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The Impact of Digitalization and Higher Education in Improving Trade Performance in Southeast Asia with the Mediating Role of Private Sector Financing

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Abstract: This study examines the role of digitalization and higher education in trade performance in Southeast Asia by considering private sector financing as a mediating variable. The analysis is motivated by the growing importance of digital transformation and human capital quality as key determinants of trade performance in the context of global economic dynamics, as well as the role of financial systems in supporting real sector activities. The study adopts an explanatory quantitative approach using panel data from six Southeast Asian countries Indonesia, Malaysia, Thailand, Vietnam, the Philippines, and Singapore covering the period 2015–2024, sourced from the World Bank. Data analysis is conducted using Partial Least Squares–Structural Equation Modeling (PLS-SEM) with a bootstrapping procedure to examine both direct and indirect relationships among variables. The results indicate that digitalization plays a significant role in enhancing trade performance and is also significantly associated with private sector financing. Higher education is found to play a significant role in trade performance, but it does not show a significant relationship with private sector financing. Furthermore, private sector financing does not exhibit a significant role in trade performance and does not function as a mediating variable in the relationships between digitalization and trade performance, nor between higher education and trade performance. These findings suggest that the contributions of digitalization and higher education to trade performance in Southeast Asia tend to be direct, while the role of private sector financing as a transmission mechanism remains structurally constrained.

Keywords: Digitalization System, Higher Education, Private Sector Financing, Trade Performance

A. Introduction

International trade is a key pillar in driving economic growth and competitiveness in the era of globalization. Global market integration has increased interdependence between countries, making trade performance a key indicator of the success of national economic development. In this context, countries no longer rely solely on

traditional comparative advantages but are required to increase efficiency, productivity, and innovation in trade activities. These changing demands in global trade are driving countries and businesses to seek new sources of competitive advantage that no longer rely solely on conventional production factors. In this context, technological advances and the use of digital innovation are key instruments in increasing efficiency, productivity, and trade competitiveness amidst increasingly fierce global competition. This transformation marks a shift in the trade paradigm from a traditional approach to a technology- and knowledge-based approach, which then positions digitalization as a strategic factor in the dynamics of the international economy and trade.

A country's trade performance is increasingly influenced by non-traditional factors such as digitalization and the quality of its human resources. Increased internet usage enables businesses to reduce transaction costs, expand market access, and participate in cross-border trade through digital platforms. Furthermore, higher education plays a crucial role in enhancing the capacity of human resources to adopt technology, innovate, and produce value-added products that meet international market standards. However, the existence of digital infrastructure and an educated workforce does not necessarily directly improve export performance without being supported by adequate economic mechanisms (Aljadani et al., 2025). However, various empirical findings indicate that the impact of digitalization on trade performance is not always immediate. In many developing countries, increased adoption of digital technology has not been fully accompanied by significant increases in exports. This situation suggests that digitalization requires the support of other supporting factors to optimally contribute to trade performance (Bakari, 2024).

Digitalization has become a strategic factor transforming the way companies operate and compete in the global economy. Digital transformation is not only about adopting information technology, but also encompasses changes in business processes, increased operational efficiency, and strengthened data-driven decision-making capabilities. Empirical findings indicate that higher levels of digitalization are associated with improved corporate financial performance, primarily through improved efficiency, innovation, and optimized asset utilization. However, the positive impact of digitalization is not automatic and is heavily influenced by resource readiness and adequate financing support, as technology investments require access to capital for effective and sustainable implementation. Therefore, digitalization needs to be understood as a strategic process whose performance is highly dependent on the alignment between technological capabilities and financial system support (Valaskova et al., 2025).

Increased internet usage has contributed to lower transaction costs, accelerated information flow, and expanded business access to global markets. However, various empirical findings indicate that the impact of digitalization on economic and trade

performance is not always direct, but rather heavily dependent on the support of other factors, particularly the development of the financial system. Private sector financing plays a strategic role in enabling businesses to utilize digital technology to increase production capacity, efficiency, and export competitiveness. Without adequate access to financing, the potential of digitalization tends to be underutilized, thus limiting its contribution to trade performance. Therefore, an integrated analysis of the relationship between digitalization, private sector financing, and trade performance is necessary, particularly in the context of developing countries in Southeast Asia (Bakari, 2024).

