Contents lists available at ScienceDirect

Journal of King Saud University – Science

journal homepage: www.sciencedirect.com

Original article

Green logistics performance and infrastructure on service trade and environment-Measuring firm's performance and service quality

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ARTICLE INFO

ABSTRACT

The link between infrastructure and green logistics performance in the services sector has been studied in this study. The mediating function of business performance and service quality are also discussed in this study as this is a deductive and cross-sectional study, the hypothesis was first formulated based on the literature gap and then tested. The unit of analysis is management personnel, entry-level economists, and financial analysts. The structural equation modeling-partial least-squares analysis (PLS-SEM) approach was employed in this investigation. The authors validated the reliability and validity of constructs and indicators used to measure constructs by assessing measurement models. The measurement methodology has then utilized to confirm the study hypothesis. The study results demonstrate that infrastructure and green logistics performance have a beneficial influence on services trade and environment; besides that, service quality and company performance are also important factors in improving services trade in China. Furthermore, firm performance and service quality have been identified as strong positive mediators between Green logistic performance, infrastructure, and services trade & environment. This study has a theoretical contribution by introducing, verifying, and proposing a new measurement for three variables: infrastructure, green logistic performance, and services trade & environment. This study has numerous relevant and helpful implications for government agencies and departments. It will provide a pathway for the upcoming industry practitioners in terms of green logistic performance and service trade & environment.

1. Introduction

Logistics has evolved as a vigorous industry that is growing quickly on a worldwide scale and plays a crucial role in global trade and economic performance. It is a multifaceted component in trade operations that focuses on processes, competencies, and technologies. In particular, green logistics influence the country's trade performance in terms of cost, consistency, duration, dependability, and customer service, which has an impact on export's overall competitiveness in the global market (Arvis et al., 2007). Consequently, companies are constantly improving the quality of logistic activities, reducing cost, human resource management, adopting innovative technology and efficient procedures (An et al., 2021; Xialong et al., 2021).

It has been argued that efficient green logistic performance and infrastructure greatly influence the service trade and environment (Gani, 2017). Better green logistics performance reduces trading costs and eliminates inefficiencies related to traditional shipping and handling business strategies. Moreover, improved logistic performance is significantly linked to export diversification, trade expansion, acquiring foreign direct investments and economic development. (Mercangoz et al., 2020). In contrast, inefficient logistic sectors such as inadequate infrastructure of port, airport,

railways, roads, as well as excessive shipping cost may impose constraints on companies to conduct trade internationally (Shtal et al., 2020). Several logistic components such as transport services, information flow system, time association, and infrastructure significantly affect supply chains, economic development, and trade flow (Ali et al., 2021).

Most of the countries are adopting reforms or rebuilding infrastructure and, also logistics sector in order to facilitate transportation and trade as well as promoting modernized services. A country's economy is influenced by the quality of its infrastructure, which affects the company's productivity, employment, domestic and global level trade, GDP, and international competitiveness (Yeo et al., 2020). In essence, high-quality infrastructure would allow the logistics sector to plan, control, and store products, services, and information related from purchasing raw material to manufacturing finished products to satisfy consumer demand (Huo et al., 2021). This is indicating that green logistic sector performance and infrastructure plays an important role in economic development. Hence, countries should focus on identifying critical areas of infrastructure and green logistic performance to get benefits of trade from the globalization process (Hao et al., 2020).

The previous literature has demonstrated that efficient infrastructure and green logistic performance have a favorable impact on export performance and international Service Trade and Environment (Djankov et al., 2006; Mercangoz et al., 2020; Portugal-Perez et al., 2010). Few researchers have investigated the impact of green logistics performance on foreign direct investment, supply chain, especially in transportation facilitation and in other contexts (Halaszovich and Kinra, 2020; Saidi et al., 2020; Soh et al., 2021). But studies have not mentioned the mediating role of firm performance and service quality on Service Trade and the environment. Therefore, to address this gap this study had focused to contribute to existing literature by developing framework based on logistics theory (Please see Fig. 1) and new trade theory to analyze the impact of green logistic performance and infrastructure on the service trade and environment through the mediating role of firm performance and service quality. The services trade has greater impact on the environment as it does not only improve the economic performance of a country but also improves its sustainability goals. Government should improve trade services to improve the sustainability and environmental performance in a state.

The remaining sections of article are as follows: The second section discuss "literature review" on considered variables and development of hypothesis; third section is related to research "methodology" which is employed to test hypothesis; fourth section is related to "interpretation" of our empirical study and the last fifth section "conclusion" concludes our results by offering future recommendations and implications.

2. Literature review

Green logistic services are continuously developing worldwide and are an important component of trading companies in their growth and competitiveness (Androniceanu et al., 2020). The success of the effective logistic performance is based on the knowledge and expertise of employees to evaluate the entire system, which can satisfy customer's expectations (Jim Wu and Huei Chou, 2007). The effective green logistic performance provides a trading company with several competitive edges, such as the increased market value of products, optimizing cash flows, and reducing current and other expenses (D'Aleo and Sergi, 2017). Therefore, to enhance green logistic performance and gain a competitive advantage, companies should focus on the use of its tangible assets and strategically consider its intangible assets.

