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Effect Size of Logistics: Evidence from Selected Countries

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Abstract: Efficiency of cross-border goods' movement and resource use is key for countries' economic growth. This study aimed to estimate the effect size of transportation infrastructure and logistics performance on selected countries' development, based on the infrastructure of services approach. A partial least square (PLS) and structural equation modeling (SEM) analysis for 74 countries for 2012–2018 revealed that transportation infrastructure and logistics performance were statistically significant (at the 1% level) for economic development, despite small and medium effect size. Transportation had a significantly positive and large effect on logistics performance (at the 1% level). Mediation analysis results also showed evidence of the significantly large effect size (at the 1% level) of logistics performance. The study concludes that logistics performance is a strong contributor—directly and indirectly—in the development of countries where transportation alone may not be enough. Hence, countries should prioritize logistics development strategies to harness global production networks, improve policies and practices, and enhance their standards of living.

Keywords: Logistics performance, transportation infrastructure quality, effects size, infrastructure of services, PLS-SEM

1. Introduction

The efficiency with which goods move across borders significantly affects the economic growth in countries and their level of development. The increase in global production networks and competition necessitates proper resource use, in light of macro development factors. The importance of logistics performance in improving economies' competitiveness has been firmly acknowledged [1–3], especially in the global value demands context.

Empirical literature also stresses the role of transportation infrastructure as a critical component supporting economic development, notwithstanding the current debate about lasting effects and other considerations [4,5]. Some studies have focused on its influence on spatial connections and

international relations [6], while others [7] suggest that transportation and related services play a pivotal role in accelerating growth. Better transportation infrastructure quality reduces marginal costs [8], supporting increased efficiency for businesses and citizens' wellness. While transport accessibility influences development paths and contributes to economic growth, it can also be a barrier [9].

However, despite their relevance for markets from an infrastructure of services perspective, there are limited studies assessing the impact of logistics and transportation infrastructure networks on countries' development. This study aims to estimate the effect size of transportation infrastructure and logistics services on selected countries' economic development.[1] Accordingly, the following hypotheses are proposed:

H1: Transportation infrastructure has a positive and large effect on economic development.

H2: Transportation infrastructure has a positive and large effect on logistics.

H3: Logistics has a positive and large effect on economic development.

H4: Logistics has a positive and large mediation effect on transportation and economic development.

The following sections will provide a theoretical review, data and methods, results, discussion, and conclusions.

1.2 Theoretical Review

This study applies the stakeholder and resource-based view (RBV) theories to assess actors' networking effects and resource use in countries. The stakeholder theory supports analysis employing active management of macro environments (e.g., countries), integration of relationships (e.g., governments and private businesses), and the promotion of shared interests (e.g., development) [10]. Moreover, the RBV stresses the integration of tangible resources, like transportation, with intangible resources that are difficult to model, such as logistics services, for better development.

1.2.1 Quality of Transportation Infrastructure[2]

Transportation infrastructure is one of the most important components of an economy [11,6]. It refers to physical assets, such as roads, ports, airports, and railways [12]. Its quality is thus critical for a country's successful integration into the globalized economy [13], export growth, and development [8]. It leads to increased productivity, reallocation of labor, and capital [12], and supports the reorganization of global production networks and facilitates coping with international markets [14]. Recently, [15] confirmed that the lack of maintenance of transportation infrastructure (i.e., highways)

[1] It is worth noting that the focus is not on establishing causation between transport and economic development but on the quantification of its effects within countries' integrated infrastructure of services.

[2] Quality of transportation infrastructure and transportation are interchangeable concepts.

negatively impacted German counties' economic development. Previously, [16] evidenced the positive effect of road quality in Sub-Saharan Africa on economic development.

1.2.2 Logistics Performance[3]

Studies have acknowledged that logistics performance is essential for enhancing competitiveness and economic growth because of the integration opportunities [1]. It should be recognized as a strategic source of competitive advantage due to its relevance in facilitating global exchanges through its development [17–18] with strong potential to reduce transaction costs [17] and improve competitiveness [19].

Exchanges are done across spatial dimensions involving unavoidable costs [20]. Hence, global value chains and production demands are highly dependent on the efficiency of logistics services. Moreover, countries' logistics efficiency is also vital for their business leaders, influencing inventory management decisions, payment processing, and firms' operational activities.