These findings indicate that the success of digitalization in improving trade performance is determined not only by the availability of technology and financial support, but also by the quality of the human resources who operate and utilize it. Digital technology and access to financing will struggle to produce optimal trade impacts without the support of a workforce with adequate skills, knowledge, and innovation capacity. Therefore, in addition to private sector financing, strengthening human capital through higher education is a crucial factor in bridging the benefits of digitalization with increased competitiveness and international trade performance.

In addition to digitalization, the quality of human resources is a crucial factor in addressing the dynamics of global trade. Modernizing higher education through digitalized learning, utilizing information technology, and strengthening linkages with productive economic sectors contributes to improving graduate competency in facing global competition. Adaptive and innovation-based higher education enables individuals to more effectively utilize digital technology in production and trade activities. However, the contribution of higher education to export performance is not automatic; it requires the support of an adequate economic ecosystem so that the acquired competencies can be translated into tangible business activities and international trade (Ilyina, 2025).

Higher education plays a strategic role in developing innovative, adaptive human resources who are ready to face the demands of an increasingly digitalized global economy. Higher education institutions, particularly those capable of integrating digitalization into the learning process, contribute to the development of practical skills, the utilization of technology, and the international collaboration capabilities needed in cross-border economic and trade activities. Digitalization in higher education increases learning flexibility, encourages innovation, and strengthens the link between academia and the needs of the global labor market. Therefore, increased participation in higher education reflects the workforce's readiness to support competitive production and trade activities, especially when supported by an adequate economic ecosystem and financing (Marinescu & Bogdan, 2025).

The transformation of higher education through digitalization is fundamentally oriented not only toward improving institutional performance but also toward developing individual capabilities relevant to the needs of the modern economy. The integration of digital technology in higher education serves as a connecting mechanism between the learning process and global market demands, ensuring that the resulting competencies are not limited to academics but can be implemented in economic and trade activities. Thus, the digitalization of higher education strengthens its role as a strategic tool in developing human capital capable of adapting, innovating, and contributing productively to the dynamics of the global economy.

Higher education plays a strategic role in developing innovative, adaptive human resources ready to face the demands of an increasingly digitalized global economy. Higher education institutions, particularly those capable of integrating digitalization into the learning process, contribute to the development of practical skills, technology utilization, and international collaboration capabilities required for cross-border economic and trade activities. Digitalization in higher education increases learning flexibility, encourages innovation, and strengthens the link between academia and the needs of the global labor market. Therefore, increased participation in higher education reflects the workforce's readiness to support competitive production and trade activities, especially when supported by an adequate economic ecosystem and financing (Marinescu & Bogdan, 2025).

The digitalization of higher education institutions has become a key factor in enhancing the competitiveness and relevance of higher education institutions amidst global dynamics and rapid technological developments. Digital transformation in higher education encompasses not only the use of online learning technologies but also comprehensive changes to the academic, administrative, and management processes of institutions. The integration of digital technology enables increased flexibility, accessibility, and personalization of learning, thereby strengthening human resource capacity to meet the demands of a knowledge-based economy. Therefore, the digitalization of higher education is seen as a crucial prerequisite for the long-term sustainability and competitiveness of educational institutions, while also reflecting the readiness of human capital to support economic and trade activities in the digital era (Stoyanova & Stoyanov, 2024). The integration of digital technology encourages the creation of adaptive, innovative, and collaborative learning environments, thereby strengthening individuals' capacity to adopt technology, innovate, and participate in modern economic activities. Thus, increased participation in higher education integrated with digitalization reflects the readiness of human capital as a critical foundation for supporting productive activities and economic competitiveness amidst the digital transformation (Luckyardi et al., 2024). However, increasing the level of higher education does not necessarily automatically improve trade performance (Artyukhova et al., 2025) The effectiveness of higher education is greatly influenced

by adequate financial support, because limited funding can hamper infrastructure development, learning quality, and research and innovation activities.

