA ANALYSIS AND DISCUSSION

Data Analysis

As shown in Table 2, 50 observations in the dataset represent five countries, with ten observations each from 2010 to 2019. The countries included in the research are: Indonesia, Malaysia, Thailand, Vietnam, and the Philippines. Manufacturing exports in these countries range from around 28 to 223 billion USD. The values of foreign direct investment among the countries also have a range of a similar magnitude, reflecting between-country disparities. Similar differences can be seen in the countries' Real Effective Exchange Rate (REER), inflation, Human Development Index (HDI), and economic complexity ranking.

Table 2. Descriptive statistics of all countries in the sample

	Manufacturing Exports (USD)	FDI (USD)	REER	Inflation	HDI	Economic Complexity Rank
Min	27,970,000,000	1,070,000,000	91.61	-0.010	0.661	18.000
Median	121,300,000,000	9,903,000,000	109.53	0.030	0.708	34.000
Mean	110,700,000,000	11,230,000,000	113.10	0.036	0.723	41.120
Max	223,400,000,000	25,120,000,000	148.88	0.190	0.810	70.000
St. Dev.	53,036,737,708	5,988,324,363	14.54	0.030	0.040	16.660

The econometric panel test suggests that the models are significant as reflected by their respective global F-statistic (for fixed effect) and Chi-statistic (random effect). As we resume with the Hausman Test, the best model is random effects, where the null hypothesis proclaims to use the random effects model; meanwhile, the alternative hypothesis states the application of the fixed effects model. The result shows a p-value above 0.05, which indicates the null hypothesis is not rejected, thus implementing random effects (see Appendix 1).

Apart from the Hausman Test, the regression model is validated by applying the Chow test for fixed effects and the LM test for random effects (see Appendix 2 and 3). From the Chow test, the result shows that the p-value is greater than 0.05. Hence the fixed effect may not be a proper model for the most efficient estimation (see Appendix 2). Instead, the LM test shows that random effects are the best model as the p-value is below 0.05 (see Appendix 3).

Hence, as shown in Table 3, we selected the random effect as the most efficient model. The reliability of this model is further proven by the higher R-square value compared to the fixed effect model, as seen in Table 3. It is proven that the structural factor of human capital development has a positive and significant effect on boosting ASEAN countries' manufacturing export. FDI and the real effective exchange rate are also significant manufacturing export determinants. The inflation rate is also a positive determinant but has a minor and less significant effect. It is notable that the economic complexity rank does not significantly predict a country's manufacturing exports.

Discussion

Analyzing the descriptive statistics for each country in particular, it can be observed that there are significant differences in all of the independent variables used in the study (see Appendix 4). It is in line with the descriptive analysis in Table 2 above. As seen from the maximum value of manufacturing exports, Thailand is the leading country in this field, second only to Malaysia by a marginal amount. When observed further, these two countries have several factors that support their export performance: inflation, HDI, and economic complexity rank. They have the lowest average inflation rate and the highest HDI index and score high on the complexity rankings.

Table 3. Fixed and random effects regression

Variables	Fixed Effect	Random Effect
ln_fdi	0.0768*	0.241***
ln_reer	10.8098***	12.4897***
ln_inf	0.0615	0.1747*
ln_hdi	6.4976***	9.5599***
ln_rank	-0.1432	-0.0083
Constant	9.601***	4.1267
R squared		
Overall	0.6538	0.7278
F-stat	0.0000	-
Chi-stat	-	0.0000

Note: *** reflects significance at 1%, ** at 5%, * at 10%

It is interesting to note that, on average, the FDI inflow to Malaysia and Thailand is on the lower end compared to its ASEAN peers. One reason may be that they have a large stock of FDI at the start vis-à-vis the other countries, given their relative standing as a more developed emerging country in the region. However, the average real effective exchange rate for both countries is not very indicative of their exports performance – with the only notable observation being that Malaysia has a stable exchange rate throughout the analysis (only 0.43 points below the base index of 100), whereas Thailand's exchange rate on average appreciated by 9.4 points.