Firm performance includes business outcomes, firm's operations and the consequences of its operational activities (Tumasjan et al., 2020). Firms that can maintain their performance usually remains competitive in market that ultimately leads to firm higher performance. In the green logistic sector, firm financial performance for supply chain operations focuses on cost savings, gaining market share, and profit growth (Chien and Shih, 2007). An et al., (2021) has revealed that efficient supply chain management positively influence firm performance because such type of supply chain resulted in better economic performance of organizations, enhance profitability and market share which ultimately influence firm's financial performance. International trade has often made a substantial contribution to increasing prosperity among the population of world. Massive infrastructure development has become a significant contributor to economic growth and international trade. A well-developed infrastructure not only saves the time of trade but also changes transactional cost of international trade. Infrastructure development may enhance trade facilitation, boost trade income, and broaden the scope of international service trade and Environment flow (Chen et al., 2019). Service quality has been characterized as customer's evaluation regarding brilliance or superiority of overall provided services (Nawaz et al., 2020). Based on the prior literature, we formulated a study conceptual framework to provide a study road map (see Fig. 1).
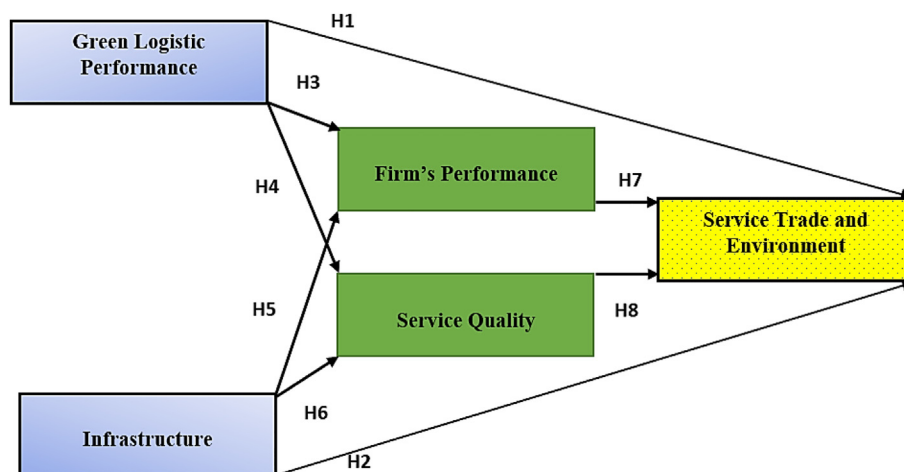

Fig. 1. Conceptual framework.

2.1. Theoretical background and hypothesis development

In this study we employed two main theories "Logistic theory" and "New trade theory" to investigate the impact of logistic performance and infrastructure on Service Trade and Environment through the mediating role of service quality and firm's performance. (Please see Fig. 1 for study model)

2.1.1. Logistic theory

An et al. (2021) defined logistics as all tangible objects utilized to carry out both primary and secondary activities. While S. A. R. Khan et al. (2019) refer to logistics in terms of business performance. Logistics is a component of supply chain management, and it is responsible for planning, controlling, storing products, services and information from origin point to consumption to fulfill the demands of consumers. Whereas Miroudot et al. (2009) explained logistics as storage, transportation, and handling of goods when they proceed in manufacturing phases such as moving from raw material to finished goods for consumers. Researchers (Gunasekaran and Ngai, 2003) have documented that logistics plays a crucial role in reducing the cost and development of businesses.

2.1.2. New trade theory

New trade theory is employed to investigate the impact of green logistic performance and infrastructure on service trade and environment through the mediating role of service quality and firm's performance. Rezaei et al. (2018) provided the groundwork for new trade theory and characterized as a collection of international trade economic models, where trade is examined using rising returns to scale and imperfect competition. As a result of new trade theory cross country interdepended has been increased. The growing trade, mobility factor and transportation cost are the reasons behind cross interdependence. Krugman (1991) and previous literature has reported that the green logistics performance, physical infrastructure, telecommunications (ICT), and transport efficiency has a significant impact on import and export of a country (Angelo et al., 2010; Portugal-Perez et al., 2010; Shepherd and Wilson, 2009).

2.2. Green logistic performance and service trade and environment

Green logistic service providing in an international setting has evolved into a critical component of the organization (Cullinane and Wang, 2006). It has also become a primary concern in foreign trade, particularly in ongoing growth of economies (Akbari and Ha, 2020). The success of green logistic activities is reflected through an economic performance of a country. International trade poses a challenge to logistic activities in terms of transporting and storing goods. High logistic cost and poor service quality may be regarded as impediments to international trade (Martí et al., 2017). The empirical literature has revealed the association among green logistic performance and service trade & environment, based on this we presented our hypothesis as follows:

H1: *Green logistic performance has a positive effect on Service trade and environment.*

2.3. Infrastructure and service trade and environment

Infrastructure encompasses networking of transportation for import and export of goods, telecommunication network system required to accelerate the exchanges information, an appropriate system for handling import duties and many other services. Infrastructure of bold quality can help to increase communication among supply chain participants (Maqsoom et al., 2021a; Nawaz et al., 2021). While the investments in infrastructure are linked to increased exports and development of companies (Portugal-Perez et al., 2010). Innovative infrastructure such as efficient information technologies reduce transportation and trading costs and motivate the international trading system (Bojnec and Fertö, 2009). Hence, it has been found that variations in state of infrastructure have a greater influence on export performance than conventional trade in terms of environmental effects barriers (Arvis et al., 2007).