One key factor determining the successful implementation of digitalization and higher education is the availability of private sector financing. In the context of the digital economy, private sector financing is a key factor in determining the ability of businesses to capitalize on the opportunities created by digitalization. The development of digital technology not only increases efficiency and transparency of information but also transforms financing mechanisms by reducing information asymmetries between businesses and financial institutions. Digitalization enables the financial sector to conduct more accurate risk assessments, expand access to credit, and provide more flexible financing alternatives for the private sector. However, financing challenges remain a major obstacle, particularly for technology-oriented businesses. Therefore, the effectiveness of digitalization in driving economic activity and trade depends heavily on the functioning of a private sector financing system that supports investment, innovation, and sustainable business expansion (Hu et al., 2025). Private sector financing, reflected in domestic credit to the private sector, serves as a transmission mechanism between digitalization, higher education, and trade performance. Through access to financing, businesses can convert technological capabilities and human capital into increased production capacity and export competitiveness (Aljadani et al., 2025). Collaboration between the public and private sectors enables the utilization of financial resources, technology, and managerial capacity to accelerate the adoption of digital technologies, particularly when public budget constraints are a major constraint. Private sector involvement through financing and investment mechanisms plays a crucial role in supporting the development of digital infrastructure, improving service efficiency, and creating a conducive business climate. Therefore, digitalization depends not only on technological readiness but also on private sector financing support capable of converting digital policies and innovations into productive and competitive economic activities, including boosting trade performance and connecting with global markets.

Although various studies have highlighted the role of digitalization in improving trade efficiency and competitiveness (Bakari, 2024) (Valaskova et al., 2025) and emphasize the importance of higher education in forming human capital that is adaptive to digital transformation (Ilyina, 2025) (Marinescu & Bogdan, 2025), The existing literature still exhibits two major limitations. First, most studies examine the relationship partially and directly, without explaining the economic mechanisms that transmit digitalization and higher education to trade performance. Second, although private sector financing is often identified as a supporting factor for technology adoption and business capacity development (Hu et al., 2025) (Aljadani et al., 2025) (Azeez et al., 2025), Its role as a mediating variable has rarely been explicitly tested, particularly in the context of cross-border trade in Southeast Asia. Furthermore, cross-country studies integrating digitalization, higher education, and private sector

financing within a consistent analytical framework remain relatively limited. This limitation indicates a research gap in understanding whether the contributions of digitalization and higher education to trade performance are direct or dependent on specific financing mechanisms.

Southeast Asia is an interesting region to study in the context of the relationship between digitalization, higher education, private sector financing, and trade performance. Countries in the region have demonstrated relatively rapid growth in digitalization and higher education, yet exhibit significant variation in access to financing and trade performance. Differences in internet access, higher education participation, and private sector financing across Southeast Asia create complex dynamics in determining each country's trade performance. This situation highlights the importance of an integrated analytical approach to understanding the interrelationships between these variables in a regional context.

Based on this description, this study considers it important to analyze the role of digitalization and higher education in improving trade performance by considering private sector financing as an intervening variable. This study is expected to provide empirical contributions in understanding the transmission mechanisms between technology, human capital, and trade in the Southeast Asian region, as well as become a basis for formulating more effective policies in increasing regional trade competitiveness.

B. Methods

This study uses a quantitative approach with an explanatory research design, as is commonly used in empirical studies analyzing causal relationships between macroeconomic variables across countries. This approach allows for testing the direct and indirect effects between variables through mediating mechanisms, making it suitable for analyzing the role of digitalization and higher education on trade performance through private sector financing as an intervening variable (Dritsaki & Dritsaki, 2020) (Kalaitzi & Chamberlain, 2020) (Hayes, 2021). This research uses secondary data in the form of panel data, which is a combination of time series and cross-sectional data. The use of panel data from official international sources is commonly applied in international economic research because it can capture inter-country dynamics and changes over time simultaneously. The research data was obtained from credible sources commonly used in empirical studies, including the World Bank.