The positive influence of Logistics Performance Index's (LPI) explicative production factor on countries' economic growth was confirmed by [21], while [22] established its positive effect in improving development. It was found that logistics positively and directly affect economic performance, measured using the gross domestic product (GDP) of 62 countries [23].

2. Data and Methods

The research design is based on pooled secondary data from 74 countries for 2012–2018. This strategy provided a total of 296 observations, enough to meet sample requirements [24-25]. Country selection was based on data availability. The dependent variable, economic development, is proxied by the GDP per capita (PPP, constant 2011, $ int), drawn from the World Bank (WB) and transformed using the natural logarithm (ln). Using the PPP measurement reduces the country's impact, adjust for price differences, and allows for economic performance comparisons [26]. Moreover, it suggests economic growth patterns and estimations for the country's overall productivity [27]. The transportation infrastructure construct is exogenously formed using the quality of the most relevant inter-modals in freight flows, namely roads (qrds), ports (qprts), airports (qarps), and railroads (qrrs) based on data drawn from the World Economic Forum (WEF), following the work of [8]. Countries' infrastructure quality and extension are compared on a Likert scale of one (*worst*) to seven (*best*). Logistics is derived from the biennial WB's LPI (starting 2007) comprising the following dimensions' averages: (1) customs efficiency, (2) infrastructure, (3) international shipments, (4) logistics competences, (5) tracking and tracing, and (6) timeliness. The LPI is based on a Likert scale survey

[3] Logistics, logistics performance and logistics services are interchangeable concepts.

of private freight-forwarders and shippers from countries currently using the common transport assets.

Partial least squares (PLS) and structural equation modeling (SEM) is used for the empirical analysis. This methodology is appropriate because: (1) it allows the multivariate analysis to determine effects simultaneously, (2) it handles non-normal data well, and (3) the structural model is unrestricted when sample size requirements are met [25]. Therefore, the proposed methodology supports the primary objective of measuring logistics performance as part of the infrastructure of service interactions. The PLS–SEM methodology has been employed in several contemporary logistics and transport studies [18,23,28].

2.1 Sample

The study draws on data from 74 **selected economies**[4] for 2012–2018. The descriptive statistics of variables are shown in Table 1.

Table 1 Descriptive statistics of variables. Source: author

Variables	N	Min	Max	Mean	Std dev
Qrds	296	2.00	6.30	4.21	1.17
Qprts	296	1.30	6.80	4.39	1.09
Qarps	296	2.20	6.65	4.74	0.99
Qrrs	296	1.20	6.70	3.62	1.33
Logistics	296	1.85	4.23	3.22	0.55
Ecodev	296	7.38	11.48	9.81	0.89

Note: N = number of observations; Std dev = standard deviation

3. Results

3.1 Structural Equation Modeling—Description

Fig. 1 presents the research path and structural modeling based on theory and structural characteristics. The circles represent constructs or latent variables, where their values, following SEM methodology, indicate the variance explained by other latent variables (R^2). The arrows from one construct to another show the path coefficient (*B*), estimating the direction, strength, and relevance

[4] Countries:
Algeria, Argentina, Armenia, Australia, Austria, Belgium, Brazil, Bulgaria, Cambodia, Cameroon, Canada, Chile, China, Colombia, Costa Rica, Croatia, Czech Republic, Denmark, Egypt, Estonia, Finland, France, Georgia, Germany, Greece, Hong Kong SAR, Hungary, India, Indonesia, Ireland, Italy, Japan, Jordan, Kazakhstan, Korea, Rep, Kyrgyz Republic, Latvia, Lithuania, Luxembourg, Madagascar, Malaysia, Mauritania, Mexico, Moldova, Montenegro, Netherlands, New Zealand, Nigeria, Norway, Pakistan, Panama, Peru, Philippines, Poland, Portugal, Romania, Russian Federation, Saudi Arabia, Senegal, Serbia, Slovak Republic, Slovenia, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, Ukraine, United Kingdom, United States, Uruguay, Vietnam, Zimbabwe

between constructs. The arrows entering the transportation construct are representative of the formative measurement. The rectangles signify the formative indicators, with their values contributing to the construct conceptualization as they are not interchangeable.