As noted in Figure 1, Vietnam has recently caught up to become the country with the highest value of manufacturing exports. Although it is plagued with the highest average inflation rate and among the lowest HDI index among its peers, its currency is the strongest, on average. The regression result in Table 3 indicating the real effective exchange rate as a highly significant determinant explains how Vietnam had achieved its stellar performance throughout the years.

Notably, Indonesia had the highest FDI inflow throughout the study, yet its peers still eclipsed its manufacturing exports. It suggests that FDI inflow may not be the most significant determinant of manufacturing exports. Additionally, the Philippines had performed relatively well in economic complexity and inflation but has among the lowest HDI and FDI inflows. On average, their exchange rate is the second highest after Vietnam.

The regression result finds that FDI positively affects manufactured export value, where a 1% increase in FDI values increases manufactured export value by 0.24%. It aligns with the descriptive statistics analysis, finding that countries with higher FDI will have better export performance. However, this does not apply to Malaysia and Thailand, as they are relatively more developed economies compared to their peers, hence not requiring as much more FDI to sustain their economic performance. Hence, the result in this paper is in line with the exploration done by Amighini et al. (2017), mentioning that FDI positively influences the manufacturing industry of developing countries. It applies to the other comparatively less developed economies, which experience more FDI inflows, except Vietnam, having the lowest FDI on average.

This finding suggests several implications. The trend of FDI inflows, even within the ASEAN region, is unequal. Malaysia and Thailand should not focus on boosting FDI but on other factors that may optimize their leading performance. As for the other countries, they should look to attract more foreign investments to further their growth in manufacturing exports. It is in line with the study done by Fernandez et al. (2020), which elaborated that in the case of developing countries, FDI is the most excellent opportunity to learn further and enhance the development of technology and capital where multiple arrangements from foreign companies can come in, namely through the manifestation of acquisition, joint venture, or new company establishments. Domestic companies will benefit from best practices and innovations from their foreign counterparts, which can be seen as a path to further cement the particular countries' competitive positioning in the ASEAN manufacturing hub and maximize their comparative advantage with the aid of FDI. Thus, FDI is required to allow quicker industrialization improvements from the global economic cluster to the ASEAN region.

Furthermore, a 1% increase in the real effective exchange rate raises manufactured export value by 12.49% and is highly statistically significant. In line with the descriptive analysis that found Vietnam to have the most appreciated currency, this explains the significance of the exchange rate towards manufacturing exports performance. The finding parallels previous studies that associate a currency's appreciation with lower input prices from the domestic economy and eventually lead to higher manufacturing export value (Dai et al., 2018; Dapice, 2021; Dhasmana, 2013).

In the case of Vietnam, its superior performance is highlighted by several factors. The country has experienced the tailwinds of the US-China trade war, where tariffs on Chinese exports caused investors to flee China in search of a more competitive economy to base their manufacturing (Dapice, 2021). Alongside rising labor costs in China, Vietnam's export performance experienced a significant increase, which also led to the appreciation of its comprehensive trade balance, which consequently caused the appreciation of its exchange rate.

This stance underscores the importance of sourcing more competitive input products. It is a consequence of the wider global production network, where the manufacturing industry has been partly assembled in Southeast Asia, thus stabilizing input prices and requiring imports (Dapice, 2021; Neilson et al., 2020). This finding also implies that countries must have a good performance regarding their trade balance with other countries, which leads to their currency appreciation. The findings of this study on the impact of exchange rate on manufacturing exports suggest that countries must strengthen their currency, which, in turn, will improve their manufacturing exports performance. It occurs as businesses can benefit from purchasing cheaper raw materials in the global market (Dhasmana, 2013), thus effectively lowering the export products' cost of production. It leads the country's manufactured exports to be more competitive in global markets, which is in contrast to other studies that suggest competitiveness is driven by a currency depreciation which leads to lower selling prices in the market, causing increased demand (Habibi, 2019; Nguyen et al., 2019).

The human development index has a positive and significant relationship with manufacturing exports, where a 1% increase in the index corresponds to a 6.5% increase in manufacturing export values. In line with the descriptive analysis, the countries with the best performance in manufacturing exports have the highest HDI index (i.e., Malaysia and Thailand), except Vietnam, which had achieved the best performance among the five countries, albeit with the lowest HDI index on average. This anomalous observation is supported by the regression result in Table 3, where the magnitude of the HDI index's effect on manufacturing exports is only the second highest among other variables.

