

# The impact of free trade zone construction (FTZs) on food security under the "Belt and Road" strategy and influencing e-commerce and technological innovation

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## ABSTRACT

The Belt and Road Initiative (BRI) is a first-rate global improvement approach aimed at selling financial cooperation and connectivity between countries in Asia, Europe, and Africa. One key element of the BRI is the construction of free trade zones (FTZs) in taking part in international locations, which are meant to facilitate worldwide alternatives, funding, and financial growth. The ability advantages of FTZs had been broadly recognized, including extended foreign investment, progressed infrastructure, and more suitable alternate opportunities. However, the impact of FTZ production on unique outcomes which include e-trade, food protection, and technological innovation isn't always properly understood. Therefore, this study aims to explore the impact of free trade zone (FTZ) creation on e-commerce, meals security, and technological innovation beneath the Belt and Road Initiative with The moderating effects of cultural compatibility and social inclusivity. A survey was conducted among 450 participants, including entrepreneurs, employees, and students. SPSS and smart PLS were used to analyze the data. The findings showed that the construction of FTZs positively impacted e-commerce, food security, and technological innovation. However, the moderating effects of cultural compatibility and social inclusivity were also significant. Cultural compatibility was found to moderate the relationship between FTZ construction and e-commerce, while social inclusivity moderated the relationship between FTZ construction and technological innovation. The study's findings suggest that policymakers should focus on promoting cultural compatibility and social inclusivity when constructing FTZs under the BRI. This will help increase FTZ's profitability in e-commerce, food safety, and technological innovation. Education also can use the findings to extend current knowledge in global change, economic improvement, and cultural research in which the results of the study may be used to evaluate the significance of cultural alignment and social integration whilst investing in FTZs.

**Keywords:** Free Trade Zone, Construction, E-commerce, Food Security, Belt and Road Strategy, Technological Innovation, Cultural Compatibility, Social Inclusivity.

## INTRODUCTION

The Belt and Road Initiative (BRI) has ended up a critical part of China's overseas policy, aiming to enhance infrastructure connectivity and facilitate trade among Asia, Europe, and Africa (Cham, Lim, Sia, Cheah, & Ting, 2021). One of the enormous components of this initiative is the development of Free Trade Zones (FTZs), which might be designed to lessen alternate boundaries and promote economic increase. The impact of FTZ creation on numerous elements of society has been extensively studied, together with its outcomes on e-commerce, food security, and

technological innovation. However, cultural compatibility and social inclusivity also play a critical role in moderating these impacts.

Free Trade Zones (FTZs) are unique monetary zones where businesses can behavior business with decreased price lists, taxes, and other exchange limitations. These zones are designed to promote global change and appeal to foreign funding by developing a commercial enterprise-pleasant environment (J. Li, Qin, Tang, & Yang, 2022). FTZs are designed to promote financial increases with the aid of attracting overseas funding

and facilitating global trade. FTZs can boom exports, create jobs, and enhance financial improvement by lowering trade limitations. FTZs can beautify a country's competitiveness with the aid of presenting a platform for corporations to get the right of entry to global markets and leverage their strengths in era, innovation, and performance. This can cause increased productivity, lower fees, and higher-great merchandise (Zuo, Ling, Zhu, Ma, & Xiang, 2023). FTZs facilitate worldwide exchange by lowering tariffs, customs duties, and different exchange boundaries. This can increase the extent and speed of trade transactions and decrease the expenses related to move-border exchange (Jin et al., 2022).

E-commerce, or the shopping for and promoting of products and offerings online, is turning more and more important in the modern global economy. E-commerce allows businesses to attain new markets and customers, reduce transaction costs, and improve supply chain efficiency (Savila, Wathoni, & Santoso, 2019). Consumers enjoy the comfort of online shopping and access to a wider variety of merchandise. Food protection refers to the availability, accessibility, and affordability of meals for everybody at all times. Ensuring meal safety is crucial for selling health and proper being, decreasing poverty, and helping monetary increase (Akurugu, Jatoo, & Domapielle, 2021). Achieving food safety calls for sustainable agricultural practices, reliable supply chains, and effective distribution networks. Technological innovation is critical for riding monetary increase, improving productivity, and addressing socially demanding situations. Innovation ends in new products, offerings, and commercial enterprise models that create jobs and power monetary development. In addition, technological innovation assist cope with urgent global challenges, together with weather alternatives, healthcare, and power (Khan, Chenggang, Hussain, & Kui, 2021).

Despite a developing frame of literature at the Belt and Road Initiative (BRI), there is a literature gap in knowledge about the impact of unfastened change sector (FTZ) construction on e-trade, food safety, and technological innovation, as well as the moderating position of cultural compatibility and social inclusivity in these relationships (J. Li et al., 2022). While there are studies that have tested the effect of FTZs on change and funding, there is a loss of studies on how those zones affect the development of e-trade and food protection, which are turning into increasingly more critical in the technology of globalization (Chen, Hu, Liu, Wang, & Zheng, 2022). Furthermore, the function of cultural compatibility and social inclusivity in selling technological innovation within FTZs is a place that requires additional exploration. Therefore, this studies hole highlights the need for a comprehensive study that examines the interaction among FTZs, e-commerce, meals safety, and technological innovation, while thinking of the moderating effects of cultural compatibility and social inclusivity (Yang et al., 2021).

The purpose of the study is to assess the effects of the construction of free trade zones on electronic commerce, food security, and technological innovation under the Belt and Road Initiative (BRI). To determine the balanced role of cultural compatibility and social inclusion in the relationship between free trade zones and their impact on e-commerce,

food security, and technological development. Moreover, the objective of the study are:

- To analyze the impact of free trade zone construction on e-commerce, food security, and technological innovation in Belt and Road countries.
- To investigate the moderating role of cultural compatibility in the relationship between free trade zones and their impact on e-commerce, food security, and technological innovation.
- To explore the moderating role of social inclusivity in the relationship between free trade zones and their impact on e-commerce, food security, and technological innovation.

