ECONOMIES OF DEVELOPED AND DEVELOPING COUNTRIES

ЭКОНОМИКА РАЗВИТЫХ И РАЗВИВАЮЩИХСЯ СТРАН

Research article / Научная статья

Institutional performance and its impact on economic growth in ASEAN countries: trend and panel data analysis

Setyo Wira Rizki ⓘ ✉, **Nikolay I. Didenko** ⓘ

Peter the Great Saint Petersburg Polytechnic University, Saint Petersburg, Russian Federation
✉ rizki.sv@edu.spbstu.ru

Abstract. This study is conducted to expect how deep the institutional impact is on economic growth in ASEAN and recommend it as a reference for enchanting policies that can strengthen economic growth. This research will investigate and determine the institutional indicators that are significant to economic growth. The study also put additional variables expected contribute to economic development, such as import and export as predictive variables. The study implies trend analysis used to reveal the performance of institutions and panel data analysis applied to determine the most significant WGI indicators for ASEAN economic growth. Trend visualization indicates Singapore and Brunei Darussalam performed the best score in almost entire institutional indicators. Thus, panel analysis discloses that export, import, and regulatory quality are selected as the most significant variables in economic growth. The regulatory quality is an indicator of institutional strength reflecting the observation of the government's capacity to advance inclusive policies to encourage the enlargement of the private sector. The decision is made by considering p-value is less than alpha value and rejecting null hypothesis. The alpha value representing an error probability is selected to make a decision. In brief, it recommends policymakers in developing regulations and executing more effective policies to promote private sector development. The result provides the comparatively modest R-squared value of 0.25247. In upcoming research, the R-squared value can be enhanced by including more independent variables. That additional variables expected can support regulatory quality such as interest rates and investment. Lastly, this study provides the latest insight of the economic development picture in ASEAN after challenging time of the Covid-19.

Keywords: world government indicators, WGI, trend visualization, panel analysis, regulatory quality

Authors' contribution. Rizki Setyo Wira — research concept and design, data collection, data analysis, wrote the paper; Didenko N.I. — research concept, supervision, result correction. All authors have read and agreed to the published version of the manuscript.

Conflicts of interest. The authors declare no conflict of interest.

Институциональная эффективность и ее влияние на экономический рост в странах АСЕАН: анализ тенденций и панельных данных

С.В. Ризки ⊠ , Н.И. Диденко

Санкт-Петербургский политехнический университет Петра Великого, Санкт-Петербург, Российская Федерация

⊠ rizki.sv@edu.spbstu.ru

Аннотация. Настоящее исследование направлено на оценку степени институционального воздействия на экономический рост в странах АСЕАН и формирование рекомендаций для разработки политических мер, способствующих его стимулированию. Основная цель исследования заключается в идентификации ключевых институциональных показателей, оказывающих статистически значимое влияние на экономическое развитие. В качестве дополнительных переменных, предположительно связанных с экономическим прогрессом, включены объемы импорта и экспорта. Методологическая база исследования включает анализ динамики (трендовый анализ) для оценки эффективности институтов, а также панельный регрессионный анализ, направленный на определение наиболее значимых индикаторов Всемирного индекса управления (WGI) в контексте экономического роста АСЕАН. Визуализация трендов продемонстрировала, что Сингапур и Бруней-Даруссалам стабильно занимают лидирующие позиции по большинству институциональных метрик. Результаты панельного анализа выделили экспорт, импорт и качество регулирования (regulatory quality) как статистически значимые детерминанты экономического роста. Качество регулирования, отражающее способность государства формировать инклюзивные политики для стимулирования частного сектора, интерпретируется как ключевой институциональный фактор. Статистическая значимость переменных подтверждена на основе критерия p-value ($p < \alpha$), что обусловило отклонение нулевой гипотезы. Уровень значимости α установлен в соответствии с общепринятыми стандартами эконометрического анализа. Исследование рекомендует органам власти акцентироваться на совершенствовании нормативно-правовой базы и внедрении адресных мер для поддержки частного сектора. Коэффициент детерминации ($R^2 = 0.25247$) указывает на умеренную объяснительную силу модели, что предполагает ее дальнейшую оптимизацию за счет включения дополнительных независимых переменных. В частности, учет таких факторов, как процентные ставки и объемы инвестиций, может повысить точность прогнозирования влияния качества регулирования. Заключительная часть работы предоставляет актуальный анализ постпандемического экономического ландшафта АСЕАН, сформированного после кризиса, вызванного COVID-19.

Ключевые слова: Всемирные индикаторы управления, WGI, графический анализ динамики, панельный анализ, качество регулирования

Вклад авторов. Ризки С.В. — концепция и дизайн исследования, сбор данных, анализ данных, написание статьи; Диденко Н. — концепция исследования, руководство, коррекция результатов. Все авторы одобрили окончательную версию статьи.

Introduction

Adam Smith, Karl Marx, and John Maynard Keynes are the most dominant economists with three distinct ideas about economic philosophy emerged as global references to the field (Bowden, 2020; O'Donnell, 2022). The concept of sustainable growth regarding some theorists such as Adam Smith and Karl Marx acknowledged the boundaries of growth and demands on the environment and the Stockholm conference represented the concept of sustainable growth expending to the present involving a number of important growths (Klarin, 2018). Adam Smith investigated the dynamics of national wealth and the well-being of individuals and society (Ucak, 2015). Adam Smith considered that government policy constituted a component of the market mechanism's control systems, even though Adam Smith had a twofold and opposing thought about the role of government or institutions in a country's economy (Davies, 2015; Smith, Smith, 1997). Karl Marx expected that capitalism would lead to internal conflicts, causing to its demise and replacement by a new system as socialism. In a socialist economic system, the government has an important role in regulating a country's economic activities (Davies, 2015; Muldoon, 2022). John Maynard Keynes initiated a revolution in economic thought on the importance of government intervention through public policy to regulate employment and price stability (Commendatore, 2003; Ferrari-Filho, Conceição, 2005). Refer to those investigation and study of several literatures, it can be concluded that these great economists stated the importance of government intervention in a country's economy.