This finding is aligned with previous studies that found a positive and significant effect of human development to export performance (Noureen & Mahmood, 2021; Aiginger & Rodrik, 2020). More developed human capital within the economy enhances the workers' skills, reflecting their capability to add more value to their manufactured goods. Therefore, it is a crucial factor for countries to pay attention to, as foreign investors put this as a major consideration when investing in foreign countries (Zafar et al., 2019). The higher value that the workers can add will signal the manufacturers' competitiveness in the global market, which in turn enhances the country's manufacturing export performance.

In addition, it is notable that international trade has a strategic position to induce knowledge transfers that can boost domestic human resources, thus further promoting value-adding in exports (Cavusgil et al., 2020). Further reinforcing the results, Sheridan (2014) explicitly asserts that attaining a minimum level of human development before transforming an economy's export structure is beneficial for transitioning from a reliance on primary exports to manufactured exports. It is due to the difference in skills required, in which manufactured exports possess relatively more complex than primary goods. If the labor force is unprepared to enter the manufacturing sector, the lack of skills can manifest in poorer export performance. This finding suggests that countries must enhance their human capital to boost export performance.

The inflation rate has a positive relationship with manufacturing exports, where a 1% increase will lead exports to increase by 0.17%. Although the result is statistically significant, this finding contradicts past studies (e.g., Purusa & Istiqomah, 2018; Mauliana et al., 2020), which predicted a negative and significant effect. The negative effect is due to an increase in the prices of goods in an economy, leading to lower export competitiveness as the products become more expensive in the global market. It predicts that countries with less inflation will have better export performance.

The different result can be supported by the descriptive analysis, where apart from the other countries (with only a 1% standard deviation in the inflation rate), Vietnam had the most variable inflation rate throughout the analysis, with a standard deviation of 5% (see Appendix 4). Yet, with this fluctuating inflation rate and the highest average inflation rate among countries, Vietnam has achieved the highest manufacturing export value. To reiterate, this study's findings are not aligned with past studies. Rather, this peculiarity may be the subject of future research, where studies can look into how higher inflation levels may positively affect manufacturing exports.

On the other hand, the rank of economic complexity is statistically insignificant in influencing manufacturing exports. However, the predicted relationship was in line with previous studies (Cavusgil et al., 2020; Meyer et al., 2021), which suggested a positive and significant effect on exports. As the metric used

is the economic complexity rank, a lower ranking would signify better complexity, leading to better export performance and vice versa.

Economic complexity represents the technological diversity of products that a country can produce (Wang et al., 2021), which represents their competitiveness, and can enhance export value (Schetter, 2016). By producing complex products that other countries find difficult to imitate, the country has a comparative advantage in adding value to that certain field. Economic complexity is also associated with better economic performance (Rodrik, 2016), where high per capita GDP countries possess a high degree of economic complexity (Erkan & Yildirimci, 2015). Thus, countries should enhance their economic complexity to create a lasting competitive advantage within their export products in global markets, benefiting their manufacturing export performance. However, increasing economic complexity will require human capital in the economy to be skilled, which is necessary to bolster their productivity (Cavusgil et al., 2020) and guarantee the quality of their production (Meyer et al., 2021). Although the relationship in this study is aligned with previous studies, the data used in this research is not conclusive to indicate a statistical relationship between economic complexity and manufacturing export value.

5. CONCLUSION, IMPLICATION, SUGGESTION, AND LIMITATIONS

This study has aimed to analyze the determinants of manufacturing export value in several ASEAN countries. As these countries' manufacturing centers increasingly contribute to global trade, consequently driving their economic progress, it is essential to assess the factors underlying their manufacturing export performance. By investigating structural and macroeconomic determinants, this study found that foreign direct investment, human development, real effective exchange rate, and the inflation rate are positive and significant determinants of manufacturing exports in ASEAN countries. However, economic complexity is not a significant determinant.