H2: *Infrastructure has a positive effect on service trade and environment.*

2.4. Green logistic performance and firm performance

Green logistics is a cost-effective activity that is often a necessity for economic development and cross-border trade. Logistic performance structure represents a firm's performance in terms of its capacity to deliver products and services in accurate amount and at precisely timed intervals as demanded by consumers (Yang et al., 2018). Green logistic services of a company such as web-based ICT and efficient procedures provide competitive advantages to firms and increase its performance (Garrido Campos and Hardwick, 2006). According to Martí et al. (2017) growth in the logistic industry is predicted to have a beneficial influence on expanding output, trade and consumption, promoting economic growth. Wong et al. (2018) has revealed that in the green logistic sector, efficient supply chain management positively influences firm performance because such a supply chain resulted in better economic performance of organizations, enhancing profitability and market share, which ultimately influences the firm's financial performance environmental sustainability. This shows that logistic prices significantly influence firm's performance based on above discussion we presented our hypothesis as follows:

H3: *Green logistic performance has a positive effect on firm's performance.*

2.5. Green logistic performance and service quality

The empirical findings reveals that in logistic sector improving transportation conditions, ICT development has substantial impact on economic growth (Martí et al., 2017). Previous studies (Jacobsson et al., 2020; Soh et al., 2021; Wong and Tang, 2018) has investigated that there are several factors which may affect the green logistic performance such as innovative logistic networks, cost associated, institutional service quality, supply chain integration, logistic operations, and financial performance. Dang & Yeo, (2018) noted that green logistic cost in Vietnam are higher than other developing countries and limiting its ability to compete in international supply chain. According to Garza-Reyes et al. (2016) growth in logistic industry is predicted to have a beneficial influence on expanding output, trade and consumption resulting in promoting economic growth. This illustrates that service quality has a significant positive impact on green logistics performance, based on above discussion we presented our hypothesis as follows:

H4: *Green logistic performance has a positive effect on service quality.*

2.6. Infrastructure and firm performance

The economy of a country is influenced by the quality of its infrastructure (Yeo et al., 2020). In essence, high quality infrastructure would allow the logistics sector to plan, control and store products, services and information related from purchasing raw material to manufacturing finished products in order to satisfy consumer's demand (Rezaei et al., 2018). Infrastructure is a crucial aspect in transportation and domestic and international trade (Groh and Wich, 2012). The improved service quality and infras-

tructure has a significant impact on firm financial performance (Arvis et al., 2018). According to Garza-Reyes et al. (2016) growth in logistic industry is predicted to have a beneficial influence on expanding output, trade and consumption resulting in promoting economic growth. S. A. R. Khan et al. (2019) has revealed that in logistic sector efficient supply chain management positively influence firm performance because such type of supply chain resulted in better economic performance of organizations, enhance profitability and market share which ultimately influence firm's financial performance. While Djankov et al. (2006) found that information sharing system in infrastructure leads to improvement in country's green logistic performance. Based on above discussion on literature we proposed our hypothesis as follows:

H5: *Infrastructure has a positive effect on firm's performance.*

2.7. Infrastructure and service quality

Infrastructure is the foundation of global economy and an essential component of all economic activities. Its involvement towards economic growth is essential for the well-being of citizens as well as for the country's wealth (Szreter, 1997). Chen et al., (2019) has reported that advancement in infrastructure can save time and decrease information cost expedite the fellow of capabilities and technical components, encourage capital investments, and lessen negative impacts of trade expenses. Ladhari (2009) regarded service quality as a primary concern of businesses because it provides competitive edge in market, helps to maintain growth and boost efficiency of companies. The improved service quality and infrastructure has a significant impact on international service trade and environment (Shepherd and Wilson, 2009). Moreover, better infrastructure and service quality leads to reduction in cost, enhance satisfaction of customers which ultimately increase financial performance of a company (Derar Shaker Yaghi, 2010). Based on above liretarure we presented our hypothesis as follows:

H6: *Infrastructure has a positive effect on service quality.*

2.8. Firm performance and service trade & environment

In the green logistic sector, firm financial performance for supply chain operations focuses on cost savings, gaining market share, and profit growth. Chien & Shih (2007) has revealed that efficient supply chain management positively influences firm performance because such a supply chain resulted in better economic performance of organizations, enhancing profitability and market share, which ultimately influences the firm's financial performance. Effective firm performance has evolved into a critical component in export competitiveness (Yang et al., 2018). The improved service quality and infrastructure significantly impact firm financial performance (Shepherd and Wilson, 2009). According to Garza-Reyes et al. (2016) growth in the logistic industry is predicted to have a beneficial influence on expanding output, trade and consumption resulting in promoting economic growth. Wong et al. (2018) has revealed that in the logistic sector, efficient supply chain management positively influences firm performance because such a supply chain resulted in better economic performance of organizations, enhancing profitability and market share, which ultimately influences the firm's financial performance. On the basis of above discussion we proposed our hypothesis as follows:

H7: *Firm performance has positive effect on service trade and Environment.*

2.9. Service quality and service trade & environment

Service quality has a significant positive influence on firm's performance. Researchers have documented that service quality helps

lower cost and enhance customer satisfaction, leading to customer loyalty and increased company financial performance (Bontis et al., 2007; Derar Shaker Yaghi, 2010). Innovative infrastructure such as efficient information technologies reduce transportation and trading costs and motivate the international trading system (Bojnec and Fertö, 2009). In case of shipment quality standards usually quantify as on time delivery of goods, reliability, risk associated with shipment and frequency (Arvis et al., 2018). Better service quality leads to reduction in cost, enhances satisfaction of customers, and ultimately increases the company's financial performance (Derar Shaker Yaghi, 2010).

H8: *Service quality has positive effect on service trade and environment.*

2.10. Mediating role of firm performance

The literature has well documented that firm performance significantly impacts green logistic and trade services (Fernando et al., 2019; Khan et al., 2019; Rezaei et al., 2018; Richey et al., 2005; Wong et al., 2018). Effective firm performance has evolved into a critical component in export competitiveness (Garza-Reyes et al., 2016). According to Rezaei et al. (2018) growth in logistic industry is predicted to have a beneficial influence on expanding output, trade and consumption resulting in promoting economic growth. Effective firm performance has evolved into a critical component in export competitiveness. Fernando et al. (2019) has revealed that in the green logistic sector, efficient supply chain management positively influences firm performance because such a supply chain resulted in better economic performance of organizations, enhancing profitability and market share, which ultimately influences the firm's financial performance. Prior studies have documented that firm performance efficiently mediate the relationship between infrastructure and service trade and environment (Mas-Verdu et al., 2010; Memedovic et al., 2008; Pechlaner et al., 2021).

H9: *Firm's performance mediates the relationship between green logistic performance and service trade and environment.*

H10: *Firm's performance mediates the relationship between Infrastructure and service trade and environment.*

2.11. Mediating role of service quality

The logistic sector performance influence positively the efficiency of international trade whereas a weak logistic industry with low quality infrastructure and transportation can stifle worldwide economies (Arvis et al., 2007). The investments in logistic sectors and its efficient performance significantly influence international trade flow (Hidalgo-Gallego et al., 2021). Moreover, information communication technologies in logistics helps to improve service quality and overall firm's performance (Ul-Hameed et al., 2019). Better green logistics performance leads to reduction in trading cost, eliminate inefficiencies related to traditional shipping and handling business strategies (Miroudot et al., 2009). In overall better green logistic services quality can help companies fulfill customer demands and resolve disputes and consumer complaints (Richey et al., 2005). This reveals that service quality effectively mediate the relationship between green logistic performance and service trade & environment.

This shows that improved service quality and infrastructure significantly impact international service trade & environment (Shepherd and Wilson, 2009). Based on above mentioned literature we proposed our hypothesis as follows:

H11: *Service quality mediates the relationship between green logistic performance and service trade & environment.*

H12: *Service quality mediates the relationship between Infrastructure and service trade & environment*

Based upon the literature review, this research was designed and the following conceptual framework was developed. The research revolves around this.

3. Research methods

This research is mainly based on two independent constructs; Green logistics performance, infrastructure, and two mediators; firm performance and services quality and a dependent construct Service trade & environment. This study is based on a survey, and the overall design is quantitative and cross-sectional. Furthermore, research is deductive in character, in which hypothesis are created based on literature and then evaluated using various analysis techniques to arrive at conclusions that are sometimes contradictory to the theory and sometimes alike to the theory. A systematic questionnaire approach with 21 questions was utilized to examine the quantitative data. The information was gathered using a convenient random sampling method. When a researcher uses convenience random sampling, data is collected at random from respondents conveniently accessible to the researcher (Huo et al., 2021; Maqsoom et al., 2021b). Overall, 335 responses will be gathered in order to preserve the dependability of the outcomes, as well as the distribution type of the data while estimating in Smart-PLS 3.3.3.