The Belt and Road Initiative (BRI) has been a sizable driving force in the world economic boom and improvement. One of the key functions of the BRI is the improvement of unfastened change zones (FTZs) which have been mounted in several nations. The impact of the construction of those FTZs has been a ways-reaching, with great impacts on e-trade, food safety, and technological innovation (Zaman, Florez-Perez, Anjam, Ghani Khwaja, & Ul-Huda, 2022). However, the role of cultural compatibility and social inclusivity in moderating the effect of those FTZs can't be ignored. The construction of FTZs has significantly impacted e-trade by creating an environment that is conducive to the growth of online businesses (Tambo et al., 2019). In addition to e-trade, FTZs have additionally had a vast effect on meal safety. By improving exchange and decreasing alternate limitations, FTZs have enabled the easier motion of meal and agricultural merchandise throughout borders. This has helped to reduce meal shortages and price fluctuations, which are commonplace in international locations that rely heavily on imports. The establishment of FTZs has additionally endorsed the development of nearby agriculture, which has further progressed meals protection in many areas (Schlör & Venghaus, 2022).

## LITERATURE REVIEW

### Free trade zone construction and e-commerce

Free trading zones (FTZs) are locations that have been set aside inside a kingdom where businesses are accepted to function with little to no government interference and with tax exemptions. Online enterprise transactions are referred to as e-trade. The growth of FTZs is recognized to have a variety of effects on e-commerce (Girelli, Marinelli, Grossi, & Arduino, 2017). This study of the literature will look at the current studies on how building free trade zones affect e-commerce. Putra et al., (2022) assert that FTZs have a favorable effect on e-commerce. They discovered that e-commerce companies situated inside FTZs experienced faster revenue development than those situated outside of FTZs. Ji et al., (2023) discovered that FTZs foster an environment that is favorable for e-commerce businesses, resulting in higher online sales and revenue. However, the effects of FTZs on e-commerce may not always be favorable. According to (Ji et al., 2023) FTZs may help e-commerce businesses thrive but they may also boost competition, which would reduce firms' profit margins. Furthermore, FTZs might draw counterfeiters, which could be detrimental to e-commerce companies (Zhou et al., 2020). FTZs

may affect on international e-commerce as well. FTZs may ease trade and lower entrance barriers, enabling e-commerce companies to enter new markets. According to (Fan et al., 2022), the creation of FTZs in China has increased cross-border e-commerce as companies use FTZs as a doorway to the Chinese market. FTZs also affect the forms of e-trade companies that conduct enterprise there.

H1: Free trade zone construction has a significant and positive impact on E-commerce.

#### **Free trade zone construction and food security**

Free trade zones (FTZs) are locations within a nation that permit the importation, processing, and exportation of commodities without the payment of import taxes or duties. They are frequently developed to encourage job development, foreign investment, and economic progress. The development of FTZs, however, also affects local food security. With an emphasis on developing nations, this literature review reviews the current studies on the effect of FTZ building on food security. According to (Sarder, 2021) studies, the development of FTZs enhances food security. The creation of FTZs has increased food exports and enhanced regional food security. Despite the conflicting outcomes, it's far apparent that the creation of FTZs improves food protection. According to (Fan et al., 2022), the introduction of FTZs opens up new options for the manufacturing and buying and selling of food, however, it additionally results in the eviction of small-scale farmers and a upward push in resource rivalry.

H2: Free trade zone construction has a significant and positive impact on food security.

#### **Free trade zone and technological innovation**

Free trade zones (FTZs) are specified geographic areas where businesses are permitted to import. FTZs have won a reputation as a strategy for fostering economic development and growth around the sector. The introduction of those zones by nations to promote exchange and investment has caused a boom in the quantity of firm organizations working in the place (Jiang, Wang, & Liu, 2021). This examine of the literature intends to analyze the effects of the creation of free alternate zones on technological innovation, in addition to how unfastened change zones assist within the improvement of technology and innovation. The effect of loose change zones on technical innovation has been the challenge of several research. Free trade zones, in accordance with (Liu, Khan, Zakari, & Alharthi, 2022), can make it easier for nations to share information and technology, which can encourage innovation. This is so that local businesses can develop new technologies and increase their competitiveness by learning from the experience and knowledge of global enterprises operating in these zones. Free trade zones can also offer a venue for cooperation between businesses, research centers, and academic institutions, which can foster technological innovation (Larbi-Siaw et al., 2022). The creation of free trade zones supports the growth of high-tech industries. This is due to the fact that free trade zones offer an environment that is favorable for the growth of these companies by providing tax incentives, streamlined administrative processes, and other

advantages (Zhuo, Mao, & Rong, 2021). Additionally, the clustering effect of companies in free trade zones has the ability to foster information spillovers and synergies, both of which could inspire innovation. According to (Jiang et al., 2021), the introduction of a unfastened change sector in China's Guangdong province benefited the boom of the electronics area. This become attributed to the fact that the unfastened trade sector presented a forum for interplay between business organizations within the area and educational institutions, which assisted in fostering innovation. However, other research has indicated that the influence of free trade zones on technical innovation is only marginal.

H3: Free trade zone has a significant and positive impact on technological innovation.