Government policies in the economy stimulates an encouraging effect on economic growth, (Haug et al., 2020; Hussen, 2023; Kuznets, 1977; Salman et al., 2019). The government's role in economic growth performance is very necessary to promote economic growth involving several economic segments through fiscal policy and government spending (Sidek, Asutay, 2020). Several studies exploring the impact of institutional performance on economic growth, accomplished in concerning the various countries as the object, have been conducted in the last years. For instance, research investigating institutional performance impact on economic development in European Union (EU) revealed that reputable institutions representing greater opportunity of economic independence and better governance towards to advanced economic growth in the EU countries, although the effect of institutions on economic growth is fluctuated over time (Bernardelli, Próchniak, Witkowski, 2021).

Another previous research, investigating economic growth as of institutional performance impact in China, disclosed that China's high-quality economic development is effectively strengthened by the institutional environment (Zhao, 2024).

To enrich and continue existing research on the impact of institutional performance towards to economic growth, the researchers attempt to investigate the performance of institutions expected to contribute on economic development in Association of Southeast Asian Nations (ASEAN) countries. The ASEAN is one of the regional organizations that has experienced an optimistic economic growth in recent years. In 2022, ASEAN economy achieved a nominal GDP of US\$3.6 trillion, placement the 5th largest in the world. Nominal GDP of ASEAN per capita attained at US\$5395, a noteworthy 37.6% increase from 2015. ASEAN economy improved by 5.7%, sustaining an average annual growth rate of 4.4% during 2010–2022. The top 3 of largest PDP per capita (US\$) is achieved by Singapore, Brunei Darussalam and Malaysia. During 2010–2022, ASEAN GDP growth rates reached between 3.5–6.1%. The highest rate is attained in 2012. The lowest rate is conquered in 2020 due to COVID-19 effect. The COVID-19 indicated a slowing impact of economic growth on various ASEAN countries. The most obvious risk is a continued economic slowdown, as measured by GDP, especially since most of ASEAN countries continue to experience negative growth (D'Aloia, Gugler, 2024).

Researchers conduct a couple approach to figure out how significantly institutional performance contributes to economic growth. Those are data visualization and panel data analysis. The data visualization is implemented to provide a trend outlook of institution performance in each ASEAN member country and deliver more straightforward information to understand at a glance. Data visualization, applied in numerous fields, is an important aspect of data analysis (Liang et al., 2022). It can simplify information and provide a comprehensive overview. By considering of observation objects involving data of several countries and periods, this research framework is strongly appropriate to basic concept of panel data approach. The panel analysis, two-dimensional statistical method, is generally applied in various research fields such as economics, social sciences, and humanities (Aparicio, Urbano, Audretsch, 2016). The basic concept of panel data analysis in this study is a combination of time series data and cross section data represented by observation data in 22 years periods and ten member countries of ASEAN.

In this panel data analysis, GDP per capita is selected as the dependent variable representing economic growth in ASEAN. Independent variables include import, and world government indicators (WGI) representing institutional performance as independent variables affecting economic growth. The GDP is a comprehensive measure of a country's complete economic activity. Imports and exports are important components of the expenditure method for calculating GDP. Several studies have revealed that exports and imports can be used as indicators that have a positive impact on economic growth. In this study, researchers involved exports and imports as independent variables with a measure that more feasible to understand quantitatively. This procedure needs hypothesis as following,

- H0: export, import and institutional performance indicators have no impact on economic growth.

- H1: export, import and institutional performance indicators have impact on economic growth.

The alpha value is selected to assess the probability of error that researchers determine in making a decision to reject or support the null hypothesis. H0 will be rejected if p-value smaller than alpha. This research purposes to disclose the performance of six institutional indicators of in a time-series trend visualization and panel data analysis. This study practices data from 2002 to 2022, where in this period there was a time when the world struggled with the COVID-19 pandemic in 2020. So that the involvement of data in 2020 can provide different results and insights from the previous studies.

Materials and methods

The World Bank released several institutional indicators manifested in the WGI, that will be used for the analysis of the impact of institutions on economic growth in ASEAN. The WGI is a valuable instrument for representatives, researchers, and experts concerned in comparative governance and institutional analysis (Gallego-álvarez, Rodríguez-Rosa, Vicente-Galindo, 2021; Handoyo, 2023; Sadaf et al., 2018). The WGI establishes a widespread dataset that assess the quality of public authority at the national level. The WGI structure refers to six key governance indicators: political stability and absence of violence, government effectiveness, regulatory quality, rule of law, control of corruption and voice and account. Effective management contributes to countries' economic growth, human capital development, and social integration. The WGI is beneficial to assist researchers and analysts discover general trends in concerning of government performance across countries and over time.

There are some researches investigating about institutional performance. For instance, a study examining empirically the significant institutional performance on investment flows in developing countries disclosed that Singapore is the one ASEAN country that has good governance and high government effectiveness (Buracom, 2014). Later, a study measuring the effectiveness of government performance on socioeconomic development in ASEAN countries found that ASEAN countries restraining public spending growth outperform countries with relatively large governments (Sagarik, 2017).

Several methods and approaches are applied in economy field study such as panel analysis. Panel data analysis is very prevalent in the fields of economics and econometrics. For example, a study examining several intrinsic variables and extrinsic variables, including corruption and armed conflict, on economic growth in ASEAN with panel data affords the result that corruption and armed conflict have a statistically significant and negative connection with economic growth in ASEAN countries (Aziz, Sundarasen, 2015).

Thus, a study investigating the role of institutions on economic growth in ASEAN countries from 1995 to 2017 applied a dynamic panel estimator revealed that institutional strength plays a significant and positive role in economic growth (Haini, 2020). In addition, research investigating the impact of institutions on economic growth in ASEAN with panel data of 10 member countries in the period 2002–2018

resulted that voice and accountability, regulatory quality, and the rule of law have a significant influence on economic growth (Sari, Prastyani, 2021).

1. Trend graph visualization. The WGI has been used since 1996 with six governance indicators by hundreds of countries around the world. Cumulative indicators are constructed with hundreds of individual underlying variables derived from a variety of data sources that reflect opinions about governance from a diverse range of qualified and expert respondents. The WGI reflects comparisons of governance across countries and over time (Kaufmann, Kraay, Mastruzzi, 2011). To reveal institutional performance in simply technique, researchers conducted a visualization method in this study.

There are several guidelines for effective data visualization in scientific publications purposing to transfer information effectively to readers and enhance communication of research outcomes (Midway, 2020). Efficient and effective data visualization techniques aim to discover more interesting visualizations building on reference visualizations (Qin et al., 2020). In general, data visualization can be simplified into three stages such as collecting data, recognizing patterns and understanding the data.

Table 1 displays a description of the institutional performance indicators that will be used as independent variables in this study.