The population in this study is all countries in the Southeast Asian region. In the context of panel data-based international economic research, the population is defined as the entire cross-country unit of analysis that is theoretically relevant to the research objectives (Kalaitzi & Chamberlain, 2020) The sample was determined using

purposive sampling, which selects units of analysis based on specific criteria established by the researcher. The sample selection criteria in this study were the availability and completeness of data during the observation period, as is commonly applied in cross-country empirical studies. Based on these criteria, the study sample consisted of six countries: Indonesia, Malaysia, Thailand, Vietnam, the Philippines, and Singapore. The observation period was 2015–2024, resulting in a total of 60 data units, the product of the six sample countries and the ten-year observation period.

The data analysis technique in this study used Partial Least Squares-Based Structural Equation Modeling (PLS-SEM). This approach, developed by Wold and widely used for predictive causal relationship analysis, particularly in conditions with relatively limited sample sizes and without strict normal distribution assumptions. PLS-SEM also allows for simultaneous testing of direct and indirect (mediation) effects. Parameter significance testing was performed using a bootstrapping procedure, which is recommended for evaluating the stability and significance of estimated relationships between variables (Hayes, 2021).

C. Results and Discussion

The development of digitalization, higher education, private sector financing, and trade performance in Southeast Asian countries during the period 2015–2024. The presentation of descriptive statistics aims to identify patterns, trends, and differences in characteristics between countries before conducting further structural analysis. Table 1 presents cross-country panel data reflecting the level of digital technology adoption, human resource capacity through higher education, the depth of private sector financing, and international trade performance. This information provides an important basis for understanding Indonesia's relative position compared to other countries in the region and provides empirical context for testing causal relationships in the research model.

Table 1. Development of Digitalization, Higher Education, Private Sector Financing, and Trade Performance in Southeast Asia, 2015–2024

No	Year	Digitalization of Individuals Using the Internet (% of Population)	Higher Education School Enrollment tertiary (% gross)	Private Sector Financing	Exports of Goods and services
Indonesia	2024	72781	0	36.39245076	22.18331287
Malaysia	2024	98021	38.5	116.1009301	71.34108498
Thailand	2024	90867	44.98	147.9789867	70.04973074
Vietnam	2024	84150	37.59	0	90.15422105
Philippines	2024	0	47.41	49.81366551	25.77344115
Singapore	2024	94378	0	0	178.7762868
Indonesia	2023	69208	44.88	36.01288886	21.7538472
Malaysia	2023	97693	37.27	117.1002525	68.67895357
Thailand	2023	89535	45.44	154.1407801	65.44456294
Vietnam	2023	78080	32.84	0	86.46741924

Philippines	2023	83766	44.24	48.31104071	26.63684935
Singapore	2023	94285	97.29	0	181.5613224
Indonesia	2022	66485	42.33	35.28843296	24.50291169
Malaysia	2022	97399	36.99	113.0704706	76.80779748
Thailand	2022	87977	43.29	156.4524166	65.37276419
Vietnam	2022	78590	44.75	124.9614788	93.42012904
Philippines	2022	75211	38.4	48.87302992	28.38740155
Singapore	2022	95954	98.02	0	186.1142908
Indonesia	2021	62105	40.63	36.99082706	21.41655564
Malaysia	2021	96751	38.19	127.2608946	70.63305555
Thailand	2021	85270	43.47	164.0950422	58.55938918
Vietnam	2021	74210	41.96	124.2828987	93.85020713
Philippines	2021	66908	33.62	49.94132491	25.75203492
Singapore	2021	96925	97.1	0	182.7108066
Indonesia	2020	53727	38.17	38.67953909	17.33116828
Malaysia	2020	89555	39.74	133.8169955	61.57793591
Thailand	2020	77844	42.59	160.1109201	51.49442661
Vietnam	2020	70300	0	115.5253499	84.38159801
Philippines	2020	53765	31.63	52.0356914	25.20283931
Singapore	2020	92004	93.13	129.1908316	181.7820245
Indonesia	2019	47691	37.32	38.37269395	18.5915278
Malaysia	2019	84187	40.81	120.7069463	65.27776684
Thailand	2019	66652	44.99	143.3691634	59.51889062
Vietnam	2019	68662	30.22	108.0319009	85.15758741
Philippines	2019	43027	30.05	47.97366866	28.38292001
Singapore	2019	88949	91.09	119.4675417	176.8913
Indonesia	2018	39905	36.15	38.80544967	21.0027465
Malaysia	2018	81201	43.31	120.2763119	68.55497142
Thailand	2018	56818	46.17	144.0887917	64.8380969
Vietnam	2018	69848	0	105.2759847	84.42345608
Philippines	2018	44100	28.12	47.5627908	30.21360537
Singapore	2018	88166	88.89	117.7053839	178.1982514
Indonesia	2017	32336	35.97	38.73234956	20.17730444
Malaysia	2017	80141	42.29	117.1675684	70.01174251
Thailand	2017	52892	47.43	144.6403073	66.67283247
Vietnam	2017	58140	25.95	103.9720323	81.76252184
Philippines	2017	41600	33.68	45.60519779	29.55229085
Singapore	2017	84452	84.79	120.8357749	171.7416255
Indonesia	2016	25447	34.83	39.40242469	19.08899385
Malaysia	2016	78788	45.4	121.9798206	66.77544545
Thailand	2016	47505	49.32	146.2239494	67.07088397
Vietnam	2016	53000	29.08	98.85896077	74.10728626
Philippines	2016	39200	38.34	42.86451799	26.67300334
Singapore	2016	84452	83.94	123.4830663	164.5506642
Indonesia	2015	22063	32.46	39.1187983	21.16017926
Malaysia	2015	71064	44.29	123.1036296	69.4486909
Thailand	2015	39316	45.71	149.3732535	67.63669027
Vietnam	2015	45000	29.73	90.39922733	72.92285184
Philippines	2015	36900	35.87	39.90378358	27.20805724
Singapore	2015	79013	0	122.4213538	178.3846085