3.1. Measurement development

There is not much literature about these constructs based on measurement and scales used to measure the causal linkage via survey technique. In Previous studies, it has been mentioned that future research should consider the managerial staff and top management experts therefore, this study considered economist, financial analysis and managerial staff of accountancy and research and development firms in China. The measurement scale for both exogenous constructs (Green logistic performance and infrastructure) and endogenous (Service trade and environment) construct are newly proposed and confirmed on the basis of reliability and validity analysis in Smart-PLS 3.3.3. The idea of these constructs was taken from the Yeo et al. (2020). We proposed five items scale for Infrastructure, six items scale for Green logistics performance and two items scale for Service trade and environment construct. Moreover, measurement scale for mediators are adapted from previous studies. Five items measurement scale for firm performance adapted from Haq et al. (2020) and three items scale for services quality from (Han et al., 2020; Pandey and Sahu, 2020). All these constructs are measure under 5 -point Likert scale from strongly agree (5) to strongly disagree (1).

4. Data analysis

The Smart-PLS version 3.3.3 software, which used the Smart-Partial Least Square Structural Equation Modeling PLS-SEM, was used to test the proposed conceptual model. The approach is broken down into two sections: measurement model assessment (Fig. 2) and structural model evaluation (Fig. 3). Previous study has suggested that these two processes be switched off in a single step. The measurement assessment reveals how all of the model's variables are measured, whereas the structural model evaluation shows how the model's variables are connected.

The demographic summary is illustrated in Table 1. The demographic detail is based of the respondents which were entry level economist, financial analysts, and the managerial staff. Authors asked five demographic questions. The total number of respondents were 335 out of them 52.24% were male and 47.76% were female. Moreover, 40% of the respondents were financial analysts

and almost 30% for each entry level economist and managerial staff. It demonstrates diversity of respondents in data collection. Interestingly the importance of services quality is well accepted among respondents as around 82% of respondents believes that services quality can improve the overall services trade in China. Afterwards, most of the respondents argued that China is an export-oriented country and exports are increasing in China. This evidence of growing exports in China and the importance of service quality were factors behind the motivation to conduct this study.

4.1. Measurement model assessment

The first step of SEM analysis is assessment of the measurement model. The measurement of assessment involves the estimation of constructs and indicator's reliability and validity that is usually measured through discriminant and convergent validity. The convergent validity is estimated through construct reliability (CR), Cronbach Alpha (α), factor loadings, and average variance extracted (AVE) (Haq and Awan, 2020). Afterward, the discriminant validity is estimated through two measures i.e., Fornell and Larcker ratio criterion and Heterotrait-Monotrait ratio for correlation. Table 2 illustrates the descriptive statistics of the data considering the mean and standard deviation.

All mean values are from 3.191 to 3.989 and standard deviations from 1.021 to 1.070 which shos the variations and interlinks of respondent's perceptions. Other data in Table 2 illustrated the convergent validity of indicators in constructs. All the values of factor loadings are above the threshold point 0.70 (Avotra et al., 2021a; b) thus indicator reliability is fulfilled for all indicators in constructs. Talking about the reliability of constructs, it is measured through CR and α values. All coefficients are above 0.70 threshold point (Hair et al., 2017) and (Haq and Awan, 2020) thus the reliability condition is also met. AVE values are also above the threshold points 0.50 (Xialong et al., 2021).

The discriminant validity is usually measured through cross loadings, Fornell and Larcker ratio criterion and HTMT ration. This study considered Fornell and Larcker ratio and HTMT ration of correlation. The bold bigger diagonal values in Table 3 from their respective values demonstrate that the discriminant validity condition is fulfilled. It is because all the diagonal values are larger than that of their beneath values (Lia et al., 2020). Values above 0.85 to 0.90 show problem of multicollinearity in HTMT (Nawaz et al., 2021). Values in Table 4 are below the threshold point thus all the constructs and their indicators are distinct and can estimate respective constructs only.

4.2. Structural model assessment

The second step of SEM analysis technique is structural model assessment. The structural model assessment determines and support to estimate the linkage between the constructs. It usually captures the direct and indirect effects. Direct effects usually help to accept and reject the relationship between two constructs and indirect effects mainly accept and reject the mediation paths. To accept and reject the hypothesis structural model assessment author considered p-values, t-statistics, beta (β) values or original sample coefficients and R^2.