Table 1

Type of WGI indicators

WGI indicators	Definition
Political stability and absence of violence	It measures the supposed probability of political variability and/or politically driven violence, counting terrorism. The value is between about –2.5 to 2.5.
Government effectiveness	It reveals the insights of the public and civil services quality and the its detachment level from political demands, the policy development quality and the legitimacy of the government's assurance to implementing policies. The value is reaching about –2.5 to 2.5.
Regulatory quality	It reflects an observation of the government capacity to develop and enforce comprehensive policies and regulations facilitating and promoting private expansion. The score is ranging around –2.5 to 2.5.
Rule of law	It discloses assessments of the agent's confidence and trust level instead in the society regulations, the agreement implementation quality, assets rights, the police and courts, and the possibility of crime and violence. The score is approaching between –2.5 and 2.5.
Corruption Control	It investigates understandings of the degree to which public authority is utilized for private advantage, involving minor and significant corruption types of government authority by privileged interests. The score is ranging from –2.5 to 2.5.
Voice and Accountability	It represents acuities about the level of citizen participation in selecting a government with freedom of appearance, association independence, and an unrestricted media. The score is ranging from –2.5 to 2.5.

Source: World Bank[1].

---

[1] World Bank. Retrieved July 12, 2024 from https://www.worldbank.org/en/publication/worldwide-governance-indicators

2. Panel data method. The use of panel data model analysis is popular in economics and econometric. The core advantage of panel data analysis is considering and controlling for individual effects and heterogeneity as well as time. It can provide valuable insight into the relationships between independent and dependent variables. The data structure consists of a time-series of annual data over 21 years and a cross-section of data from 10 ASEAN member countries.

The use of statistical application and software is needed to simplify complex data calculations and provide accurate results. Excel application is used to display the trends of the variables used in this study. A statistical software commonly used by statistics researchers in data analysis is R Studio. It is an open-source software with some advantages such as the legality of using safe software and updating packages. R Studio is a low-risk software for conducting and analyzing data improving its services continually (Henningsen, Henningsen, 2019).

The calculation involves GDPC as dependent variable and export, import, political stability, government effectiveness, regulatory quality, rule of law, corruption control, and voice and accountably as independent variables. The more detail information is represented in Table 2 as following.

Table 2

List of dependent and independent variables

Name of variables	Denotation of variables
GDPC	GDP per Capita
Exp	representing total value of goods and services provided to the rest of the world (%GDP)
Imp	representing total value of goods and services provided to the rest of the world (%GDP)
PSAV	political stability with score between –2.5 to 2.5
GE	government effectiveness with score between –2.5 to 2.5
RQ	regulatory quality with score between –2.5 to 2.5
RL	rule of law with score between –2.5 to 2.5
CC	corruption control with score between –2.5 to 2.5
VA	voice and accountability with score between –2.5 to 2.5

Source: compiled by S.W. Rizki, N.I. Didenko.

There are several stages of data analysis in panel data analysis. The stages procedure is directed as following,

    i. *Data standardization* is needed before accomplishment calculations because of the differences in measurement scales of the data to be used.

The standardization technique aims to simplify comparisons between data originating from variables with different scales. The most common approach to standardization is to use the Z-score by formula as following:

$$Z = \frac{X - \overline{X}}{\sigma},$$

where X = real value of data; $\overline{X}$ = average value of data; σ = deviation standard of data; A positive Z-score value indicates that the data is above the mean and a negative value indicates that the data is below the mean.

ii. *Chow test* is conducted to find out whether the panel data regression technique with the fixed effect method is better than the panel data model regression without dummy variables or the common effect method. The null hypothesis is the same intercepts, or in other words the right model for panel data regression is common effect, and the alternative hypothesis is that the intercepts are not the same or the right model for panel data regression is fixed effect. Therefore, the hypothesis can be represented as following,
H0: common effect model
H1: fixed effect model

iii. *Hausman test* is led to determine whether there are random effects in the panel data model. The random effects suppose that the entity with the errors does not correlate with the predictive variables. Thus, the hypothesis can be denoted as following,
H0: random effect
H1: fixed effect

iv. *Breusch-Pagan Lagrange Multiplier test* is directed to assess whether there is a time or individual effect or even none in the model. The Breusch Pagan method for the random effect significance test is based on the residual value. The Lagrange Multiplier test is not conducted if the Chow test and the Hausman test indicate that the most appropriate model is the fixed effect approach. This test is needed if Chow test and the Hausman test indicate common effect and random effect model. Thus, the hypothesis can be denoted as following,
H0: no time or individual effect
H1: time or individual effect

An alpha value symbolizing an error probability is selected for all hypothesis to make a decision. If p-value is smaller than alpha, so the null hypothesis will be rejected. Formula of panel data regression is presented as following

$$GDPC_{it} = \theta_0 + \theta_1 Exp_{it} + \theta_2 Imp_{it} + \theta_3 PSAV_{it} + \theta_4 GE_{it} + \theta_5 RQ_{it} +$$
$$+ \theta_6 RL_{it} + \theta_7 CC_{it} + VA_{it} + e_{it},$$

where $\theta_0, \theta_1, \theta_2, \theta_3, \theta_4, \theta_5, \theta_6, \theta_7$ are parameter coefficient and e_{it} is error.

Institutional performance on trend

The WGI has a very important role in supporting the economic growth of a country. It can be a reference in determining government policies having an impact on improving the progress of society and the economic growth of a country. Researchers summarize the trends of the six institutional indicators performance in 10 ASEAN member countries in the period 2002–2022 pointing to describe the state of public governance in ASEAN countries.