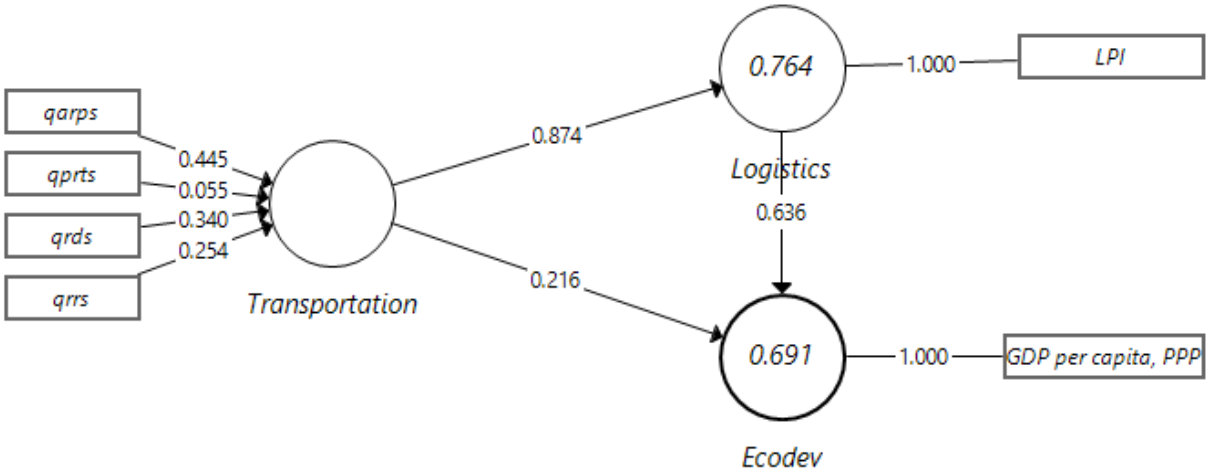

Fig. 1 Research path and structural modeling. Source: author

3.2 Structural Model—Outer Evaluation

3.2.1 Convergent Validity

The convergent validity of transportation, a formative construct, is necessary to establish its adequacy for the model. This process uses a global item to capture the construct essence [29-30]. Convergent validity is confirmed when $B \geq 0.70$. Fig. 2 presents the results, confirming the accuracy of the variables forming the quality of transportation infrastructure in measuring the construct ($B = 0.94$). The global item employed, namely *Transportation_G*, was: *How do you assess your country's general state of infrastructure? [1, extremely underdeveloped –7, extensive and efficient]*

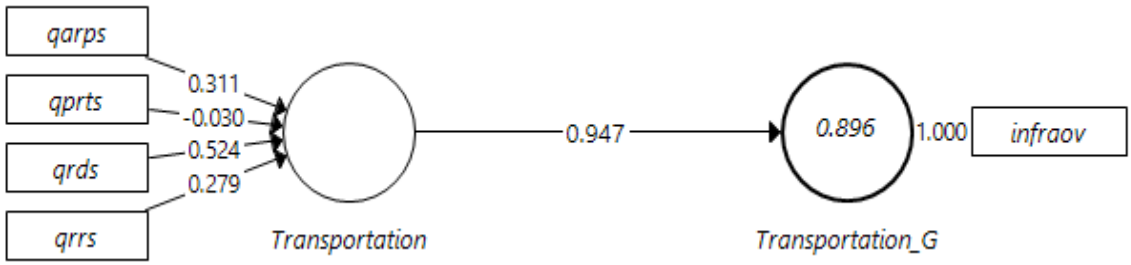

Fig. 2 Convergent validity—transportation. Source: author

3.2.2 Indicators' Variance Inflation Factors

The variance inflation factors (VIF) are examined to confirm that values do not exceed the suggested threshold of 5 [25]. A higher value confirms multicollinearity. Table 2 presents the VIF values of the indicators, confirming that multicollinearity is not a concern (< 5).

Table 2 VIF values of the indicators. Source: author

Variables	VIF
Qrds	4.06
Qprts	3.98
Qarps	4.79
Qrrs	2.32
Logistics	1.00
Ecodev	1.00

3.2.3 Outer Weights Assessment

The indicator's outer weights (*w*) establish the relative importance of forming transportation infrastructure from multiple regression of the construct on its set of indicators [25]. The outer loadings (*l*) are considered in deciding indicator removal, when the *w* are not significant. Table 3 confirms the relative and absolute significance of the transportation construct formation indicators (at a 1% level).