#### **Moderating role of cultural compatibility between free trade zone construction and e-commerce**

Companies can conduct worldwide trade in distinctive free alternate zones (FTZs) with reduced tariffs, tax incentives, and simplified guidelines. With the growth of pass-border e-commerce, e-commerce has notably impacted worldwide change. It has been determined that the success of international commercial collaborations is critically dependent on cultural compatibility (Zuo et al., 2023). Free trade zones have gained popularity as a tool used by governments to entice FDI and boost economic growth. Because they offer numerous incentives for enterprises to locate within the designated area, they create a setting that supports international trade (Azémar, Desbordes, & Wooton, 2020). These inducements consist of reduced taxes, fewer rules, and simpler customs procedures. As a result, e-commerce companies frequently choose to establish their operations in FTZs. The formation of FTZs has helped to facilitate the expansion of go-border e-change, which has grown to represent a sizable problem of global exchange. For instance, the formation of the Shanghai Free Trade Zone (SFTZ) in China has made international e-trade transactions less difficult. The SFTZ has made it easier for e-commerce organizations to check in their activities and advantage get right of entry to to international charge networks (Cao & Chang, 2022). International business interactions have been shown to be highly successful when there is cultural compatibility. Cultural variations can affect communication, decision-making, and other business activities, according to Hofstede's cultural dimensions hypothesis. Therefore, trust, connection building, and eventually success in international business endeavors all depend on cultural compatibility. It has been determined that cultural compatibility moderates the association between the creation of free trade zones and online shopping. According to a study by (Zhong, Xu, & Li, 2022), cultural compatibility significantly affects how well e-commerce companies doing business in China's FTZs do. Businesses that were culturally compatible with their Chinese counterparts had a higher chance of success in the Chinese market, according to the authors.

H4: Cultural Compatibility significantly moderates the relationship between Free trade zone construction and E-commerce.

#### **Moderating role of cultural compatibility between free**

### trade zone construction and food security

Many nations have adopted the creation of free alternate zones as a monetary development method. But the host groups' food security impacted in a number of one of a kind approaches via the creation of those zones. The development of free change zones also have both favorable and damaging results on the nearby residents' access to food. the advent of these zones might also sell employment potentialities and monetary increase, which might also consequently enhance meals safety and get entry to to food (Tian, Yu, Xu, Li, & Liu, 2023). A potential moderator of the association between the creation of free trade zones and food security is cultural compatibility. Cultural compatibility is the degree to which the investors' and developers' attitudes, beliefs, and practices fit with those of the host community (Peña-García, Gil-Saura, Rodríguez-Orejuela, & Siqueira-Junior, 2020). The likelihood that the creation of the free trade zone will improve local food security increases with the degree of cultural compatibility between investors and the host population. Numerous research has looked into how cultural compatibility influences the development of free trade zones and food security. For instance, (Xu & Hao, 2021) discovered that in the host towns of China's free trade zones, cultural compatibility was positively correlated with food security.

H5: Cultural compatibility significantly moderates the relationship between free trade zone construction and food security.

### Moderating role of cultural compatibility between free trade zone construction and technological innovation

The creation of several free trade zones around the world is a result of the markets' expanding globalization. These zones were established to promote global trade by offering businesses tax breaks, less regulations, and other advantages. Innovation in technology has recently become crucial to the success of these zones (Jiang et al., 2021). The cultural compatibility of the creation of free trade zones and technical advancement, however, has not been thoroughly investigated. The goal of this literature review is to investigate how cultural compatibility influences both the creation of free trade zones and technological innovation. Free trade zones are places set aside where products can be produced, imported, and exported again without the involvement of customs officials. These zones are created to promote economic development and a business-friendly environment that draws international investment (Krajcsák, 2019). Increased trade, foreign investment, and job creation may result from the construction of free trade zones (Lee, 2019). However, various of factors, consisting of as infrastructure, marketplace accessibility, and the supply of a certified group of workers, affect how a hit these zones are. Innovation in era is critical to the fulfillment of unfastened change zones. Artificial intelligence, robots, and the internet of factors are examples of modern-day technologies which can increase productivity, lower costs, and enhance the competitiveness of companies working in these regions (Hidalgo, Parra, & Abril, 2020). Additionally, technological innovation can aid inside the development of recent markets and items, boosting alternate and producing

employment (Peng, 2016). However, the adoption of new technologies can also bring about issues with infrastructure, regulatory frameworks, and worker skills. According to (LaForett & De Marco, 2020), cultural compatibility is the degree to which a given culture's values, beliefs, and customs match those of another culture. The success of foreign business endeavors might be impacted by cultural compatibility. Cultural compatibility influence the acceptance and use of new technologies in the context of the creation of free trade zones and technological innovation. The propensity of businesses to accept new technologies may vary depending on the attitudes that various cultures have toward technology (Rahmani & Tienken, 2022). The communication and collaboration between businesses operating in free trade zones can also be impacted by cultural compatibility, creating issues with knowledge transfer and technological dissemination. Cultural compatibility is expected to have a moderating effect on the relationship between the creation of free trade zones and technical innovation. The adoption and application of new technology may be impacted by the degree of cultural compatibility between the host nation and the businesses operating in the free trade zone. Businesses that fit into the culture of the host nation are more likely to comprehend the local business climate and consumer preferences (Peña-García et al., 2020).

H6: Cultural Compatibility significantly moderates the relationship between Free trade zone construction and Technological Innovation.

### Moderating role of social inclusivity between free trade zone construction and e-commerce

The connection between the improvement of FTZs and e-trade, but, has no longer received sufficient attention within the literature. The goal of this literature study is to investigate how social inclusion influences both FTZ development and e-commerce. FTZs are regions that have been set aside within a nation to facilitate duty-free import and export of products. Building FTZs may assist lower trade barriers, boost foreign investment, and generate employment (Zuo et al., 2023). On the other hand, e-trade describes the change of commodities and services over the net. The increased use of the internet and mobile gadgets has led to a massive growth in e-trade during the last numerous years. The growth of e-commerce has created chances for firms to grow and opened them new markets (Beckers, Cardenas, & Sanchez-Diaz, 2022). Although it's been determined that both the creation of FTZs and the growth of e-commerce have favorable results on the economic system, it's miles nonetheless doubtful how the two are associated. According to studies, the introduction of FTZs can promote e-trade by using supplying a more hospitable commercial enterprise environment. By creating a more accommodating regulatory framework and lowering trade obstacles, (L. Li, Lin, Turel, Liu, & Luo, 2020), for instance, discovered that the introduction of FTZs in China has assisted in promoting cross-border e-commerce. According to some other studies, there may be a more nuanced connection between e-commerce and FTZ development. For instance, Luo et al., (2022) discovered that while the establishment of FTZs in China has increased the quantity of e-commerce businesses, it hasn't necessarily increased the volume of e-commerce transactions. This shows

that other factors may function as a mediator in the relationship between FTZ building and e-commerce. The extent to which all members of society can profit from economic progress is referred to as social inclusion. Construction of FTZs may aid in the growth of e-commerce by producing a better educated workforce and expanding access to technology if it is accompanied by socially inclusive policies, such as expenditures in education and training (Sylla & Gil, 2020). However, the creation of FTZs may exacerbate already-existing social inequities and impede the growth of e-commerce if it is not accompanied with policies that support social inclusion. For instance, if the advantages of FTZ building are concentrated in a few number of regions or industries, it could expand the digital divide and impede the growth of e-commerce in other areas or sectors (Schlör & Venghaus, 2022).