Figure 1 shows Singapore and Brunei Darussalam have the highest score around 1 which means those countries has strong political stability. It describes that the mentioned countries have the best quality of public services and credibility to implement and commit government's policies. Myanmar, Philippines, Indonesia, Thailand and Cambodia gained mostly negative score indicating low political stability during 21 years. Myanmar's score has decreased in the last years around –2.2 in 2022. The political situation in Myanmar is very unstable and a state of military emergency is still in effect
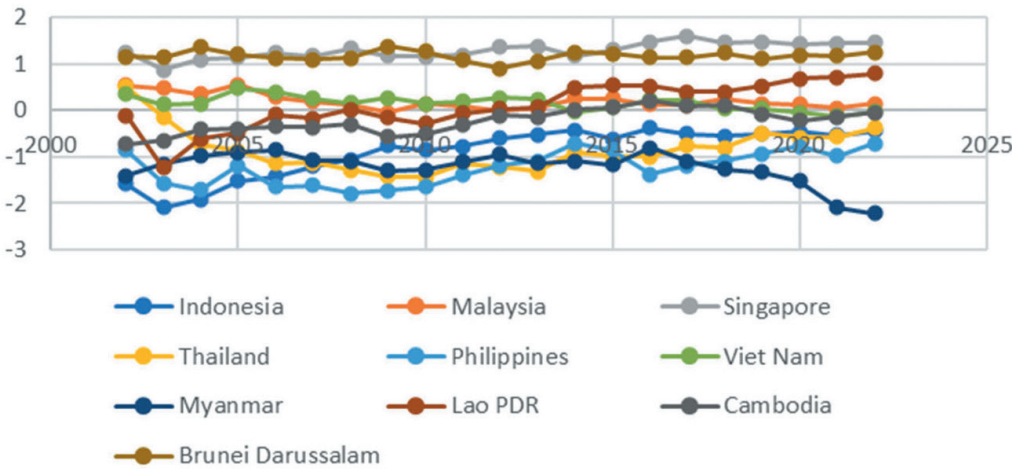

Figure 1. Trend of political stability score in ASEAN countries in 2002–2022
Source: Worldwide Government Indicators[2].

Figure 2 explains that Singapore has the strongest government effectiveness with score about 2 followed by Brunei Darussalam and Malaysia with score round 1. Thailand, Philippines, Viet Nam and Indonesia are in the medium level at around 0. Cambodia and Lao PDR gained round –1. The last, Myanmar reached the weakest score approximately –2.

Figure 3 shows that Singapore gained the highest score around 2, in the meantime Myanmar has the weakest score. It represents that government of Singapore

---

[2] Worldwide Government Indicators. Retrieved July 29, 2024 from https://data.worldbank.org/indicator/PV.EST?skipRedirection=true&view=map

have the strongest capability to formulate and implement comprehensive policies and regulations that permit and encourage private sector expansion and indicating that Myanmar has weak abilities for private sector development. Brunei Darussalam, Malaysia, Thailand, Philippines, Cambodia, Viet Nam, Indonesia and Lao PDR reached score between –1 and 1. This means that these eight countries have done quite well in attracting the private sector to support economic growth but are still struggling to expand private sector growth
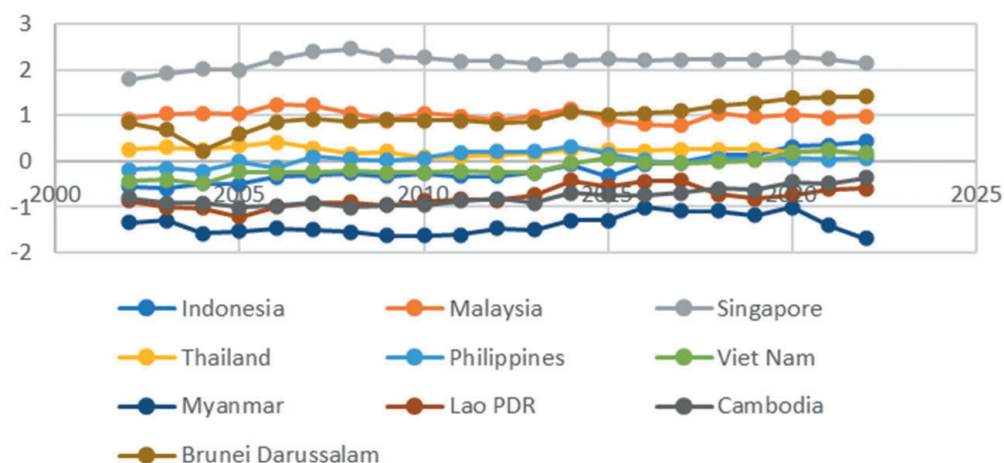

Figure 2. Trend of government effectiveness score in ASEAN countries in 2002–2022
Source: Worldwide Government Indicators[3].

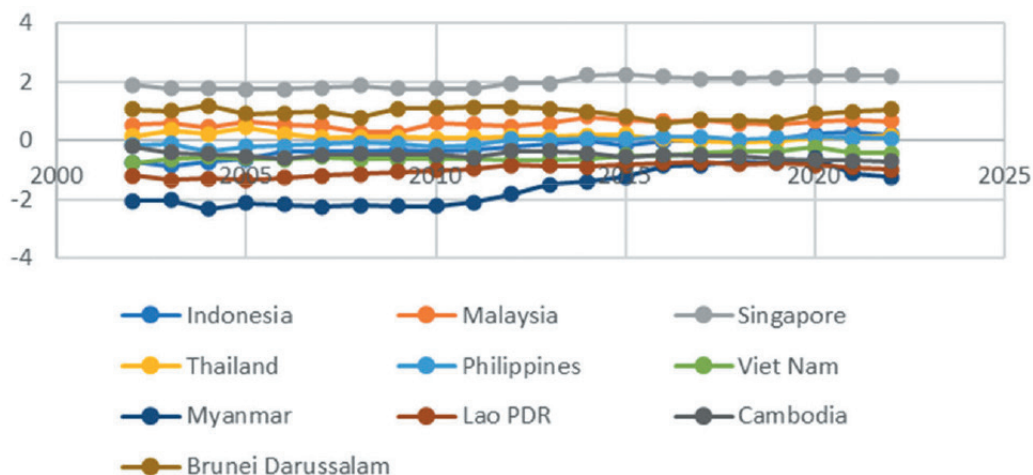**Figure 3.** Trend of regulatory quality score in ASEAN countries in 2002–2022
Source: Worldwide Government Indicators[4].