This study analyzes the direct and indirect effects of infrastructure and green logistics development on service trade and the environment. Overall, this research proposes 12 total hypotheses out that 8 are direct effects and the rest of 4 are indirect effects. The results for all direct and direct effects were illustrated in Table 5. The H1 was confirmed that green logistics performance meaningfully predict the services quality with $-statistic = 8.641 : p - value = 0.000$. The second hypothesis H2 also confirmed posi-
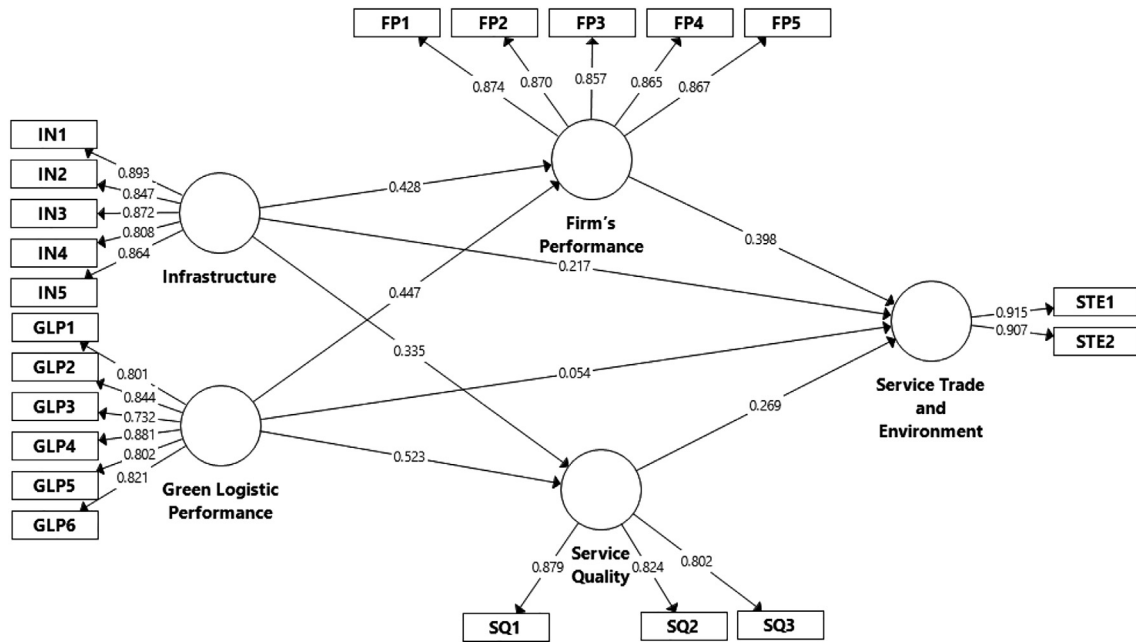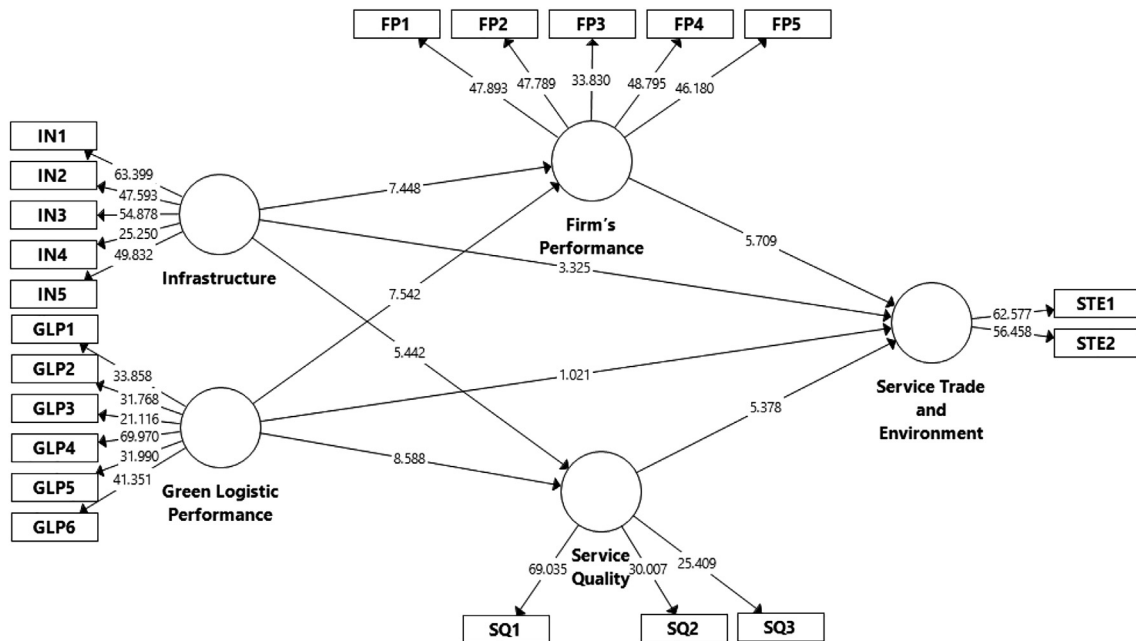
Fig. 2. Assessment of measurement.

Fig. 3. Assessment of structural model.

tive as Green logistics performance meaningfully predicts firm's performance under $-statistic = 7.077 : p - value = 0.000$. In contrast, Green logistics performance does not positively predict the service trade and environment as there is no statistical significance $-statistic = 1.091 : p - value = 0.308$, thus H3 rejected. The second independent variable demonstrate a positive and significant relationship in all three direct effects with service quality, firm performance, services trade. H4, H5, and H6 were accepted under $-statistic=5.465:p-value=0.000$, $t-statistic=6.978:p-value=0.000$ and $t-statistic=3.468:p- value=0.000$ respectively. Similarly, H5 and H6 were also accepted and confirmed a significant positive effect of services quality and firm's performance on service trade

and environment. Services quality and firms' performance meaningfully predicts the service trade and environment constructs under $t-statistic= 5.221:p-value=0.000$ and $t-statistic=5.805:p-value= 0.000$ respectively.