H7: Social Inclusivity significantly moderates the relationship between Free trade zone construction and E-commerce.

#### Moderating role of social inclusivity between free trade zone construction and food security

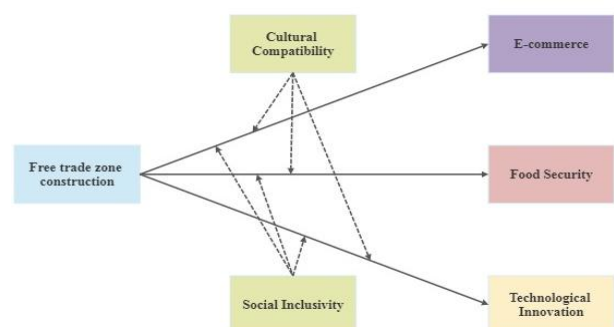
Many nations have created free trade zones to encourage global trade and draw foreign direct investment. Thoughts have been raised about how these zones may affect food security, particularly in underdeveloped nations where it is already a significant problem. The intention of this literature evaluate is to investigate how social inclusion affects the improvement of unfastened trade zones and food safety (Jenkins, Brennan, Molenaar, & McCaffrey, 2022). There are places known as unfastened exchange zones (FTZs) in which gadgets may be processed, exported, and imported with little to no authorities interference. These zones are frequently advanced in developing international locations in order to boost overseas investment, foster economic growth, and generate employment possibilities. But the creation of FTZs has been associated with detrimental consequences on food security, especially in low-income countries (Rivera, Ferroni, & Moreira, 2022). The fundamental issue with FTZs is that they frequently promote the cultivation of food crops at the expense of products geared toward export, such as cash crops. This might result in less food being produced locally and more reliance on imports. Additionally, the advent of FTZs may additionally result in the uprooting of neighborhood residents and the destruction of agriculture, which could get worse the situation of food lack of confidence (Karamian, Mirakzadeh, & Azari, 2023). The level to which all members of a society can have interaction in political, social, and financial sports on an equal footing is known as social inclusion. For excluded people in particular, inclusive development has been associated to better food security results. Social inclusion may be able to mitigate the connection among FTZs and food safety, in keeping with a number of studies. For instance, Tian et al., (2023) discovered that social inclusion in Bangladesh significantly impacted the association between FTZs and household food security. The study indicated that households in locations with higher degrees of social inclusivity performed better in terms of food security than families in areas with lower levels of inclusivity.

H8: Social Inclusivity significantly moderates the relationship between Free trade zone construction and Food security.

#### Moderating role of social inclusivity between free trade zone construction and technological innovation

The idea of social inclusion has drawn more and more attention in recent years from academic and political circles as a crucial element that can temper the relationship between economic policies and outcomes. This review of the literature investigates how social inclusion influences the relationship between FTZ development and technological innovation. FTZs are places that have been specifically designated within a nation where customary trade restrictions, such tariffs and quotas, have been removed or scaled back to promote foreign investment and trade (Chen et al., 2022). Many international locations, consisting of China, Singapore, and the United Arab Emirates, have constructed FTZs. The courting among FTZs and technical innovation has been extensively studied in the literature. For instance, (Zhuo et al., 2021) discovered that by fostering an environment that is favorable for research and development (R&D) activities, FTZs in China have significantly contributed to promoting technological innovation. Wang (2019) also discovered that by luring in foreign investment and allowing technology transfer, FTZs have boosted technological innovation. However, some research indicates that FTZs might stifle technological progress. Guan et al., (2023) advised that because of the absence of efficient regulations to inspire innovation, FTZs in China have now not significantly elevated the technological innovation functionality of neighborhood establishments. According to Marschark et al., (2019) social inclusion can strengthen the beneficial connection between FTZs and technological innovation in China by promoting information transfer and business collaboration. **Figure 1** shows the study framework which has been developed based on the literature review.

H9: Social Inclusivity significantly moderates the relationship between Free trade zone construction and Technological innovation.



**Figure 1.** Conceptual Framework

## METHODOLOGY

Research Design: The research design for this study was a cross-sectional survey design. The research used a questionnaire to collect data from respondents in the FTZ area under study.

**Sampling:** The target population for this study was all individuals and businesses located within the FTZ area. A random sampling technique was used to select a representative sample from this population.

**Data Collection:** Data was collected using a structured questionnaire. The questionnaire consisted of closed-ended

questions that required respondents to rate the impact of FTZ construction on E-commerce, food security, and technological innovation on a Likert scale. The questionnaire also included questions on cultural compatibility and social inclusivity.