Source: World Bank (2025)

In general, the data shows strong heterogeneity among Southeast Asian countries in terms of levels of digitalization, higher education, private sector financing, and trade performance. Developed countries in the region, such as Singapore and Malaysia, consistently demonstrate high levels of digitalization and strong trade performance, while developing countries like Indonesia, the Philippines, and Vietnam show gradual progress with different structural characteristics.

1. Digitalization (Individuals Using the Internet)

Indonesia shows a consistent and significant upward trend in digitalization throughout the 2015–2024 period. Internet penetration increased from 22,063 (2015) to 72,781 (2024). This increase reflects the successful expansion of digital infrastructure and the adoption of technology by the public. However, comparatively, Indonesia's digitalization rate still lags behind Malaysia, Thailand, and Singapore, which have achieved internet penetration rates above 85–95 percent of the population. This indicates that, despite Indonesia's rapid digital progress, its digital capacity is not yet fully optimized to support regional trade competitiveness.

2. Higher Education (School Enrollment, Tertiary)

Indonesia's higher education participation rate ranged from 32 to 45 percent during the observation period, peaking at around 44.88 percent (2023). This figure is relatively lower and fluctuates compared to Thailand, Malaysia, and the Philippines, which consistently have higher higher education participation rates. This indicates that Indonesia's human capital accumulation is not as strong as that of comparable countries, thus the potential for leveraging digitalization and financing to improve trade performance has not been fully maximized.

3. Private Sector Financing (Domestic Credit to the Private Sector)

Private sector financing in Indonesia has been relatively stagnant and low, ranging from 35 to 39 percent of GDP for almost a decade. This figure is far below that of Malaysia, Thailand, and Singapore, which have credit-to-GDP ratios above 100 percent. These financing limitations indicate that the transmission mechanism from digitalization and higher education to real economic activity, particularly trade, is not yet optimal in Indonesia. The private sector faces limited access to capital for production expansion and increased export competitiveness.