This study's findings greatly affect the ASEAN region's manufacturing export strategy. To firmly boost a country's manufacturing export, to some extent, cheap wages are no longer relevant as a determinant of manufacturing export performance. Indeed, to boost manufacturing productivity, advancing human capital development is a key factor in retaining competitive advantage in global manufacturing, of which ASEAN countries are a growing hub for export-manufacturing industries. In this perspective, human development is key to faster productivity, leading to lower production costs per output. From a macroeconomic perspective, FDI plays a critical part vis-a-vis predictable real effective exchange rates to stimulate more manufacturing export performance in Southeast Asia. The positive relationship between exchange rates and manufacturing export found in this study suggests that countries should strengthen their currency to benefit from lower production costs in manufacturing their exports. Achieving even human development and FDI penetration across member countries is a massive task for the ASEAN region to work on. Thus, more constructive regional economic development policies are required to support manufacturing development in the ASEAN region.

This research puts forward several recommendations for future studies. Firstly, considering that the literature suggests economic complexity as a key determinant of manufactured exports but yields an insignificant result, another indicator that may be a better proxy for this can be used instead. Besides, other future studies can expand into demand conditions, degree of cluster development, degree of trade openness, and openness to FDI as proxies of economic complexity in the future, along with more feasible econometric modeling and samplings. Finally, researchers can also explore how inflation has a positive effect on exports, which runs contrary to past studies.

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APPENDIX 1 - HAUSMAN TEST

Coefficient				
	(b) Fixed	(B)	(b-B) Difference	sqrt(diag(V_b-V_B)) SE.
ln_fdi	0.0768	0.2410	-0.1642	-
ln_hdi	6.4976	9.5599	-3.0623	-
ln_reer	10.8098	12.4897	-1.6799	-
ln_rank	-0.1432	-0.0083	-0.1349	0.1613
ln_inf	0.0615	0.1747	-0.1133	-
<hr/>				
chi2	2.80			
<hr/>				
Prob > chi2	0.7313			
<hr/>				

APPENDIX 2 – CHOW TEST FOR FIXED EFFECT

(Std. err. adjusted for 5 clusters by country)

Robust						
ln_mfg	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
ln_fdi	0.0366	0.0223	1.65	0.175	-0.0252	0.0984
ln_reer	12.3430	4.0819	3.02	0.039	1.0097	23.6763
ln_inf	0.0898	0.0550	1.63	0.178	-0.0630	0.2426
ln_hdi	-9.7301	5.1693	-1.88	0.133	-24.0824	4.6221
ln_rank	-0.3245	6.2136	-1.52	0.203	-0.9175	0.2685

Year	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
2011	0.1449	0.1049	1.38	0.239	-0.1463	0.43622
2012	0.3527	0.1201	2.94	0.043	0.0192	0.68621
2013	0.3832	0.1443	2.66	0.057	-0.0173	0.7839
2014	0.5230	0.1877	2.79	0.050	0.0017	1.0443
2015	0.5987	0.2463	2.43	0.072	-0.0853	1.2827
2016	0.6903	0.2478	2.79	0.050	0.0021	1.3786
2017	0.8704	0.3039	2.86	0.046	0.0264	1.7144
2018	1.0409	0.3165	3.29	0.030	0.1619	1.9198
2019	1.0656	0.3669	2.90	0.044	0.0468	2.08443
_cons	3.0268	7.5589	0.40	0.709	-17.9602	24.0138

sigma_u	1.15267	
sigma_e	0.1254	
rho	0.9883	(fraction of variance due to u_i)

```
. testparm i.year  
(1) 2011.year = 0  
(2) 2012.year = 0  
(3) 2013.year = 0  
(4) 2014.year = 0  
(5) 2015.year = 0  
(6) 2016.year = 0  
(7) 2017.year = 0  
(8) 2018.year = 0  
(9) 2019.year = 0  
Constraint 2 dropped  
Constraint 3 dropped  
Constraint 5 dropped  
Constraint 6 dropped  
Constraint 8 dropped  
F( 4, 4) = 4.14  
Prob > F = 0.0988
```

APPENDIX 3 - LM TEST FOR RANDOM EFFECT

```
. xttest0
Breusch and Pagan Lagrangian multiplier test for random
effects
ln_mfg[country,t] = Xb + u[country] + e[country,t]
```