**Data Analysis:** Data was analyzed using Smart PLS.

**Table 1.** Outer Loading of Items

Phase 1	Items	Outer Loading	VIF
Cultural compatibility	CC1	0.920	4.409
	CC2	0.920	4.216
	CC3	0.930	4.737
	CC4	0.908	3.857
	CC5	0.918	4.300
E-commerce	EC1	0.828	2.480
	EC2	0.830	2.355
	EC3	0.798	2.045
	EC4	0.839	2.472
	EC5	0.798	2.032
Food security	FS1	0.742	1.430
	FS2	0.559	1.458
	FS3	0.784	1.968
	FS4	0.871	2.470
	FS5	0.847	2.481
Free trade zone construction	FTZC1	0.807	2.613
	FTZC2	0.807	1.816
	FTZC3	0.894	3.650
	FTZC4	0.907	4.265
	FTZC5	0.826	2.085
Social inclusivity	SI1	0.798	1.685
	SI2	0.601	1.265
	SI3	0.816	1.886
	SI4	0.570	1.172
	SI5	0.791	1.773
Technological innovation	TI1	0.844	2.222
	TI2	0.749	1.664
	TI3	0.766	1.821
	TI4	0.830	2.052
	TI5	0.749	1.618
Phase 2	Items	Outer Loading	VIF
Cultural compatibility	CC1	0.914	4.109
	CC2	0.927	4.646
	CC3	0.929	4.765
	CC4	0.931	4.940
	CC5	0.910	3.989
E-commerce	EC1	0.812	2.352
	EC2	0.814	2.234
	EC3	0.775	1.901
	EC4	0.822	2.304
	EC5	0.773	1.852
Food security	FS1	0.712	1.320
	FS2	0.554	1.471
	FS3	0.759	1.806
	FS4	0.850	2.184
	FS5	0.837	2.368
Free trade zone construction	FTZC1	0.836	2.327
	FTZC2	0.709	1.639
	FTZC3	0.905	3.361
	FTZC4	0.929	4.078
	FTZC5	0.756	2.072
Social inclusivity	SI1	0.800	1.684
	SI2	0.611	1.267

	SI3	0.801	1.819
	SI4	0.550	1.150
	SI5	0.786	1.750
Technological innovation	TI1	0.823	2.051
	TI2	0.722	1.585
	TI3	0.758	1.745
	TI4	0.839	2.078
	TI5	0.747	1.625

## RESULTS

In the process of determining the validity of the content of the content, the loadings play a role, and it is recommended that the value of these loadings exceed 0.40. **Table 1** shows the result of outer loading which indicated that all values are above than threshold value (0.40).

An initial investigation into the degree of collinearity that

exists between the various multidimensional constructs was carried out before the PLS estimations for the structural model were carried out. The estimated values for the variance inflation factor (VIF) served as a validation for the least amount of collinearity that exists between the multi-dimensional constructs. As can be seen in **Table 1**, the VIF values that were generated by the structural model fall within the recommended cut-off range of 1.620 to 4.909 (VIF < 5) (Hair, Risher, Sarstedt, & Ringle, 2019).

**Table 2.** Construct Reliability

Phase	Variables	Cronbach Alpha	CR	AVE
Phase 1	Cultural compatibility	0.954	0.965	0.845
	E-commerce	0.877	0.910	0.670
	Food Security	0.825	0.876	0.591
	Free Trade Zone Construction	0.904	0.928	0.721
	Social Inclusivity	0.764	0.843	0.523
	Technological Innovation	0.847	0.891	0.622
Phase 2	Cultural compatibility	0.956	0.966	0.850
	E-commerce	0.859	0.898	0.639
	Food Security	0.804	0.863	0.563
	Free Trade Zone Construction	0.888	0.917	0.691
	Social Inclusivity	0.757	0.839	0.515
	Technological Innovation	0.837	0.885	0.607

In addition, the researchers examined the test's discriminant validity by using two separate tests: the first test was the Fornell Larker test (**Table 2**), and the second test was the HTMT ratio test. Both of these tests were conducted separately. To get started on accomplishing this goal, the character Fornell Larker was used. According to Fornell &

Larcker, (1981) general rule, the values that revealed the linkage with the construct itself should have a greater magnitude than those that revealed the connectivity with other constructs. The results confirmed this and showed that the discriminant validity was accurate. **Table 3** is provided below and contains the PLS-SEM estimations for the Fornell Larker technique-based discriminant validities.

**Table 3.** Discriminant Validity (Fornell-Lacker)

	CC	EC	FC	FTZC	SI	TI
<b>Phase 1</b>						
Cultural compatibility	0.919					
E-commerce	0.765	0.819				
Food Security	0.668	0.462	0.769			
Free Trade Zone Construction	0.062	0.030	0.160	0.849		
Social Inclusivity	0.523	0.346	0.542	0.177	0.723	
Technological Innovation	0.768	0.655	0.725	0.237	0.624	0.789
<b>Phase 2</b>						
Cultural compatibility	0.922					
E-commerce	0.680	0.799				
Food Security	0.630	0.311	0.750			
Free Trade Zone Construction	0.329	0.159	0.051	0.831		
Social Inclusivity	0.486	0.246	0.516	0.071	0.718	
Technological Innovation	0.745	0.535	0.715	0.044	0.625	0.779

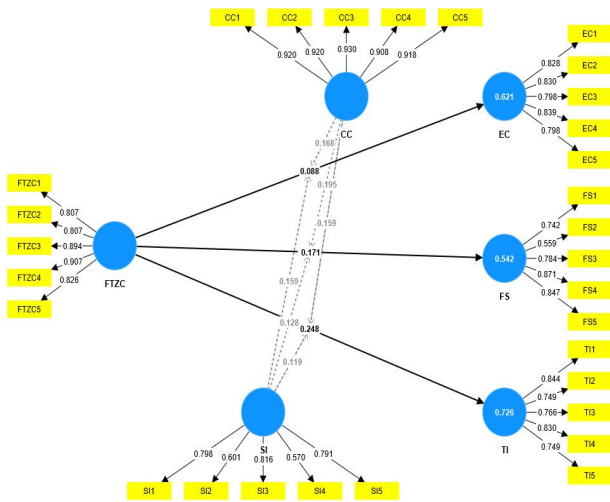


Figure 2. Measurement Model (Phase 1)