Table 3 Outer weights/loadings. Source: author

Variables	Weights	Loadings	p-value	t-statistic
Qrds	0.34*	--	<0.001	5.90
Qprts	0.05	0.85*	<0.001	37.63
Qarps	0.44*	--	<0.001	6.44
Qrrs	0.25*	--	<0.001	5.61

*Significant at 1% level

3.3 Structural Model—Inner Evaluation

3.3.1 Bootstrapping

The bootstrapping sampling method is a non-parametric procedure used to assess the model's structural relationships [25]. Fig. 3 shows the bootstrapping estimates based on 5.000 iterations (two-tailed at a 5% significance level). The numbers within the arrows are the t-statistics, used for hypotheses testing in this study, based on the significance of p-value <0.001, t > 2.58.

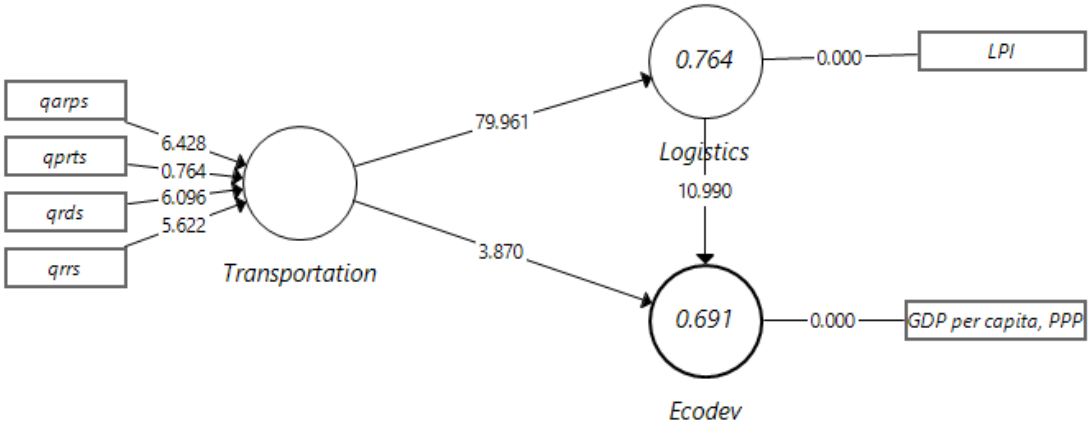

Fig. 3 Bootstrapping results. Source: author

3.3.2 Constructs' Variance Inflation Factors

The model assessment must consider the VIF values between constructs to avoid overestimation of results. Table 4 presents the results, establishing that multicollinearity is not an issue, since values are under the maximum recommended threshold (< 5).

Table 4 VIF values. Source: author

Path relationship	VIF
Transportation → Ecodev	4.23
Transportation → Logistics	1.00
Logistics → Ecodev	4.23

3.3.3 R2

According to the results shown in Fig. 3, transportation infrastructure explains logistics performance variation by 76%, whereas they together influence variance in economic development by 69%.

3.3.4 Hypotheses Testing

Table 5 presents the results for the research hypotheses supported at a 1% significance level.

Table 5 Hypotheses testing on effect types. Source: author

Hypotheses	Original sample	Std dev	t-statistic	p-value	Decision
Transportation → Ecodev (H_1)	0.21	0.05	3.84*	<0.001	Supported
Transportation → Logistics (H_2)	0.87	0.01	79.72*	<0.001	Supported
Logistics → Ecodev (H_3)	0.63	0.05	10.93*	<0.001	Supported
Transportation→Logistics→Ecodev (H_4)	0.55	0.05	10.84*	<0.001	Supported

*significant at 1% level; Std dev = standard deviation

3.3.5 Effect Sizes (f 2)—Direct Hypotheses

The f^2 in the structural model contends (1) the practical relevance of the effects [30], and (2) the relative impact of a regressor regardless of sample size [25]. Effect size values range 0.02–0.15 (small), 0.15–0.35 (medium), and 0.35 and above (large) [24-25]; whereas [31] included the value of 2+ to represent a huge effect. Table 6 shows the f^2 results from the direct relationships in the model where H_2 is supported ($f^2 = 3.23 > 0.35$), indicating a vast transportation effect in logistics. However, neither H_1 ($f^2 = 0.03 < 0.35$) nor H_3 ($f^2 = 0.31 < 0.35$) is supported.