---

[3] Worldwide Government Indicators. Retrieved July 29, 2024 from https://data.worldbank.org/indicator/GE.EST?skipRedirection=true&view=map

[4] Worldwide Government Indicators. Retrieved July 29, 2024 from https://data.worldbank.org/indicator/GE.EST?skipRedirection=true&view=map
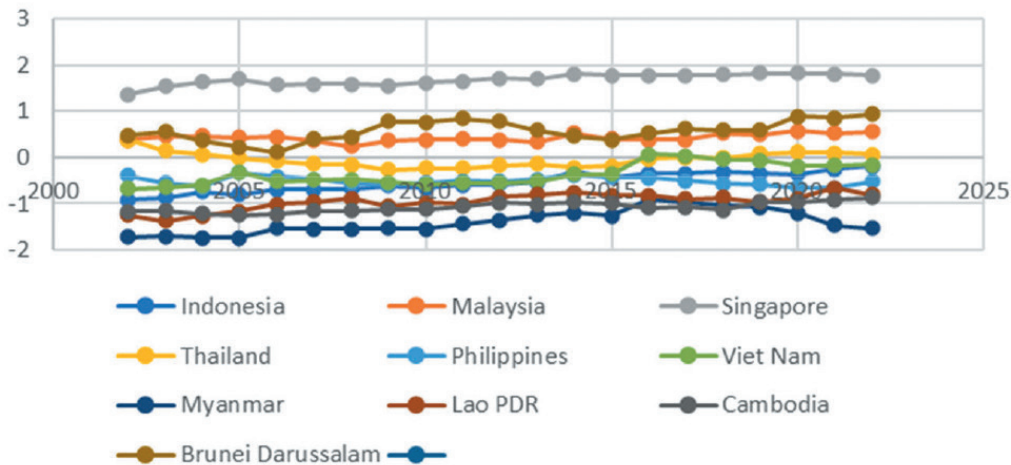
Figure 4. Trend of rule of law score in ASEAN countries in 2002–2022
Source: Worldwide Government Indicators[5].

Figure 4 signifies that Singapore has the strongest score on the rule of law, meaning Singapore has a strong belief in following the rules of society and the courts, and a low incidence of crime and violence. Malaysia and Brunei Darussalam reached positive score near 1. Thailand, Philippines, Indonesia and Viet Nam have score between –1 and 0. Lao PDR, Cambodia and Myanmar are in the lowest level under –1, which means the level of public compliance to the law is very low. It implements that there are a high probability of crime and violence
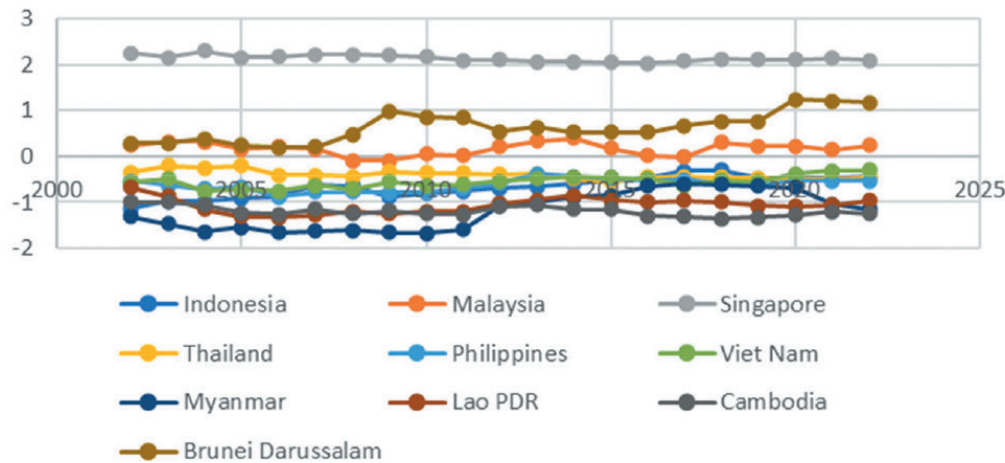

Figure 5. Trend of corruption control score in ASEAN countries in 2002–2022
Source: Worldwide Government Indicators[6].

Figure 5 reflects that Singapore government has the best capability to control corrupt behaviour. Malaysia and Brunei Darussalam have a fairly good ability to control corruption levels with scores above zero. The remaining countries performs under 0. Myanmar touched the lowest score at the 1st decade. It acclaims that those countries must conduct evaluations in order to improve control and reduce the level of corruption
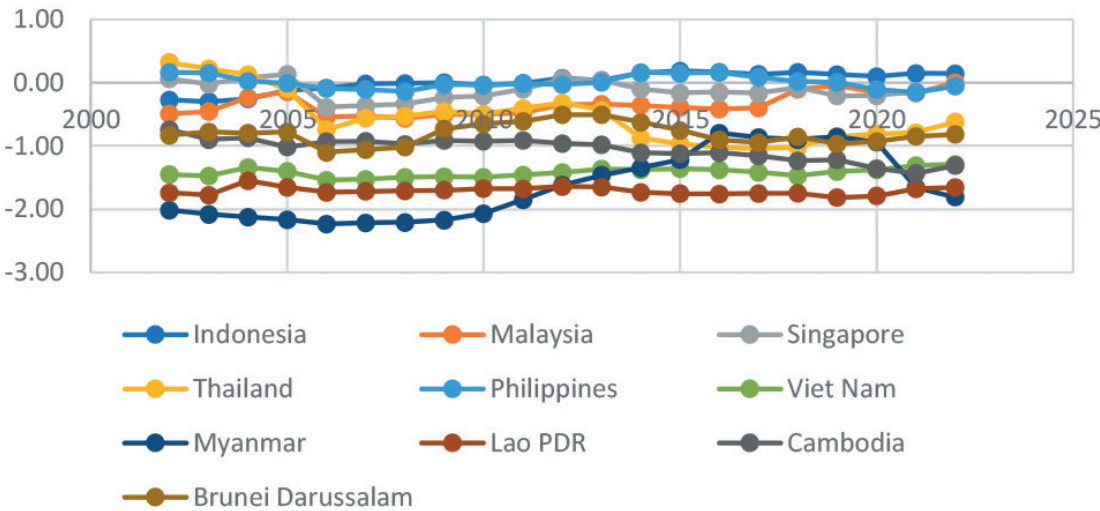
Figure 6. Trend of voice and accountability score in ASEAN countries in 2002–2022
Source: Worldwide Government Indicators[7].

Figure 6 presents almost all countries has score between 0 and –2. It means that public participation in government, freedom of expression, freedom of association, and freedom of the media are low. Indonesia and Philippine are the two countries that have most affordable scores although it is a fairly low assessment with values around zero

Panel data analysis
of institutional performance in ASEAN countries

To summarize the overall information from the data in a simple form, descriptive statistics are needed. The descriptive statistics are used to obtain a glimpse of information about the profile of government quality in ASEAN countries. The descriptive statistics can assist readers to understand several highlights and simplify information from the large data. The simple information of descriptive statistics is represented in Table 3 as following.