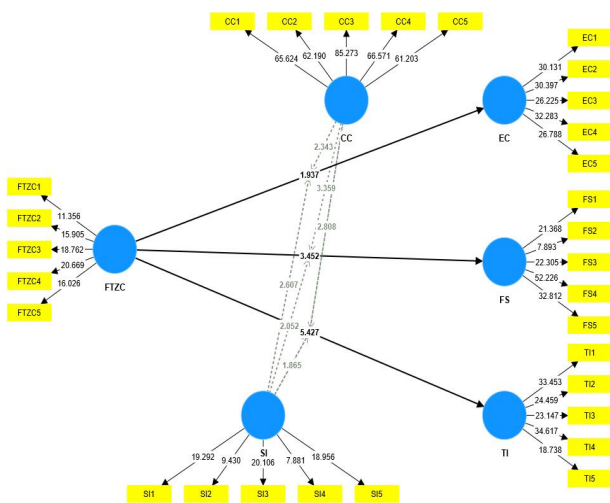


Figure 3. Measurement Model (Phase 2)

Testing of hypotheses

The PLS-SEM bootstrapping technique generates evaluation ratings for the structural path model, which are

based on the study hypotheses and are presented in Table 5. The model of phase 1 (Figure 2) shows the direct influence that the construction of free business sites and E-commerce is (H1:  $t = 1.937$ ;  $p = 0.026$ ). The construction of free trade zones and food security is (H2:  $t = 3.452$ ;  $p = 0.000$ ), the construction of free trade zones and technological development is (H3:  $t = 5.427$ ;  $p = 0.000$ ). In addition, the model of phase 2 (Figure 3) shows the direct influence that the construction of free trade areas and E-commerce is (H1:  $t = 1.667$ ;  $p = 0.048$ ). The construction of free trade zones and food security is (H2:  $t = 1.879$ ;  $p = 0.030$ ). The construction of free trade zones and technological innovation is (H3:  $t = 4.642$ ;  $p = 0.000$ ), as shown in Table 4.

Table 4. Direct Path Analysis

	Constructs	Path Coefficient	T value	P value
Phase 1	FTZC -> EC	0.088	1.937	0.026
	FTZC -> FS	0.171	3.452	0.000
	FTZC -> TI	0.248	5.427	0.000
Phase 2	FTZC -> EC	0.095	1.667	0.048
	FTZC -> FS	0.129	1.879	0.030
	FTZC -> TI	0.269	4.642	0.000

Note: FTZC=Free Trading Zone Construction, EC=E-commerce, FS=Food Security, TI=Technological Innovation.

Moderation analysis

Cultural compatibility and social inclusivity as a moderator investigated on the relationship between free trading zone construction and E-commerce, free trading zone construction and food security, and free trading zone construction and technological innovation the phase 1 results of this investigation for cultural compatibility as moderator and for social inclusivity as a moderator as displayed in Figure 4. On the other hand, the phase 2 results of this investigation for cultural compatibility as a moderator and for social inclusivity as a moderator as displayed in Figure 5 and Table 5.

Table 5. Moderation Analysis

	Constructs	Path Coefficient	T value	P value
Phase 1	CC x FTZC -> EC	0.168	2.343	0.010
	CC x FTZC -> FS	0.195	3.359	0.000
	CC x FTZC -> TI	0.159	2.808	0.003
	SI x FTZC -> EC	0.159	2.607	0.005
	SI x FTZC -> FS	0.128	2.052	0.020
	SI x FTZC -> TI	0.119	1.865	0.031
Phase 2	CC x FTZC -> EC	0.199	2.352	0.009
	CC x FTZC -> FS	0.231	3.046	0.001
	CC x FTZC -> TI	0.215	3.240	0.001
	SI x FTZC -> EC	0.167	2.450	0.007
	SI x FTZC -> FS	0.132	1.988	0.023
	SI x FTZC -> TI	0.108	1.806	0.035

Note: FTZC=Free Trading Zone Construction, EC=E-commerce, FS=Food Security, TI=Technological Innovation, CC=Cultural Compatibility, SI=Social Inclusivity.



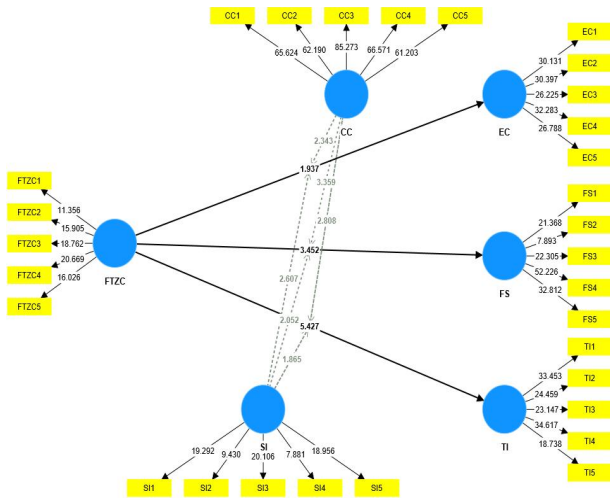


Figure 4. Structure Model (Phase 1)

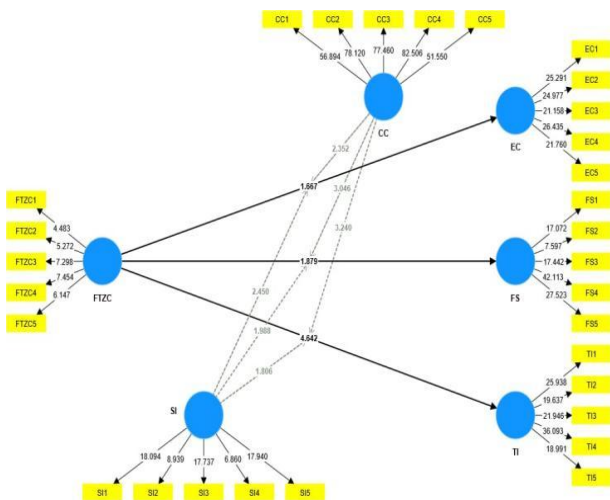


Figure 5. Structure Model (Phase 2)