Table 6 Hypotheses testing on effect sizes. Source: author

Path relationships	f^2	Effect size	Decision
Transportation → Ecodev (H_1)	0.03	Small	Not supported
Transportation → Logistics (H_2)	3.23	Huge	Supported
Logistics → Ecodev (H_3)	0.31	Medium	Not supported

3.3.6 Mediation Analysis

Mediation effects are evident when a third variable governs the relationship between two constructs [25]. The methodology of [32-33] for mediation and characterization was used to measure logistics' impact in the relationship between transportation and economic development (H_4). Commonly research studies employ the [34] test. However, the mentioned test assumes a normal distribution not consistent with PLS-SEM's non-parametric methodology [25].

According to [33], there are three types of mediation: (1) complementary, where both the direct (P1) and indirect effects (P2*P3) are significant and have the same direction; (2) competitive, where both P1 and P2*P3 are significant but have opposite directions; and (3) indirect, where P2*P3 is the only one significant. Path coefficients and p-values are used on mediation effect calculations. Table 7 presents the results for Transportation →Logistics → Ecodev (H4).

Table 7 Mediation analysis. Source: author

Path relationships	Effects	p-value
Transportation → Logistics (P_1)	0.87*	<0.001
Logistics → Ecodev (P_2)	0.63*	<0.001
Transportation → Ecodev (P_3)	0.21*	<0.001

*Significant at 1% level

The calculations for the effects size on the mediation analysis contend that P3 = 0.21 and P1*P2 = 0.54. Thus, total effects comprise their sum (P3 + (P1*P2) = 0.21 + (0.87*0.63) = 0.75). Path relationships have a positive direction and p-values are statistically significant at 1% level (p = <0.001). Based on the approach of [24,33], logistics performance has a large and complementary mediation effect (f 2 = 0.75 > 0.35, p = <0.001) on the relationship between quality of transportation infrastructure and economic development, lending support for H4.

4. Discussion

In general, the findings revealed the positive and statistically significant effect of transportation infrastructure on economic development. A one-unit change in transportation will influence economic development by 21% (B = 0.21, t = 3.84), as per [8]. Within the transportation infrastructure, findings

suggest the quality of airports ($w = 0.44$, $t = 6.44$) and the quality of roads ($w = 0.34$, $t = 5.90$) are the most important. The quality of transportation infrastructure was also significant for logistics performance ($B = 0.87$, $t = 79.72$) similar to the results in [23,28]. Logistics is indicated to positively and significantly affect economic development ($B = 0.63$, $t = 10.93$), implying that a unit change in logistics will benefit economic development by 63%—a positive effect, as established by [21-23]. Moreover, the integration of transportation and logistics as an infrastructure of services is necessary for economic development. A unit change in these will favor country development by 55% ($B = 0.55$, $t = 10.84$).

H1 and H3 proposed a direct, large effect size of transportation infrastructure and logistics on economic development. However, these hypotheses were not supported. Transportation experienced a small effect ($f\ 2 = 0.03$) whereas logistics obtained a medium effect ($f\ 2 = 0.31$) on economic development. Nevertheless, the mediation analysis provided support for H4. Logistics had significant and large effect size ($f\ 2 = 0.75 > 0.35$, $p < 0.001$) on transportation-related infrastructure and development, establishing the complementary mediation role of logistics. This does not imply that the quality of transportation infrastructure is not necessary for development. Instead, it highlights that integration of logistics, even in the short term, maximizes the benefits of resource integration, especially for global demands [1–3].

5. Conclusion

This study provided evidence about the effects of the quality of transportation infrastructure and logistics performance on the development of selected countries. The wide-reaching effects of countrywide logistics performance on development were revealed to increase within the network services framework.

While infrastructure, including transportation infrastructure, has been recognized as a global challenge under the United Nations Sustainable Development Goals 2030 agenda, merely ensuring its quality is not enough for development. The results suggest that the integration of logistics development strategies within the economic development framework should be a priority for policymakers and regulators to improve resource integration and standards of living, especially for markets where the logistics sector has proved to be critical.