---

[7] Worldwide Government Indicators. Retrieved July 29, 2024 from https://data.worldbank.org/indicator/VA.EST?skipRedirection=true&view=map

ЭКОНОМИКА РАЗВИТЫХ И РАЗВИВАЮЩИХСЯ СТРАН

Table 3

Descriptive statistics of dependent and independent variables

Variables	GDPC, $	Export, % GDP	Import, % GDP	PSAV	GE	RQ	RL	CC	VA
Mean	10597.06	64.30	58.6	−0.149	0.117	−0.033	−0.216	−0.271	−0.760
Std. Dev.	17692.77	50.42	42.57	0.932	1.015	1.004	0.892	1.001	0.681
Min	36.99	0.1	0.1	−2.212	−1.684	−2.349	−1.736	−1.673	−2.230
Max	85623.75	229	208.3	1.599	2.470	2.252	1.838	2.301	0.320
Obs.	210	210	210	210	210	210	210	210	210

Source: compiled by S.W. Rizki, N.I. Didenko.

Table 3 represents a simple form of governance conditions in ASEAN countries expressed in numerical form. The descriptive analysis reveals an extreme difference between minimum and maximum values in all variables. In this case, the minimum GDPC value is $36.99 and the maximum is $85623.75, it confirms that there is a very significant difference in prosperity between ASEAN countries. Data of export and import represent a structure of demand of export and imports (% of GDP at current market prices) of goods and services from 10 ASEAN member countries completed 21 years. The maximum and minimum values of export and import revealed an extreme difference of those values. It reinforces the indications of a large prosperity gap between ASEAN member countries.

This situation is quite relevant with a sharp difference exist between the maximum and minimum values of the WGI. It implies a very significant difference in government performance in each ASEAN member country. The biggest difference is in regulatory quality and the smallest is in voice and accountability.

Table 4

Correlation between independent variables

Variables	Export	Import	PSAV	GE	RQ	RL	CC	VA
Export	1							
Import	0.7251	1						
PSAV	−0.2434	−0.1239	1					
GE	0.0931	0.0971	0.2738	1				
RQ	−0.0207	0.0059	0.2109	0.3429	1			
RL	0.0169	0.0043	0.3802	0.5499	0.4591	1		
CC	0.0424	0.2434	0.0715	0.4060	0.4476	0.3061	1	
VA	−0.0207	0.0562	−0.0165	−0.0223	0.4334	0.3397	0.4658	1

Source: compiled by S.W. Rizki, N.I. Didenko.

ECONOMIES OF DEVELOPED AND DEVELOPING COUNTRIES

Table 4 confirms that the strongest correlation between export and import gained coefficient value around 0.725151 and the weakest correlation between rule of law and import earned coefficient value about 0.004301. The strongest anti-correlation between political stability and absence of violence and export is round –0.243421.

Result of special test of significance

Test	Statistics	p-value
Chow test	**F statistic** F = 41.746; df1 = 20; df2 = 181	2.2e−16
Hausman test	**Hausman test** chisq = 0.00046684; df = 8	1
Breusch Pagan test	**LM test — two-ways effects** chisq = 214.66; df = 2	2.2e−16
	LM test — Individual effect chisq = 209.41; df = 1	2.2e−16
	LM test — time effects chisq = 5.2424, df = 1	0.02204

Source: compiled by S.W. Rizki, N.I. Didenko.

Table 5 represents several tests involved in panel regression analysis. Firstly, The Chow test is conducted to choose the better model between a common effect (as null hypothesis) or fixed effect method (as alternative hypothesis). It resulted that H0 rejected (or H1 accepted) because $p – value = 2.2e – 16 > 0.05$. It means that the fixed effect method is better than the common effect method with a 95% confidence level.

Secondly, The Hausman test is needed to determine whether there are random effects supposing the unit with the errors does not correlate with the independent variables. The results revealed that it failed to reject H0 because $p – value = 1 > 0.05$. It means that the random effect method is a better method to use when compared to the fixed effect method with a 95% confidence level.

Lastly, because the Hausman test disclosed that the model has a random effect, it is continued with the Breusch Pagan test to determine whether there is a time or individual effect or even none in the model. Based on the results of the Breusch Pagan test all p-value less than α, it concludes that in the random effect model there are two-way effects such as cross-section and time effects. The results of the Hausmann test and the Breusch-Pagan test conclude that the model to be estimated is a random effect data model with cross-section and time effects. In brief, this research conducted a fixed model having random effect with cross-section and time effects. Then a significance test of the variables in the model is carried out in Table 6 as following.

Result of panel regression

Variables	Estimated coefficients	Std. Error	z-value	Pr (>|z|)
Intercept	0.0029714	0.0841461	0.0353	0.9718
Export	0.2333809	0.0541044	4.3135	1.607e−05 ***
Import	−0.3132212	0.0550479	−5.6900	1.271e−08 ***
PSAV	−0.0404423	0.0414292	−0.9762	0.3290
GE	0.0007504	0.0515786	0.0145	0.9884
RQ	0.2142237	0.0450639	4.7538	1.997e−06 ***
RL	0.0185307	0.0531348	0.3487	0.7273
CC	−0.0431136	0.0505659	−0.8526	0.3939
VA	−0.0382610	0.0497207	−0.7695	0.4416

R-Squared: 0.25247
Adjusted R-Squared: 0.22272

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Source: compiled by S.W. Rizki, N.I. Didenko.

The panel analysis equation by putting estimated coefficients to formula equation can be written as following,

$$\text{GDPC}_{it} = 0.0029714 + 0.2333809\text{Exp}_{it} - 0.3132212\text{Imp}_{it} - 0.04044230_3\text{PSAV}_{it} +$$

$$+ 0.0007504\text{GE}_{it} + 0.2142237\text{RQ}_{it} + 0.0185307\text{RL}_{it} -$$

$$- 0.0431136\text{CC}_{it} - 0.0382610\text{VA}_{it} + e_{it},$$

where *i* denotes countries in ASEAN and *t* denotes years. The Table 6 gives the results for the previous hypothesis as following
- H0: export, import and institutional performance indicators have no impact on economic growth.
- H1: export, import and institutional performance indicators have impact on economic growth.