## DISCUSSION

The first hypothesis is to investigate the impact of free trade zone construction on e-commerce. Free alternate zones are locations that have been set apart where organizations can behavior their operations with fewer alternate-limiting measures, along with lower price lists, streamlined customs tactics, and simplified policies. Free trade zones have the capability to increase e-trade by using making it simpler and extra affordable for groups to buy and sell products online (Vahdani & Sazvar, 2022). The established order of loose trade zones can gain e-commerce in some of specific approaches. Free trade zones, in the first region, decrease the fee of importing and exporting goods, making it less complicated for businesses to acquire gadgets from foreign suppliers or promote their goods to clients overseas (Guan et al., 2023). Lowering change restrictions and tariffs can save cash that can be passed directly to clients, decreasing the cost of goods and boosting call for. Second, free trade zones offer a better infrastructure for logistics, enabling companies to process and fulfill orders more rapidly and affordably (S. Li, Liu, & Kong, 2021). For instance, free trade zones frequently contain modern warehousing facilities and streamlined customs processes that can shorten the time it takes to clear

products through customs and deliver them to their intended location. Thirdly, free trade zones have the potential to draw in investment and foster economic expansion, which might open up fresh possibilities for e-commerce companies. A free trade zone's presence can increase a region's appeal to companies trying to expand, which can lead to the creation of jobs and increase demand for e-commerce services (Jin et al., 2022).

The second hypothesis is to investigate the impact of free trade zone construction on food security. Building a free trade zone can significantly and favorably affect food security, particularly in developing nations. In free trade zones, import and export of goods are permitted with few to no tariffs or other trade restrictions. Increased trade and investment may result from the creation of these zones, which may then boost economic growth (Saari, Damberg, Frömbing, & Ringle, 2021). Free trade zones can increase food availability, which is one approach to enhance food security. This is due to the possibility that greater trade and investment in the region may result in the construction of facilities like ports, warehouses, and highways that will make it easier to move and store food (Tian et al., 2023). Additionally, the greater rivalry among dealers may result in lower costs for customers, increasing access to and affordability of food. Free trade zones can help increase agriculture production, in addition. Farmers might be motivated to produce more food and enhance their revenue by offering a market for their products. As there is more food accessible for both internal and international trade, food security increase as a result (Mashi, Inkani, & Oghenejabor, 2022). A possibility of food shortages and price hikes in the local market exists if the zone's emphasis is on exporting rather than home consumption. Furthermore, the zone's expansion could result in the eviction of small-scale farmers and a concentration of the agricultural industry in the hands of powerful multinationals (Asamane, Marinda, Khayeka-Wandabwa, & Powers, 2021).

The third hypothesis is to investigate the free trade zone construction on technological innovation. Free trade zones have the potential to spur technical innovation, which is one among its most important advantages. Businesses that perform in free trade zones can gain from a number of blessings, which include tax breaks, streamlined customs approaches, and access to pinnacle-notch infrastructure and logistics offerings (Guan et al., 2023). Additionally, free trade zones frequently offer a supportive regulatory environment that can promote innovation. For instance, some free trade zones might have laxer laws governing intellectual property, which might assist businesses in safeguarding their cutting-edge goods and technologies (Zhuo et al., 2021). Additionally, free trade zones could have more lenient labor rules that allow businesses to test out novel business strategies and employment configurations. In addition to the advantages for specific businesses, free trade zones can also assist the whole economy (Jiang et al., 2021). For instance, when businesses in free trade zones innovate, they might develop new goods and services that increase demand and lead to employment in other industries. Additionally, free trade zones may draw in international capital and expertise, which

may encourage knowledge transfer and cooperation between businesses and researchers (Jiang et al., 2021).

The fourth hypothesis is to investigate the cultural compatibility moderating impact between free trade zone construction and E-commerce. In other words, the degree of cultural similarity between the participating nations affects how well free trade zones facilitate e-commerce. In international commercial interactions, cultural compatibility is crucial because it affects how people communicate, negotiate, and make decisions (Peña-García et al., 2020). Similar cultural backgrounds increase the likelihood that two nations will be able to comprehend each other's viewpoints, values, and attitudes, which can encourage cooperation and collaboration. Cultural compatibility can affect the adoption and usage of digital technology, as well as the marketing and branding techniques used by companies operating in free trade zones and e-commerce (Niu, Dong, Dai, & Jin, 2022). For instance, if a free trade zone is established between two nations with radically different cultural traditions, it could be more challenging for companies to properly promote their goods or to comprehend customer preferences.

The fifth hypothesis is to investigate the cultural compatibility moderating impact between free trade zone construction and food security. This is so that cultural considerations might affect how economic policies are implemented and how well they mesh with regional customs, values, and practices (Leland, Ociepa, Kuonen, & Bangert, 2018). For instance, food may be considered sacrosanct or an integral component of daily life in some cultures, and any policies that undermine food security may encounter opposition. Other cultures might prioritize economic development and growth over food security (Britwum & Demont, 2022). Therefore they might support policies that support FTZs even if they have a negative effect on regional food production. As a result, when developing and executing economic policies like the creation of FTZs, cultural considerations must be made. In order to obtain long-lasting and equitable results, it is crucial to take into account the cultural environment in which economic policies are executed (Murray, 2012). The relationship between FTZ building and food security is intricate and varied.

The sixth hypothesis is to investigate the cultural compatibility moderating result between Free trade zone construction and technological innovation. Cultural compatibility a key moderating factor in free trade zones and technical innovation. One way that free trade zones might encourage technical innovation is by giving companies access to new markets, assets, and knowledge (Najafi, Mohammadi, van Wesemael, & Le Blanc, 2023). Free trade zones can generate a favorable environment for technology innovation by lowering trade barriers and encouraging cooperation between companies from other nations. However, the degree of cultural compatibility between the enterprises engaged may determine how well free trade zones promote technological innovation (Zeng, Cheng, Shi, & Luetkenhorst, 2021).