This study has the following limitations. It takes a ceteris paribus approach in highlighting the benefits of an integrated infrastructure of services; hence, the results may vary depending on the levels of development in different countries and the incorporation of other country-specific factors in the analysis. Future research may consider additional variables, such as the dimensions of the logistics index and income classifications, for a more tailored approach to logistics strategies.

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Note

The use of the SmartPLS is granted under a license agreement, required to be referenced as follows:

Ringle, C. M., Wende, S., and Becker, J.-M. 2015. "SmartPLS 3." Boenningstedt: SmartPLS GmbH, http://www.smartpls.com.

References

[1] Arvis, J., Mustra, M., Panzer, J., Ojala, L. & Naula, T. (2007). Connecting to compete: Trade logistics in the global economy. Washington DC: The World Bank. DOI: 10.1596/24600.

[2] Korinek, J. & Sourdin, P. (2011). To what extent are high-quality logistics services trade facilitating? OECD Trade Policy Working Papers 108. Paris: OECD Publishing. DOI: 10.1787/18166873.

[3] Kunaka, C., Mustra, M. & Saez, S. (2013). Trade dimensions of logistics services: A proposal for trade agreements. Policy Research Working Paper. Washington DC: The World Bank. DOI: 10.1596/1813-9450-6332.

[4] Crescenzi, R., Di Cataldo, M. & Rodríguez-Pose, A. (2016). Government quality and the economic returns of transport infrastructure investment in European regions. Journal of Regional Science 56(4), 555–582. DOI: 10.1111/jors.12264.

[5] García-Milà, T., McGuire, T. & Porter, R. (1996). The effect of public capital in state-level production functions reconsidered. The Review of Economics and Statistics 78(1), 177–180. DOI: 10.2307/2109857.

[6] Skorobogatova, O. & Kuzmina-Merlino, I. (2017). Transport infrastructure development performance. Procedia Engineering 178, 319–329. DOI: 10.1016/j.proeng.2017.01.056.

[7] Carter, E., Chadda, H. & Schonfeld, P. (1984). A comparison of transportation planning in developed and developing countries. Transportation Quarterly 38(1), 69–86. DOI: 10.1061/(ASCE)UP.1943-5444.0000091.

[8] Portugal-Pérez & Wilson, J. (2010). Export performance and trade facilitation reform. Policy Research Working Paper 5261. Washington DC: The World Bank. DOI: 10.1596/1813-9450-5261.

[9] Krugman, P. (1991). Increasing Returns and Economic Geography. Journal of Political Economy 99(31), 483–499. DOI: 10.1086/261763.

[10] Freeman, R. & Mcvea, J. (2001). A stakeholder approach to strategic management. SSRN Electronic Journal 263511. DOI: 10.2139/ssrn.263511.

[11] Rodrigue, J-P., Comtois, C. & Slack, Brian (2017). The geography of transport systems (4th ed.). New York: Routledge.

[12] Bruinsma, F., Nijkamp, P. & Rietveld, P. (1989). Employment impacts of infrastructure investments: a case study for the Netherlands. In: Karin Peschel (Ed.), Infrastructure and space-economy, 209–226. Berlin: Springer.

[13] Hoekman, B. & Nicita, A. (2010). Assessing the Doha round: Market access, transactions costs and aid for trade facilitation. The Journal of International Trade & Economic Development 19(1), 65–79. DOI: 10.1080/09638190903327476.

[14] Hummels, D. (2007). Transportation costs and international trade in the second era of globalization. Journal of Economic Perspectives 21(3), 131–154. DOI: 10.1257/jep.21.3.131.

[15] Gaus, D. & Link, H. (2020). Economic effects of transportation infrastructure quantity and quality: A study of German counties. DIW Discussion Paper 1848, 1–35. Berlin: Deutsches Institut für Wirtschaftsforschung (DIW). DOI: 10.2139/ssrn.3545188.

[16] Njoh, A. (2000). Transportation infrastructure and economic development in Sub-Saharan Africa. Public Works Management & Policy 4(4), 286–296. DOI: 10.1177%2F1087724X0044003.