By taking an alpha value as 0.05, H0 will be rejected if p-values less than 0.05. Based on the overall test results on Table 6, it was obtained that the p-value of the export, import and RQ variables are 1.607e-05, 1.271e-08 and 1.997e-06, respectively. Those are less than alpha 0.05, which means that the null hypothesis is rejected and alternative hypothesis is accepted. It reveals that the export per capita, import per capita and RQ variables have impact on economic growth under 95 percent confidence level. Thus, simultaneously, those independent variables have a significant effect on GDPC. The value of adjusted R-Square is 0.22272. It means that the independent variables, namely the export, import and RQ variables, are able

to explain the dependent variable, that is GDPC, by 22.272%, while the remaining 77.278% is explained by other factors not mentioned in the model. R-Squared measures how much deviation in the model, the greater the R-Square means the deviation in the model is less which indicates the model is better. In this study, R square is 0.25247, and this is relatively small. To increase the R square value, more independent variables can be added in further research.

Discussion

Singapore achieved the highest scores in five institutional indicators: political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and corruption control, meanwhile Indonesia and the Philippines scored the highest in voice and Accountability. Brunei Darussalam and Malaysia ranked high in the five indicators following Singapore. Thailand, the Philippines, Indonesia, and Vietnam maintained a relatively high level in almost every indicator. Cambodia, Lao PDR, and Myanmar continue to struggle with governance indicator assessment. Myanmar attained the lowest level in all indicators. This is due to the unstable political situation and an effect of military emergency state. The existence of a fairly large gap in institutional performance assessment scores has caused a very significant difference in welfare between ASEAN countries. The important objective of ASEAN's formation to realize supporting economic growth, cultural development, and social progress in the regional area is facing a big challenge until present. It needs to be a more effective and strict policy to achieve the joint goal.

Panel data analysis reveals that export, import, and RQ contributing significantly to ASEAN economic growth, with an adjusted R-square value of 0.25247. This value is fairly insufficient, as it is less than 0.5. The result indicates that the export, import, and regulatory quality variables can explain 22.272% of the dependent variable, GDPC, with the remaining 77.278% explained by factors not identified in the model. Refers to the results of this panel data analysis, we know that the quality of regulation has a significant impact on economic growth. These results recommend that policy makers be more active in formulating regulations and implementing more optimal policies to encourage the development of the private sector. By considering the relatively slight R-squares value as 0.25247, it can be improved by adding independent variables in further research. The independent variables that can be added can refer to additional variables that can support regulatory quality such as interest rates and investment.

Conclusion

According to the researcher's point of view, ASEAN has unique and interesting characteristics and descriptions to be used as research study material. There are several opinions from economic experts regarding the impact of population on economic growth, on the one hand several experts and studies state that the number of residents can have a positive impact on economic growth. However, some opinions are still not sure whether the number of residents has a positive impact on economic growth. In this

study, observations in the ASEAN region provide clues that Singapore and Brunei with the smallest area and population performed very impressive economic growth with per capita income significantly above on the average GDP per capita of other ASEAN countries. In addition, these two countries have the smallest land area compared to ASEAN countries. The large area should be able to provide large natural resources that can be used as production materials and can increase export value and ultimately have a positive impact on economic growth as reflected in GDP per capita. The connecting line that could be taken from this situation is that government performance plays a very important role in managing natural resources and improving the quality of the population. From this point of view, several policies, related to how to utilize natural resources optimally and strive to improve human quality, is need to improve. Further research could involve the human development index and education quality to measuring success in efforts to build the quality of human life. In addition, interest rate and investment can be considering to be independent variables as a parameter of natural resource processing and management stimulator.

This study only limits two quantitative variables, which have an impact on economic growth, namely exports and imports, as complementary variables of the institutional performance variable. In further research, other variables can be involved, such as Foreign Direct Investment between ASEAN countries as a manifestation of economic cooperation. The researcher also suggests that further research involve the Human Development Index as one of the independent variables. The addition of suggested variables is expected to provide a more detailed description of the research results and can be used as a consideration for making policies that can support economic development in ASEAN.

References

Aparicio, S., Urbano, D., & Audretsch, D. (2016). Institutional factors, opportunity entrepreneurship and economic growth: Panel data evidence. *Technological Forecasting and Social Change*, *102*, 45–61. https://doi.org/10.1016/j.techfore.2015.04.006

Aziz, M.N., & Sundarasen, S.D.D. (2015). The impact of political regime and governance on ASEAN economic growth. *Southeast Asian Economies*, *32*(3), 375–389. https://doi.org/10.1355/ae32-3e

Bernardelli, M., Próchniak, M., & Witkowski, B. (2021). Time stability of the impact of institutions on economic growth and real convergence of the EU countries: Implications from the hidden Markov models analysis. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, *16*(2), 285–323. https://doi.org/10.24136/eq.2021.011 EDN: SRONEJ

Bowden, B. (2020). Economic foundations: Adam Smith and the classical school of economics. In *The Palgrave Handbook of Management History* (pp. 345–365). Springer International Publishing. https://doi.org/10.1007/978-3-319-62114-2_20

Buracom, P. (2014). ASEAN Economic performance, institutional effectiveness, and foreign direct investment. *Asian Affairs (UK)*, *41*(3), 108–126. https://doi.org/10.1080/00927678.2014.936801

Commendatore, P. (2003). On the post Keynesian theory of growth and "Institutional" distribution. *Review of Political Economy*, *15*(2), 193–209. https://doi.org/10.1080/0953825032000064887 EDN: DWUWUF

D'Aloia, F., & Gugler, P. (2024). Impact of Covid-19 on the economic growth of ASEAN countries: Convergence or divergence? *International Journal of Global Business and Competitiveness.* https://doi.org/10.1007/s42943-024-00098-2 EDN: IUEGJX

Davies, W. (2015). The return of social government: From 'socialist calculation' to 'social analytics.' *European Journal of Social Theory*, *18*(4), 431–450. https://doi.org/10.1177/1368431015578044

Ferrari-Filho, F., & Conceição, O.A.C. (2005). The concept of uncertainty in post Keynesian theory and in institutional economics. *Journal of Economic Issues*, *39*(3), 579–594. https://doi.org/10.1080/00213624.2005.11506835

Gallego-álvarez, I., Rodríguez-Rosa, M., & Vicente-Galindo, P. (2021). Are worldwide governance indicators stable or do they change over time? A comparative study using multivariate analysis. *Mathematics*, *9*. https://doi.org/10.3390/math9243257 EDN: FDYVUR

Haini, H. (2020). Examining the relationship between finance, institutions and economic growth: evidence from the ASEAN economies. *Economic Change and Restructuring*, *53*(4), 519–542. https://doi.org/10.1007/s10644-019-09257-5 EDN: DMDRNP