The indirect effect or mediation hypothesis were also accepted. As H9 were accepted and illustrated a full mediation by firm performance as there was not a statistically significant direct relationship thus the positive significant indirect relationship $t - statistic = 4.171 : p - value = 0.000$ confirmed that there is a full mediation by firm performance between green logistics performance and service trade & environment. Additionally, *H*11 was accepted and confirmed a positive partial mediating effect by firm

Table 1
Demographic summary.

Demographic summary	Frequency	%
Gender		
Male	175	52.24%
Female	160	47.76%
Which is your current title?		
Financial analyst	134	40.00%
Economist	101	30.15%
Managerial position	100	29.85%
Do you think service quality is important to improve Service Trade and Environment?		
Yes	276	82.39%
No	59	17.61%
Are exporters increasing in China?		
Yes	296	88.36%
No	39	11.64%
Is China export or import oriented country?		
Export oriented	270	80.60%
Import oriented	65	19.40%

Note: n = 335

performance between infrastructure and services trade as $-statistic = 4.548 : p - value = 0.000$. Moreover, service quality proved as a mediator between infrastructure & services trade and green logistics performance and service trade & environment. Thus, H12 and H14 were accepted, and partial mediation was approved as $t - statistic = 4.543 : p - value = 0.000$ and $t - statistic = 3.661 : p - value = 0.000$ respectively. Additionally, values (0.700 0.675, 0.766) of R^2 confirmed that independent variables meaningfully and statistically predict the dependent variable and (70%, 67.5%, 76.6%) changes in dependent variables are due to independent variables.

5. Discussion

The role of services quality and firms' performance have significant effect on the overall trade services in a country particularly in

developing regions. This study investigate the relationship between infrastructure and green logistics performance on services trade. Additionally, the mediating role of firms' performance and services quality were explored in this study. Discussion usually covers a contrast and comparison overview of the findings of current research with the previous literature. Current findings of this research is well matched with previous research (Yeo et al., 2020). This study generalizes the findings of (McKnight et al., 2002) as this study is similar to current research in several ways. But this research explores the quantitative side of research. This study proposed measurement scales for several variables such as services trade and environment, infrastructure, and green logistics performance. Authors used reliability and validity analysis to confirm validity and reliability of constructs via PLS-Algorithm. Thus, these scales were introduced, verified, and then recommended for future research.

This research contributes several ways to the previous literature on infrastructure, green logistics performance, services quality, firm performance, and service trade & environment. Earlier researcher have explored the influence of infrastructure and green logistics performance with international trade as mediator (Yeo et al., 2020), but this research considered the mediating role of services quality and firm performance.

In particular, the first three hypotheses explain that logistic performance is very important to improving service quality and firm performance. When green logistics performance of firms increases in a country, it also influences the overall services quality of firms and the firm performance that consequently improves the economic performance in a country. Moreover, infrastructure and logistic performance are important elements for economic growth as well as improve the overall economic performance.

Afterward, the next three hypothesis explored the direct impact of infrastructure on service quality, firm performance, and service trade & environment. As the infrastructure is very important for economic growth and development in developing countries, these findings align with previous research (Androniceanu et al., 2020; Dahwan and Raju, 2021; Krishnan and Teo, 2012). Besides they

Table 2
Measurement model and descriptive statistics.

Constructs	Code	FD	α	CR	AVE	SD	M
Infrastructure			0.91	0.933	0.735	1.034	3.830
	IN1	0.893					
	IN2	0.847					
	IN3	0.872					
	IN4	0.808					
	IN5	0.864					
Green logistic performance			0.898	0.922	0.664	1.039	3.989
	GLP1	0.801					
	GLP2	0.844					
	GLP3	0.732					
	GLP4	0.881					
	GLP5	0.802					
	GLP6	0.821					
Services quality			0.784	0.874	0.698	1.070	3.291
	SQ1	0.879					
	SQ2	0.824					
	SQ3	0.802					
Services trade and environment			0.795	0.907	0.83	1.041	3.691
	STE1	0.915					
	STE2	0.907					
Firm performance			0.917	0.938	0.751	1.021	3.191
	FP1	0.874					
	FP2	0.87					
	FP3	0.857					
	FP4	0.865					
	FP5	0.867					

Note: FD = Factor Loadings, CR = Construct Reliability, AVE = Average Variance Extracted, and α = Cronbach Alpha.

Table 3
Fornell and Larcker Criterion.

	FP	IN	GLP	SQ	STE
FP	**0.866**				
IN	0.798	**0.857**			
GLP	0.801	0.827	**0.815**		
SQ	0.847	0.767	0.800	**0.835**	
STE	0.842	0.786	0.767	0.816	**0.911**

Note: FP = Firm Performance, IN = Infrastructure, GLP = Green Logistics Performance, SQ = Service Quality, STE = Service Trade and Environment

Table 4
HTMT Ratio.