4. Trade Performance (Exports of Goods and Services)

Indonesia's trade performance is relatively low and stable, with exports contributing 17–25 percent to GDP. This figure lags far behind Vietnam (80–93 percent), Malaysia and Thailand (60–75 percent), and Singapore, which are structurally highly dependent

on international trade (>170 percent). This indicates that Indonesia's growing digitalization has not yet fully translated into improved trade performance, primarily due to limited financing and human resource quality. Malaysia and Thailand demonstrate strong synergies between high digitalization, relatively mature higher education, and deep private sector financing. This combination is reflected in stable and high trade performance. In contrast, Indonesia experiences a structural disconnect, where increasing digitalization is not accompanied by adequate financial sector deepening and higher education quality. Vietnam exhibits an interesting pattern, namely very high trade performance despite relatively lower digitalization and higher education in some years. This suggests that Vietnam's export industry structure and global integration are stronger, and private sector financing (in certain years) is capable of supporting aggressive export expansion. Indonesia, on the other hand, has not been able to capitalize on similar opportunities due to limited financing and export-driven industrial transformation. Singapore is a structural outlier, with very high digitalization, deep private sector financing, and extremely high trade performance. This comparison highlights that without a strong financial system and superior human resources, digitalization alone is not enough to boost trade performance.

R Square (R2)

The coefficient of determination (R^2) is a measure that shows the proportion of variation in endogenous variables that can be explained by exogenous variables in a structural model. In the Structural Equation Modeling (SEM) approach, the R^2 value is used to assess the model's predictive ability in explaining the relationship between latent variables (Hayes, 2021)**.** States that R^2 is an important measure of effect size because it provides information about the magnitude of the independent variable's contribution to the dependent variable, not just its significance. However, because the R^2 value tends to increase with the addition of predictors, the use of adjusted R^2 is necessary to obtain a more conservative estimate and avoid overfitting bias. In the SEM-PLS model evaluation, an R^2 value of 0.67 indicates strong explanatory power, a value of 0.33 is considered moderate, and a value of 0.19 is considered weak. Therefore, the R^2 and adjusted R^2 values in this study are used to assess the extent to which digitalization and net exports through Gross Domestic Fixed Capital Formation (GFCF) are able to explain economic growth in South Kalimantan Province.

Tabel 2. R Square

Variabel Endogen	R Square	R Square Adjusted
Digitalization, Higher Education, and Private Sector Financing in Improving Trade Performance in Southeast Asia	0,500	0,473
Digitalization and Higher Education in Improving Private Sector Financing in Southeast Asia	0,071	0,038

Source: Reprocessed Secondary Data (2025)

Based on the results of the coefficient of determination test in Table 2, the R-square value of 0.500 in the model explaining trade performance indicates that digitalization, higher education, and private sector financing together explain 50.0 percent of the variation in trade performance in Southeast Asian countries. Meanwhile, the adjusted R-square value of 0.473 indicates that the model has a fairly strong and stable level of explanation, even considering model complexity. This finding suggests that although the factors within the model play a significant role, nearly half of the variation in trade performance is influenced by factors outside the model. Furthermore, in the model explaining private sector financing as an endogenous variable, the R-square value of 0.071 and the adjusted R-square value of 0.038 indicate that digitalization and higher education only explain 7.1 percent of the variation in private sector financing in Southeast Asia. This value is relatively low, indicating that private sector financing is more predominantly influenced by other structural factors, such as monetary policy, macroeconomic stability, financial system depth, and banking regulations. These results confirm that the role of digitalization and higher education on private sector financing is limited and indirect, thus strengthening the argument that private sector financing functions as a transmission mechanism that is influenced by various external factors outside the main research variables.

Hypothesis Testing

Hypothesis testing is conducted based on the results of the Inner Model (structural model) testing, which includes r-square output, parameter coefficients, and t-statistics. To see whether a hypothesis can be accepted or rejected, among other things, by paying attention to the significance value between constructs, t-statistics, and p-values. This research hypothesis testing was conducted using SmartPLS (Partial Least Square) 3.0 software. These values can be seen from the bootstrapping results. The rule of thumb used in this study is t-statistics >1.96 with a significance level of p-value 0.05 (5%) and a positive beta coefficient. The value of this research hypothesis testing can be shown in the table below, and the results of this research model can be illustrated as shown in the following figure:

Direct Effect

The hypothesis will be accepted if the t-statistic value is >1.96 or the p-value is <0.05 (5%) with a positive coefficient. The following is the value of the direct effect of the bootstrapping results.