Handoyo, S. (2023). Worldwide governance indicators: Cross country data set 2012–2022. *Data in Brief*, *51*. https://doi.org/10.1016/j.dib.2023.109814 EDN: VAIKFU

Haug, N., Geyrhofer, L., Londei, A., Dervic, E., Desvars-Larrive, A., Loreto, V., Pinior, B., Thurner, S., & Klimek, P. (2020). Ranking the effectiveness of worldwide COVID-19 government interventions. *Nature Human Behaviour*, (4), 1303–1312. https://doi.org/10.1038/s41562-020-01009-0 EDN: GOIRBP

Henningsen, A., & Henningsen, G. (2019). Analysis of panel data using R. In *Panel Data Econometrics: Theory* (pp. 345–396). Elsevier. https://doi.org/10.1016/B978-0-12-814367-4.00012-5

Hussen, M.S. (2023). Institutional quality and economic growth in Sub-Saharan Africa: a panel data approach. *Journal of Economics and Development*, *25*(4), 332–348. https://doi.org/10.1108/JED-11-2022-0231 EDN: OYCQBO

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2011). The worldwide governance indicators: Methodology and analytical issues. *Hague Journal on the Rule of Law*, *3*(2), 220–246. https://doi.org/10.1017/S1876404511200046 EDN: XBFMMS

Klarin, T. (2018). The concept of sustainable development: From its beginning to the contemporary issues. *Zagreb International Review of Economics and Business*, *21*(1), 67–94. https://doi.org/10.2478/zireb-2018-0005

Kuznets, S. (1977). *Two Centuries of Economic Growth: Reflections on U.S. Experience.*

Liang, J., Yin, Z., Yang, J., Li, Y., Xu, M., Li, J., Yang, M., & Niu, L. (2022). Bibliometrics and visualization analysis of research in the field of sustainable development of the blue economy (2006–2021). *Frontiers in Marine Science*, *9*. https://doi.org/10.3389/fmars.2022.936612 EDN: TPJCHS

Midway, S.R. (2020). Principles of effective data visualization. *Patterns*, *1* (9). https://doi.org/10.1016/j.patter.2020.100141 EDN: KUNXLE

Muldoon, J. (2022). A socialist republican theory of freedom and government. *European Journal of Political Theory*, *21*(1), 47–67. https://doi.org/10.1177/1474885119847606

O'Donnell, R. (2022). Keynes and Smith, opponents or allies? Part I: Keynes on Smith. *Review of Political Economy*, *34*(1), 69–92. https://doi.org/10.1080/09538259.2021.1882185 EDN: OZPRCD

Qin, X., Luo, Y., Tang, N., & Li, G. (2020). Making data visualization more efficient and effective: a survey. *VLDB Journal*, *29*(1), 93–117. https://doi.org/10.1007/s00778-019-00588-3 EDN: TZIDRA

Sadaf, R., Oláh, J., Popp, J., & Máté, D. (2018). An investigation of the influence of the worldwide governance and competitiveness on accounting fraud cases: A cross-country perspective. *Sustainability (Switzerland)*, *10* (3). https://doi.org/10.3390/su10030588

Sagarik, D. (2017). Size of Government, Effectiveness and Socioeconomic Development: A Comparative Analysis of ASEAN Countries. *Journal of Comparative Asian Development*, *16*(2), 91–112. https://doi.org/10.1080/15339114.2017.1334565

Salman, M., Long, X., Dauda, L., & Mensah, C.N. (2019). The impact of institutional quality on economic growth and carbon emissions: Evidence from Indonesia, South Korea and Thailand. *Journal of Cleaner Production*, *241*. https://doi.org/10.1016/j.jclepro.2019.118331

Sari, V.K., & Prastyani, D. (2021). the impact of the institution on economic growth: An evidence from ASEAN. *Jurnal Ekonomi Pembangunan*, *19*(1), 17–26. https://doi.org/10.29259/jep.v19i1.12793 EDN: NVKWHG

Sidek, N.Z.M., & Asutay, M. (2020). Do government expenditures and institutions drive growth? Evidence from developed and developing economies. *Studies in Economics and Finance*, *38*(2), 400–440. https://doi.org/10.1108/SEF-10-2019-0412 EDN: QUKUFY

Smith, V.L., & Smith, A. (1997). The two Faces of Adam Smith. *Distinguished Guest Lecturer. Southern Economic Jurnal1998*, *65*(1), 20.

Ucak, A. (2015). Adam Smith: the inspirer of modern growth theories. *Procedia — Social and Behavioral Sciences*, *195*, 663–672. https://doi.org/10.1016/j.sbspro.2015.06.258

Zhao, J. (2024). How do innovation factor allocation and institutional environment affect high-quality economic development? Evidence from China. *Journal of Innovation and Knowledge*, *9*(2). https://doi.org/10.1016/j.jik.2024.100475 EDN: CGAWYV

Bio notes / Сведения об авторах

Setyo Wira Rizki, PhD Student, Institute of Industrial Management, Economics and Trade, Peter the Great Saint Petersburg Polytechnic University, 29 B Polytechnicheskaya St., Saint Petersburg, 195251, Russian Federation. ORCID: 0000-0003-0829-9767. E-mail: rizki.sv@edu.spbstu.ru

Ризки Сетьо Вира, аспирант, институт промышленного менеджмента, экономики и торговли, Санкт-Петербургский политехнический университет Петра Великого, Российская Федерация, 195251, Санкт-Петербург, ул. Политехническая, д. 29 Б. ORCID: 0000-0003-0829-9767. E-mail: rizki.sv@edu.spbstu.ru

Nikolay I. Didenko, Doctor of Economics, Professor, Institute of Industrial Management, Economics and Trade, Peter the Great Saint Petersburg Polytechnic University, 29 B Polytechnicheskaya st., Saint Petersburg, 195251, Russian Federation. ORCID: 0000-0001-8540-7034. SPIN-код: 3512-5410. E-mail: didenko.nikolay@mail.ru

Диденко Николай Иванович, доктор экономических наук, профессор, Институт промышленного менеджмента, экономики и торговли, Санкт-Петербургский политехнический университет Петра Великого, Российская Федерация, 195251, Санкт-Петербург, ул. Политехническая, д. 29 Б. ORCID: 0000-0001-8540-7034. SPIN-код: 3512-5410. E-mail: didenko.nikolay@mail.ru