Estimated results:

Var sd = sqrt(Var)

ln_mfg	0.30613	0.5532
e	0.02937	0.1713
u	0.00607	0.0779

Test: Var(u) = 0

chibar2(01) = 88.73

Prob > chibar2 = 0.0000

INDONESIA

	Manufacturing Exports	FDI	REER	Inflation	HDI	Economic Complexity Rank
Min	58,430,000,000	4,542,000,000	97.97	0.03	0.67	59.00
1 st Quantile	67,710,000,000	19,130,000,000	101.85	0.04	0.68	60.25
Median	68,150,000,000	20,540,000,000	104.31	0.05	0.69	61.00
Mean	69,350,000,000	19,420,000,000	104.49	0.05	0.69	61.60
3 rd Quantile	70,960,000,000	22,760,000,000	107.08	0.06	0.71	62.75
Max	77,710,000,000	25,120,000,000	110.58	0.06	0.72	67.00
St. Dev.	5,293,314,555	5,682,778,096	3.88	0.01	0.02	2.24

MALAYSIA

	Manufacturing Exports	FDI	REER	Inflation	HDI	Economic Complexity Rank
Min	129,100,000,000	8,304,000,000	91.61	0.01	0.77	24.00
1 st Quantile	134,400,000,000	9,208,000,000	94.44	0.02	0.78	25.00
Median	140,800,000,000	10,240,000,000	100.58	0.02	0.79	27.00
Mean	144,100,000,000	10,700,000,000	99.57	0.02	0.79	26.70
3 rd Quantile	145,000,000,000	11,190,000,000	104.43	0.03	0.80	28.50
Max	169,800,000,000	15,120,000,000	105.85	0.04	0.81	29.00
St. Dev.	13,099,748,834	2,036,312,428	5.39	0.01	0.01	1.79

THAILAND

	Manufacturing Exports	FDI	REER	Inflation	HDI	Economic Complexity Rank
Min	140,100,000,000	2,474,000,000	104.60	-0.01	0.72	18.00
1 st Quantile	162,100,000,000	4,856,000,000	105.80	0.01	0.73	22.25
Median	165,100,000,000	8,606,000,000	109.00	0.02	0.75	23.00
Mean	166,400,000,000	8,973,000,000	109.40	0.02	0.75	22.70
3 rd Quantile	174,000,000,000	13,110,000,000	111.40	0.03	0.76	23.75
Max	189,400,000,000	15,940,000,000	119.20	0.04	0.78	26.00
St. Dev.	12,934,106,370	4,701,713,955	4.31	0.01	0.02	2.19

VIETNAM

	Manufacturing Exports	FDI	REER	Inflation	HDI	Economic Complexity Rank
Min	46,230,000,000	7,430,000,000	112.00	0.01	0.66	52.00
1 st Quantile	83,320,000,000	8,501,000,000	123.50	0.03	0.68	56.25
Median	122,100,000,000	10,500,000,000	140.20	0.04	0.69	58.00
Mean	127,700,000,000	11,200,000,000	134.90	0.06	0.69	59.00
3 rd Quantile	169,400,000,000	13,720,000,000	147.40	0.09	0.70	61.50
Max	223,400,000,000	16,120,000,000	148.90	0.19	0.70	70.00
St. Dev.	56,585,804,455	3,085,279,430	14.20	0.05	0.01	4.88

PHILIPPINES

	Manufacturing Exports	FDI	REER	Inflation	HDI	Economic Complexity Rank
Min	27,970,000,000	1,070,000,000	108.10	0.01	0.67	28.00
1 st Quantile	43,040,000,000	3,346,000,000	113.90	0.02	0.69	31.50
Median	48,630,000,000	5,689,000,000	117.40	0.03	0.70	34.00
Mean	46,050,000,000	5,857,000,000	117.10	0.03	0.70	35.60
3 rd Quantile	54,040,000,000	8,573,000,000	120.20	0.04	0.71	40.25
Max	57,560,000,000	10,260,000,000	127.50	0.05	0.72	46.00
St. Dev.	9,975,736,573	3,148,820,583	5.55	0.01	0.01	5.90