	FP	IN	GLP	SQ	STE
FP	–				
IN	0.871	–			
GLP	0.878	0.515	–		
SQ	0.556	0.405	0.095	–	
STE	0.454	0.142	0.106	0.024	–

Note: FP = Firm Performance, IN = Infrastructure, GLP = Green Logistics Performance, SQ = Service Quality, STE = Service Trade and Environment

Table 5
Direct and indirect effects.

Paths	H	(O)	(M)	(STDEV)	T Statistics	P Values	R^2	Results
GLP → SQ	H1	0.523	0.524	0.06	8.641	0.000		Supported
GLP → FP	H2	0.447	0.448	0.063	7.077	0.000	0.700	Supported
GLP → STE	H3	0.054	0.054	0.053	1.019	0.308	0.675	Supported
IN → SQ	H4	0.335	0.335	0.061	5.465	0.000	0.766	Supported
IN → FM	H5	0.428	0.428	0.061	6.978	0.000		Supported
IN → STE	H6	0.217	0.216	0.063	3.468	0.001		Supported
SQ → STE	H7	0.269	0.271	0.051	5.221	0.000		Supported
FP → ST	H8	0.398	0.398	0.069	5.805	0.000		Supported
GLP → FP → STE	H9	0.178	0.179	0.043	4.171	0.000		Supported
GLP → SQ → STE	H10	0.141	0.142	0.031	4.543	0.000		Supported
IN → FP → STE	H11	0.170	0.170	0.037	4.548	0.000		Supported
IN → SQ → STE	H12	0.090	0.091	0.025	3.661	0.000		Supported

Note: FP = Firm Performance, IN = Infrastructure, GLP = Green Logistics Performance, SQ = Service Quality, STE = Service Trade and Environment H. = Hypothesis O = Original Sample, M = Sample Mean, STDEV = Standard Deviation,

investigated the element of infrastructure toward economic growth in developing countries however this research generalized and confirmed those findings in developed country like China. Moreover, infrastructure development can improve the overall green logistics performance and effective element to improve sustainable economic growth (Kazutomo and John, 2011; Liu et al., 2012). Moreover, mediating role of firm performance and services quality proved full mediation because to improve the services trade logistics is not only directly related but the indirect role of services quality and firm's performance are crucial to improve the services trade and economic performance of country. As previously only international trade has been explored as mediator in these settings.

These findings have several policy implications for the government and regulatory bodies. These findings suggest government of China particularly infrastructure and development ministry to develop a road map for future development. Government and developed bodies are recommended to make infrastructure and green logistic-focused development plans. This study summarizes that when infrastructure and green logistics performance improve, they help increase the overall economic growth and services trade in a country. Therefore, government may form infrastructure and logistics strategies to improve services trade. Moreover, full mediation and partial mediation by firm performance imply that the government should form a set of strategies and polices where organizations should improve the services quality and performance to improve the services trade in a country like China.

6. Conclusion

This is study explored the relationship between infrastructure and green logistics performance on services trade & environment. Additionally, the mediating role of firms' performance and services quality were explored in this study. This study is deductive in nature and cross-sectional therefore first formed the hypothesis based on the literature gap and then tested it. It considers managerial staff, entry level economist and financial analysts as unit of analysis. A total number for 335 respondents were used for analysis purpose. The analysis techniques used in this study is structural equation modeling-partial least square (PLS-SEM). SEM analysis was based on two steps measurement model assessment and structural model assessment. Through measurement model assessment authors confirmed the reliability and validity of constructs and indicators used to measure constructs. Then, measurement model used to confirm the proposed hypothesis of this research. A total number of 12 hypothesis were proposed and 11 were accepted and confirmed statistically. Findings of research show that infrastructure and logistic performance have positive impact on services trade & environment moreover services quality and firm performance also strong source to improve the services trade in China. Moreover, firm performance and services quality prompted as positive significant meditators between green logistic performance, infrastructure, and services trade. The most novel contribution of this study introduced, verified, and proposed a new measurement for three variables such as infrastructure, green

logistic performance, and services trade & environment. This research have several useful and important implication for government bodies and ministries.

7. Limitation of the study

This study has several limitations. This study is cross-section in nature and data was collected in single point of time. Therefore, a longitudinal study can provide a truer picture of current findings. Secondly, this study considered the view of respondents and based on primary data. Therefore, it is a true picture of what people and expert believe in China. However, secondary data and real data can produce more accurate picture and implications for governance in China. Thirdly, this study is conducted in China so these findings cannot be generalized for other countries as China is an export-oriented country. Therefore, these findings may not be useful for countries with export orientation. Moreover, it has Chinese flavor in findings therefore it requires to explore more in different regions and other developing and non-developing countries. These limitations provides potential future direction for scholars and academia to explore the current line of research. Future research should focus on the current model or replicate this model in other settings. Moreover, other potential mediators and moderator can be added to analyze which forces and factors can strengthen or weaken this effect. The effect of artificial intelligence on services trade and environment can be a potential line of research.

8. Data Availability

All data generated or analyzed during this study are included in this published article and can be available on request to corresponding author.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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