The seventh hypothesis is to investigate the social inclusivity moderating impact between Free trade zone construction and E-commerce. According to the assertion,

social inclusion acts as a moderator in the relationship between the rise of free trade zones and e-commerce. This suggests that a society's level of inclusion affects how free trade zones and e-commerce interact. In different words, it's far much more likely that the establishment of unfastened trade zones will result in the enlargement of e-commerce the more inclusive a society is (Butz & Hancock, 2019). The capacity of a society to offer same opportunity and remedy to all of its participants no matter their social, monetary, or cultural heritage is referred to as social inclusion. It involves organizing an equitable and just society in which every person has access to essential offerings which include healthcare, education, and other necessities. The truth that a more inclusive society is likely to have extra humans with get right of entry to to the net and digital generation is one explanation for how social inclusion might modify the relationship between free trade zones and e-commerce (Belda-Medina, 2022). This suggests a larger capability marketplace for e-commerce, that may gasoline in addition enlargement on this enterprise. A extra open society can also be much more likely to have favorable legal and regulatory frameworks for e-trade, that can in addition inspire boom (Mustafa, Mabhaudhi, Avvari, & Massawe, 2021).

The eighth hypothesis is to investigate the social inclusivity moderating impact between Free trade zone construction and food security. The free change sector would possibly, however, bring about extra employment possibilities and economic boom if it's far extended in a socially inclusive way, which might then enhance meals safety. As an illustration, if the free trade zone boosts local economic growth and produces jobs, customers' spending power and access to food may both increase (Jenkins et al., 2022). Therefore, the viable outcomes of unfastened trade zones on social inclusion and food safety have to be carefully taken into consideration via policymakers and stakeholders. They want to make certain that the creation of unfastened alternate zones does no longer jeopardize the technique of subsistence or food get entry to for deprived human beings (Karamian et al., 2023). Instead, they ought to paintings to make certain that the advent of unfastened alternate zones fosters social equality and lengthy-time period monetary growth, both of that may ultimately improve meals protection and latest properly-being (Mustafa et al., 2021).

The ninth hypothesis is to investigate the social inclusivity moderating impact between free trade zone construction and technological innovation. Social inclusion can significantly influence the relationship between the creation of free trade zones and technological advancement in this setting. Free trade zones can, on the one hand, open doors for technological innovation by luring foreign capital (Elnour et al., 2022), fostering exports, and fostering an advantageous business climate. The benefits of technological progress may not, however, be completely realized if they are not equally divided among all societal groups. Social inclusion has a role in this. Free trade zones can support fair growth and development that benefits all societal members when they are built with a focus on social inclusivity (Stewart, 2022).

## CONCLUSION

This study provided valuable insight into the interdependent relationships between these economic variables. The study found that the creation of FTZs has a positive impact on the development of e-commerce, food security and technological innovation, and that these effects are moderated by host country cultural cohesion and social inclusion. Findings indicate that FTZ construction promotes e-commerce growth by providing a favorable business environment for online retailers and improving logistics and infrastructure networks. In addition, FTZs have a positive impact on food security by improving trade facilitation, reducing transportation costs and promoting agricultural production and exports. Finally, FTZs have an important role in promoting technological innovation by providing a platform for technology transfer, enhancing research and development, and promoting entrepreneurship. The study also identified cultural compatibility and social inclusion as moderating factors that may influence FTZ manufacturing e-commerce, food security, and technological innovation. Cultural compatibility is important to promote technology transfer and knowledge-sharing across borders, while social inclusion is essential to ensure that all members of society can benefit from the economic opportunities created by FTZs.

## IMPLICATIONS

This study has implications for policymakers, businesses, and theories of economics, way of life, and society. Policymakers can use these findings to formulate policies that sell FTZ development and obtain the advantages of E-commerce, Food Security, and Technological Innovation. This study additionally emphasizes the significance of cultural compatibility and social inclusivity in FTZ improvement. Governments and organizations ought to ensure that the improvement of FTZs does not negatively affect nearby way of life and society, and that they must attempt to create FTZs that gain all contributors of society. The take a look at additionally has theoretical implications for economic, cultural, and social theories. It shows that FTZs can promote financial boom by way of growing trade and investment possibilities, lowering exchange obstacles, and selling innovation. Additionally, the look at highlights the importance of cultural compatibility in FTZ development, and the way FTZs can only be successful if they may be evolved in a manner that is like minded with the neighborhood way of life and society. Finally, the examine underscores the significance of social inclusivity in FTZ improvement, and how FTZs can most effectively be successful if they are evolved in a way that benefits all members of society.

## LIMITATIONS AND FUTURE DIRECTIONS

Limitations: One of the limitations of the study is its constrained generalizability. The examine targeted at the Belt and Road countries, which are characterized by means of precise economic, cultural, and social contexts. Therefore, the

findings might not be relevant to different areas with one of a kind situations. This quandary ought to have an effect on the transferability of the study's findings to different areas out of doors the Belt and Road countries, reducing the impact and validity of the research. Moreover, the examiner trusted self-suggested facts accumulated through surveys, that is every other hassle. Self-reported facts can be difficult to various biases and won't as it should be reflect the real state of affairs on the ground. The use of self-said facts can result in over or underestimations of the authentic effect of FTZ production on E-trade, Food Security, and Technological Innovation. Thus, the accuracy and reliability of the examiner's findings can be compromised due to the records series method used.

Future Directions: One possible direction is to use longitudinal analyzes that track changes in dependent variables over time, thereby providing more reliable evidence of causal relationships in FTZ dimensions and dependent variables between Cross-sectional studies are limited in that they only provide snapshots of any particular moment happens Another approach is to use mixed-methods analysis that combines quantitative and qualitative methods. This approach can provide a comprehensive understanding of the impact of FTZ construction on e-commerce, food security and technological innovation. Comparative studies can also be conducted to compare the impact of FTZ construction in different regions and countries. In addition, the impact of FTZ construction on environmental sustainability is an area that requires further research. Future research could examine the environmental impact of FTZs and identify strategies for their sustainable development. Such as use of renewable energy, reducing waste and emissions, and promoting green technologies in the development and operation of FTZs.

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