Table 3. Direct Influence

	T Statistic	P Values
X1 To Y	5,227	0,000
X1 To Z	2,133	0,033
X2 To Y	2,229	0,026
X1 To Z	0,282	0,778
Z To Y	0,128	0,898

1. The Effect of Digitalization (X_1) on Trade Performance (Y)
   The test results show that digitalization has a t-statistic of 5.227 with a p-value of 0.000. This value meets the criteria for statistical significance (t > 1.96 and p < 0.05), thus concluding that digitalization has a direct, significant impact on trade performance in Southeast Asian countries. This finding indicates that increased adoption of digital technology significantly boosts export performance and international trade activity.
2. The Effect of Digitalization (X_1) on Private Sector Financing (Z)
   Based on the test results, digitalization has a t-statistic of 2.133 with a p-value of 0.033. This value meets the criteria for significance (t > 1.96 and p < 0.05), thus concluding that digitalization has a significant impact on private sector financing in Southeast Asia. These results indicate that increased digitalization contributes to expanding access and efficiency of financing for the private sector.
3. The Effect of Higher Education (X_2) on Trade Performance (Y)
   The test results show that higher education has a t-statistic of 2.229 with a p-value of 0.026. This value meets the significance criteria (t > 1.96 and p < 0.05), thus concluding that higher education has a direct effect on trade performance in Southeast Asia. This finding confirms the role of human resource quality in increasing international trade competitiveness.
4. The Effect of Higher Education (X_2) on Private Sector Financing (Z)
   The test results show that higher education has a t-statistic of 0.282 with a p-value of 0.778. This value does not meet the criteria for statistical significance, thus concluding that higher education does not have a significant effect on private sector financing in Southeast Asia. This indicates that increasing higher education has not directly driven the deepening of private sector financing.
5. The Effect of Private Sector Financing (Z) on Trade Performance (Y)
   Private sector financing showed a t-statistic of 0.128 with a p-value of 0.898, indicating its effect was not statistically significant. Thus, it can be concluded that private sector financing has not been able to directly influence trade performance in Southeast Asia.

Indirect Effect

The role of intervening can also be seen from the significance of the indirect effect, the following is the value of the indirect effect from the bootstrapping results.

Table 4. Indirect Effects

	T Statistic	P Values
X1 Against Y Through Z	0,104	0,917
X2 Against Y Through Z	0,036	0,971

1. The Effect of Digitalization (X_1) on Trade Performance (Y) through Private Sector Financing (Z). The results of the indirect effect test indicate that digitalization through private sector financing has a t-statistic of 0.104 with a p-value of 0.917.

This value does not meet the criteria for statistical significance ($t > 1.96$ or $p < 0.05$), so it can be concluded that private sector financing does not mediate the effect of digitalization on trade performance in Southeast Asia.

2. The Effect of Higher Education (X_2) on Trade Performance (Y) through Private Sector Financing (Z).

Based on the test results, the indirect effect of higher education on trade performance through private sector financing shows a t-statistic of 0.036 with a p-value of 0.971. This value falls short of the significance criteria, so it can be concluded that private sector financing does not act as a mediating variable in the relationship between higher education and trade performance in Southeast Asia.

D. Conclusion

This study concludes that digitalization and higher education are key structural factors directly improving trade performance in Southeast Asia, while private sector financing has not yet effectively functioned as a transmission mechanism. Digitalization lowers transaction costs, accelerates information flows, and expands international market access—transforming it from a supporting factor into a strategic source of enhanced trade capabilities and digital market integration. Digitalization also strengthens the financial system through operational efficiency, financial inclusion, and reduced information asymmetry. However, increased financing has not been optimally allocated to export-oriented sectors, thus limiting its impact on trade. Higher education contributes significantly to the quality of human resources, innovation capacity, and the business sector's adaptation to global trade dynamics, in line with endogenous growth theory, which positions knowledge as a driver of long-term competitive advantage. However, the effect of higher education on private sector financing is insignificant, reflecting a structural dislocation between human capital development and credit distribution mechanisms that still prioritize collateral and traditional risk. Private sector financing also has neither a significant impact nor a mediating variable on trade. Therefore, integrated policies are needed: strengthening the digital trade ecosystem, directing financing to productive and export sectors, and integrating higher education, the business world, and the financial sector to promote sustainable trade performance.

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