[17] Arvis, J., Ojala, L., Wiederer, C., Shepherd, B., Raj, A. & Kiiski, T. (2018). Connecting to compete: Trade logistics in the global economy. Washington DC: World Bank. DOI: 10.1596/29971.

[18] Munim, Z. & Schramm H.J. (2018). The impacts of port infrastructure and logistic performance on economic growth: the mediating role of seaborne trade. Journal of Shipping Trade 3(1), 1–19. DOI: 10.1186/s41072-018-0027-0.

[19] De, P. (2006). Trade, infrastructure and transaction costs: The imperative for Asian economic cooperation. Journal of Economic Integration 21(4), 708–735. DOI: 10.11130/jei.2006.21.4.708.

[20] Donaghy, K. (2009). Regional growth and trade in the new economic geography and other recent theories, In Capello, R., Nijkamp, P. (eds), Handbook of regional growth and development theories. Cheltenham: Edward Elgar.

[21] Coto-Millán, P., Agüeros, M., Casares-Hontañón, P. & Pesquera, M. (2013). Impact of logistics performance on world economic growth (2007–2012). World Review of Intermodal Transportation Research 4(4), 300–310. DOI: 10.1504/WRITR.2013.059857.

[22] Sánchez, R., Cipoletta, G. & Perrotti, D. (2014). Economic development and logistics performance. A probabilistic approach. Revista de Economía Mundial 38, 27–47. ISSN: 1576-0162. Retrieved November 6, 2020, from the Redalyc.org system on the World Wide Web: http://www.redalyc.org/articulo.oa?id=86632965002.

[23] Yeo, A., Deng, A. & Nadiedjoa, T. (2020). The effect of infrastructure and logistics performance on economic performance: The mediation role of international trade. Foreign Trade Review 55(4), 450–465. DOI: 10.1177%2F0015732520947676.

[24] Cohen (1992). A power primer. Psychological Bulleting 112, 115–159. DOI: 10.1037//0033-2909.112.1.155.

[25] Hair, J., Hult, G., Ringle, C. & Sarstedt, M. (2017). A primer on partial least squares structural equation modeling (PLS-SEM) (2nd ed.). Sage Publications.

[26] International Comparison Program (2017). Fundamentals of purchasing power parities. Development Economics Data Group, The World Bank. Retrieved November 6, 2020, from: https://olc.worldbank.org/content/fundamentals-purchasing-power-parities-ppps-self-paced.

[27] Schreyer, P. & Koechlin, F. (2002). Purchasing power parities—measurement and uses. Statistics Brief OECD 3. Retrieved November 15, 2020, from: https://www.oecd.org/sdd/prices-ppp/2078177.pdf.

[28] Yeo, A. & Deng, A. (2020). Logistics performance as a mediator of the relationship between trade facilitation and international trade: A mediation analysis. South African Journal of Economic and Management Sciences 23(1), 11. DOI: 10.4102/sajems.v23i1.3453.

[29] Cheah, J.-H., Sarstedt, M., Ringle, C., Ramayah, T. & Ting, H. (2018). Convergent validity assessment of formatively measured constructs in PLS-SEM: On using single-item versus multi-item measures in redundancy analyses. International Journal of Contemporary Hospitality Management 30(11), 3192–3210. DOI: 10.1108/IJCHM-10-2017-0649.

[30] Sarstedt, M., Wilczynski, P. & Melewar, T. (2013). Measuring reputation in global markets—A comparison of reputation measures' convergent and criterion validities. Journal of World Business 48(3), 329–339. DOI: 10.1016/j.jwb.2012.07.017.

[31] Sawilowsky, S. (2009). New effect size rules of thumb. Theoretical and Behavioral Foundations 8(2), 597–599. DOI: 10.22237/JMASM%2F1257035100.

[32] Barron, R. & Kenny, D. (1986). The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. Journal of Personality and Social Psychology 51(6), 1173–1182. DOI: 10.1037/0022-3514.51.6.1173.

[33] Zhao, X., Lynch, J. & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and Truths about Mediation Analysis. Journal of Consumer Research 37, 197–206. DOI: 10.1086/651257.

[34] Sobel, M. (1982). Asymptotic confidence intervals for indirect effects in structural equation models. Sociological Methodology 13, 290–312. DOI: 10.2307/270723.